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DIGITALIZATION OF THE FINANCE FUNCTION

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PREFACE

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LIST OF ABBREVIATIONS

AI: Artificial intelligence

BPO: Business process owner

BI: Business intelligence

CEO: Chief executive officer

CFO: Chief financial officer

CIO: Chief information officer

ERP: Enterprise resource planning

FTE: Full time equivalent

HR: Human resource

IoT: Internet of Things

IT: Information technology

RPA: Robotic process automation

SSC: Shared service centre

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1 Introduction

The finance function refers to the finance department and the financial processes in an organisation. The finance function has relationships throughout the organisation and represents an important role regarding digitalization in the organisation (De Waal, Bilstra, & De Roeck, 2019). Digitalization leverages the transition from a paper to a paperless driven business context (Brennen & Kreiss, 2016). Digitalization prompts new opportunities for researchers to collaborate with the industry and to provide an outside-in view to support organisations with digital improvements (Legner et al., 2017).

New digital technologies enable the re-engineering of the finance function (Bhimani & Bromwich, 2009). McKinsey (2018) indicates that digital technologies can automate 42 percent of the finance function's activities. The traditional tasks of the finance function get automated, allowing the finance function to rethink its role in the organisation (Lambert & Sponem, 2012). Bhimani & Bromwich (2009) warn for the restructuring and downsizing of the finance function due to a lack of digital skills in the finance workforce. Other studies argue that the finance function has the available qualities to adapt to the changing digital environment (Richins, Stapleton, Stratopoulos, & Wong, 2017; Tudor, Gheorghe, Oancea, & Robert, 2013). The finance function needs to possess the necessary digital skills to adapt to the changing business environment (Mohamed & Lashine, 2003). This master's dissertation reviews the finance function's ability to digitalize and argues the importance of a hybrid finance role to achieve digital maturity.

The literature review in chapter two describes the role of the finance function in an organisation. Secondly, the digital maturity dimensions are explored, which influence the finance function's ability to digitalize. The digital maturity of the finance workforce is evaluated based on the work of Bahador & Haider (2013), incorporating the use of a questionnaire and a review of the job advertisements from the case companies. The case studies provide a broad view on the digital maturity dimensions influencing the finance function's ability to digitalize (Parker & Vannest, 2012).

The main research question of this master's dissertation explores the finance function's ability to digitalize. To support this initial question, two secondary questions are proposed. The secondary questions describe the role of the finance function in an organisation and evaluate the dimensions influencing the digital maturity of the finance function. In chapter three, the research questions and the study design are explained. The results from the interviews, the questionnaires and the job advertisements are described in chapter four. Lastly, the results are discussed in chapter five and a conclusion is proposed in chapter six.

2 Literature review

2.1 The role of the finance function

The finance function incorporates all financial processes, systems and professionals in an organization (de Waal, Bilstra, & De Roeck, 2019). Financial information is traditionally evaluated in a fiduciary manner and indicates a historic perspective of the finance function (Colton, 2001). The finance function is associated with purely number-based tasks and low social interaction (Hagel, 2012). Hoffjan (2004) indicates that the typical accountant is portrayed as inflexible and uncreative. The accountant for example is seen as dissociated and passive. The finance function was mainly portrayed as a 'scorekeeper' for the organisation (Anderson, 1944).

2.1.1 The role transition of the finance function

The boundaries of activities within organisations are blurring and this results in the redefinition of organisational positions (Caglio, 2003). The roles within the finance function change over time (Goretzki, Strauss & Weber, 2013). Rieg (2018) adds that the finance function is constantly evolving. Moag, Carleton & Lerner (1967) mention that the finance function is splintering in different directions. Burns & Baldvinsdottir (2005) suggest analysing the role change of the finance function as an ongoing process and not as endpoint. Hoe (2009) notes an increase in the importance of the finance function in an organisation due to external changes in the business environment. The finance function transitions from a transactional role to a function with a stronger focus on business orientation (Järvenpää, 2007; Pickard & Cokins, 2015).

The finance workforce transitioned from a purely accounting role to for example the management accounting and controlling role. The dynamic nature of the management accountant improved the image of the finance function (Baldvinsdottir, Burns, Nørreklit, & Scapens, 2010). The controller is responsible for the financial processes in an organisation and works cross-departmental (de Waal & Bilstra, 2016). The controller supports the organisation in strategic planning (Fern & Tipgos, 1988). The finance function manages resources (Ricciardi & Simon, 2000) and has expertise in the interpretation of business information to support decision making (Burns & Baldvinsdottir, 2007; Granlund & Lukka, 1998). The expertise of the finance function lies in reporting, compliance, internal control and risk management (Chang, Ittner, & Paz, 2014). The finance function's operational tasks are described as budgeting, control, planning, accounting support and management reporting (Cooper & Dart, 2013; Mouritsen, 1996).

Role transformations, process redesigns and new integrated systems affect the role changes within the finance function (Burns and Baldvinsdottir, 2005). The introduction of digital technologies allowed the finance function to extend its position by adding new tasks such as performance management, process optimisation and change leadership (Chang, Ittner, & Paz, 2014). The increased importance of the decision support role allows the finance function to grow as a business partner within the organisation (Pickard & Cokins, 2015; Rieg, 2018). The business partner tasks imply strategic planning, strategic control and risk management (Burns & Baldvinsdottir, 2005; Graham, Davey-Evans & Toon, 2012; Verstegen, de Loo, Mol, Slagter, & Geerkens, 2007). Figure 1 illustrates a role transition timeline of the finance function based on previous mentioned findings.

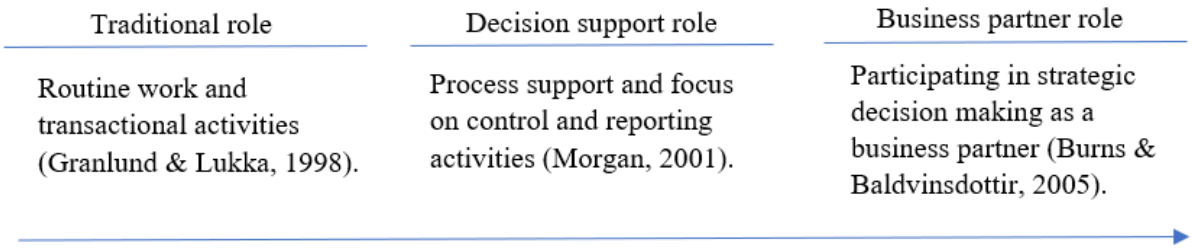

Figure 1: Role transition of the finance function

The finance function extends its tasks by being more forward looking (Graham, Davey-Evans, & Toon, 2012). Granlund & Lukka (1998) describe a present and future oriented finance function. The strategic evaluation of financial information is future oriented and indicates proactive engagement from the finance function. This proactive engagement of the finance function is not in line with the perceived role as 'bookkeeper' or 'watchdog' (Graham, Davey-Evans, & Toon 2012; Hopper, 1980; Morgan, 2001). The unbiased nature of the finance function creates tension with the decision-making tasks of the business partner role (Friedman & Lyne, 1997; Sathe, 1983; ten Rouwelaar & Bots, 2008).

Moodley & Saheed Bayat (2017) indicate the importance of the business partner role of the finance function for an organisation. Neglecting the business partner tasks within the finance function leads to job losses of finance professionals (Favaro, 2001). The finance function needs to shift focus towards alternative roles or arguably the finance function will be marginalised (PwC, 2015).

2.1.2 The hybrid finance role

Recent digital innovation led to the ability of the finance function to participate in fields that were traditionally not appointed to the finance role (Maas & Matejka, 2009). Burns & Baldvinsdottir (2005) define the hybrid finance role as the alignment of the finance function to the structural changes in an organisation. The hybrid finance role adapts professional expertise to a specific business context (Newman & Westrup, 2005). The finance workforce is driven by the modularity of the finance skills (Deloitte, 2018). Caglio (2003) describes a cross-hybridization between accounting and IT. Donnell et al. (2004) envision the absorption of IT-responsibilities in those of the finance function. The hybrid finance role accommodates a multi-faceted and multi-disciplined professional (Allott, Weymouth, & Claret, 2001; Graham, Davey-Evans & Toon, 2012; Maas & Matejka, 2009).

Hybridization of the finance function depends on the willingness and ability of the finance workforce to expand its occupational expertise (Abbott, 1998). Expertise in IT will positively stimulate the role change of the finance function (Granlund & Malmi, 2002; Scapens & Jazayeri, 2003). The combination of finance and IT-knowledge creates a new expert role based on trust for the finance function (Hyvönen, Järvinen, & Pellinen, 2006). The finance function takes on the role as trusted finance lead with operational insight and analytical thinking (Bilstra, 2017). Technology can enhance and augment the finance function by broadening the scope of the provided services (Caringe & Holm, 2017). The implementation of enterprise resource planning (ERP) tools for example allow hybrid finance roles to emerge and improve their positions to gain access to other professional fields (Caglio, 2003).

Morgan (2001) describes the finance function as an information architect with the ability to leverage IT as a competitive advantage. The finance function contributes value through the entire information value chain, from data collection to reporting and insight (EFAA, 2017). The finance function is a service provider and has added responsibilities in business analytics as an information expert (Bilstra, 2017). The finance function provides strategic insight using data analytics (IBM, 2017). Operational and financial information is gathered and analysed by the finance function to support strategic decision making (Tudor, Gheorghe, Oancea, & Robert, 2013). The finance department distributes information to the whole organisation because it has a unique view on strategy, processes and business (Niven, 2002). The hybrid finance professional can combine its financial and non-financial knowledge to support business processes (Caglio, 2003; Sathe, 1983). Caglio (2003) mentions that organisations are looking for finance professionals with expertise in strategic decision making and IT-management to increase digital maturity.

2.2 Digitalization of the finance function

Digitalization takes advantage of a paperless driven business environment (Brennen & Kreiss, 2016). The digitalization process is stimulated by cost reducing technologies, methods and tools (Albers, Gladysz, Pinner, Butenko, & Stürmlinger, 2016). Digitalization is defined as the use of digital technologies to create value-producing activities within an organisation (Gartner's IT glossary, 2018). The finance function is challenged in recent years by the greater focus of the organisation on digitalization (Tudor, Gheorghe, Oancea, & Robert, 2013). Action oriented studies suggest that digitalization is the result of human action rather than a solely external constraint (Zuboff, 1988; Noble, 1984).

2.2.1 Sociotechnical influence of digitalization

Digitalization is a sociotechnical phenomenon and affects the organizational and social context (Legner et al., 2017). The social context of organizations affects the use of digital technologies in an organisation (Caglio, 2003). The structuration model (Orlikowski, 1992) implies that technology is an external force impacting organisations, but the impact is mediated by the socio-organizational background of the organisation. Zainuddin & Sulaiman (2016) explain that the changes in IT affect the transformation of the finance function. Recent technological developments allow for an improvement of productivity in the organisation and the finance function (Posada et al., 2015).

Human action affects digital technology in the design phase and digital technologies modify human behaviour when people use the technologies (Orlikowski, 1992). Kamble, Gunasekaran & Gawankar (2018) mention that the human-technology interaction is the binding force of the fourth industrial revolution called 'industry 4.0'. The fourth industrial revolution depicts the shift from widespread digitalization in the third industrial revolution to increased automation, data sharing and cloud computing (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014). Hermann, Pentek & Otto (2016) define 'industry 4.0' as the overhauling term of technologies that digitalize the physical world.

The ‘industry 4.0’ design principles allow organisations to select the appropriate digital solutions for their organisation (Santos, Mehrsai, Barros, Araújo, & Ares, 2017). Dai & Vasarhelyi (2016) provide an overview of the design principles of the fourth industrial revolution:

- Interoperability: Interconnection of objects and people through communication in a global network (Drath & Horch, 2014).
- Decentralisation: Reduce organizational hierarchies to achieve faster decision making (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014).
- Modularity: Flexible adaptation to changing requirements by adjusting modular systems (Hermann, Pentek, & Otto, 2016).
- Virtualization: The virtual monitoring of physical objects and processes (Hermann, Pentek, & Otto, 2016).
- Service orientation: Change from a product mindset to a service mindset (Iivari, Ahokangas, Komi, Tihinen & Valtanen, 2016).
- Real-time capability: Constant availability of analysable and reliable objects and information (Drath & Horch, 2014).

The concepts of ‘industry 4.0’ entail smart automation, advanced data analytics and system integrations (Jayaram, 2016). The real-time information streams for example allow the finance function to provide improved reporting to the organisation (Donnell et al., 2004). The finance function distributes information by ensuring the accuracy and relevancy of the decimated information. Kristandl, Quinn & Strauss (2014) describe the utilisation and structuring of information as the *‘home turf’* of the finance function.

Robotic process automation (RPA) is an example of advanced automation to eliminate low-input finance work (Anagnoste, 2017). RPA is a software tool and allows for the automation of rule-based tasks (Aguirre & Rodriguez, 2017). ERP-tools are an example of integrated systems challenging the role of the finance function in an organisation (Caglio, 2003). ERP-tools allow for the integration and automation of critical business processes (Samaranayake, 2009). A tension is introduced in the finance function due to advanced automation of traditional finance work (Vakalfotis, Ballantine, & Wall, 2011).

2.2.2 Automation of the finance function

The use of digitalization processes, advanced information technologies and automation have an influence on the finance function (Lu, 2017). Digitalization allows for changes in behaviour within an organisation by introducing companywide technologies such as ERP-tools (Jack & Kholeif, 2008) and greater automation (Rieg, 2018) through RPA. The traditional tasks of the finance function are outsourced and automated, creating a need to rethink the finance function (Lambert & Sponem, 2012). The changing technologies are challenging the core tasks of the finance function (Allott, Weymouth, & Claret, 2001; Scapens & Jazayeri, 2003).

Automation software providers aim to provide time savings through simplification of business processes and enhancement of business productivity (Birt, Wells, Robb, & Bir, 2018). Automation of the repetitive finance tasks provide the finance function the ability to focus more time on the decision support role within the organisation (Burns & Baldvinsdottir, 2005; Chang, Ittner, & Paz, 2014; Granlund & Lukka, 1998; Hopper, 1980). Frey & Osborne (2017) warn for the impact of advanced technologies on the finance profession due to further automation. Brewer, Sorensen, & Stout (2014) indicate a competence crisis regarding the IT-skills of the finance function, due to changes in the digital business context.

Derksen & Luftman (2013) indicate the relation between IT-implementation and cost reduction in the finance function. RPA for example reduces full time equivalents (FTEs) in the finance function (The Hackett Group, 2018). The evolution of technology influences the finance function's working methods (Jablonsky & Barsky, 2000) and reduces monotonous finance work (Stock & Seliger, 2016). Traditional activities of the finance function such as processing data can be done with less employees, resulting in a cost reduction (Burns & Baldvinsdottir, 2005).

2.3 Digital maturity of the finance function

Digital maturity models allow for the assessment of dimensions such as processes (Paulk, Curtis, Chrissis, & Weber, 1993), technology (Popovic, Coelho, & Jaklic, 2009) and people (Curtis, Hefley, & Miller, 2002). A dimension is a specific capability area and each dimension is further explained by measures or qualitative descriptions (de Bruin, Freeze, Kaulkarni, & Rosemann, 2005). Each dimension is mostly exhaustive and distinctive to allow for clear differences in descriptions of characteristics (Mettler & Rohner, 2009).

The strategy dimension is the driver of digitalization (Tadeu, Duarte, Taurion, & Jamil, 2019). Digital strategies enforce the sociotechnical transformation of an organisation by affecting organizational structures and IT-architectures (Legner et al., 2017). Müller, Kiel & Voigt (2018) introduce digital maturity dimensions such as organisational processes and people. The process dimension contains the organisational structure and the business processes (Vial, 2019). Digital transformation shapes the processes in the business domain (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017).

The technological imperative paradigm (Applegate, 1996; Davis, 1989) claims that technology is a driver of change and automatically impacts organisations in a unidirectional manner. On the contrary, the structuration perspective (Orlikowski, 1992) suggests that the people dimension is reflexive in relation to the technology dimension. The people in an organisation are influenced by the technology dimension, and vice versa (Orlikowski, 1992). Kerrigan (2013) notes that processes are interlinked with the people and technology dimension. The technology dimension reviews the implementation of technology and the attitude towards technology (Tadeu, Duarte, Taurion, & Jamil, 2019). Based on the previous mentioned findings, four main dimensions influencing digital maturity are indicated in figure 2. The dimensions and characteristics are described in more detail in the following sections.

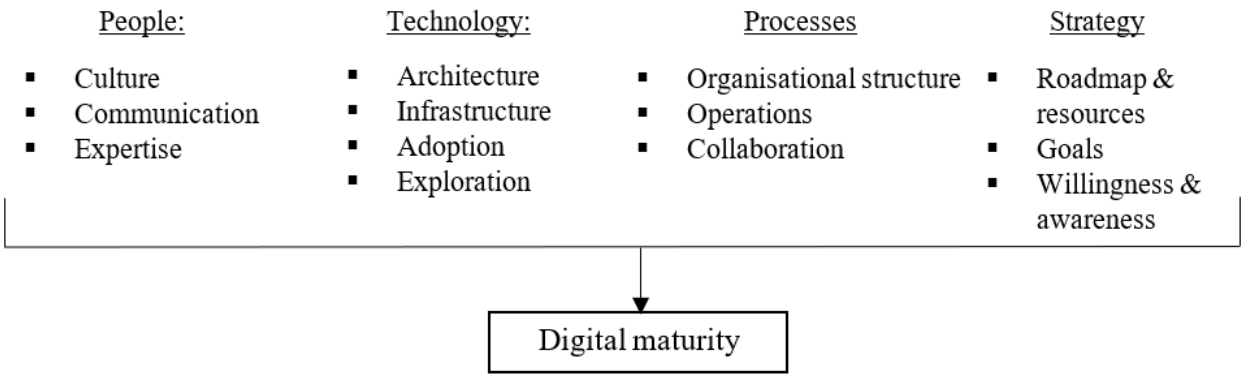

Figure 2: Dimensions and characteristics influencing digital maturity

The levels of digital maturity of the finance function are based on the 'capability maturity model', which measures software process maturity. The 'capability maturity model' defines the levels of maturity as 'initial', 'emerging', 'defined', 'managed' and 'optimised' (Paulk, Curtis, Chrissis, & Weber, 1993). A level is a state of maturity and depicts a description of the characteristics (Fraser, Moultrie, & Gregory, 2002). Each level indicates practices and activities that are empirically testable (Nolan, 1973).

Bahador & Haider (2013) provide an adaptation on the 'capability maturity model' to assess digital expertise of finance workforces. The digital maturity levels indicate the attitude towards technology and the recognition of digital skills in the finance function. The attitude of the finance function towards digitalization can be identified through an evaluation of the job advertisements. The job descriptions provide an insight on the goals of the finance function regarding digitalization (Johnson, Winter, Reio Jr, Thompson, & Petrosko, 2008). Figure 3 illustrates the digital maturity levels of the finance function.

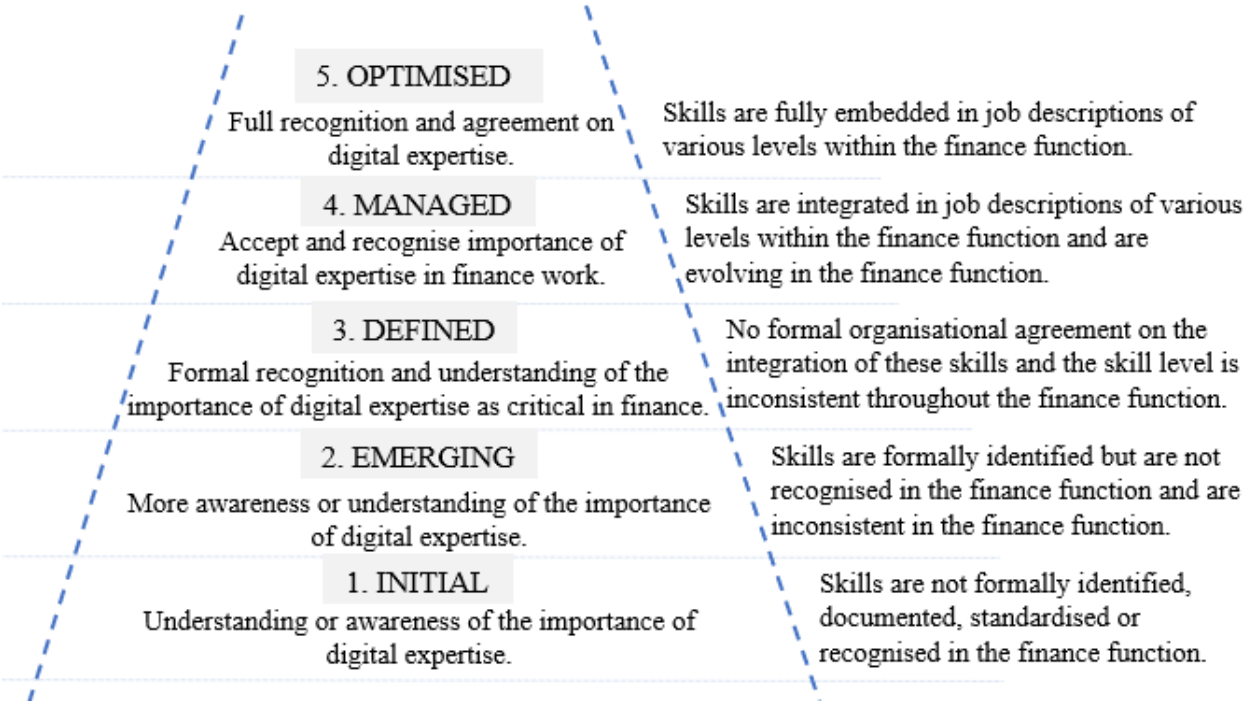

Figure 3: Levels of digital maturity of the finance function (Bahador & Haider, 2013)

Digital acceptance requires new mindsets from the finance function and a strategy to address digital challenges (Hirsch-Kreinsen, 2014). Bahador & Haider (2013) argue that digital expertise and digital recognition illustrate digital maturity of the finance function. Job descriptions reflect the recognition and awareness of the finance function towards digital expertise (Kim, Warga, & Moen, 2013). Additionally, digital maturity of the finance function depends on the use of technology (Markus & Robey, 1988) and the implementation of adequate processes (Schumacher, Erol, & Sihn, 2016).

The levels of digital maturity are indicated by digital expertise, digital usage and digital transformation (Martin & Grudziecki, 2006). The finance function transformation requires cultivation of new services and augmentation of knowledge (Moodley & Saheed Bayat, 2017). Tam (2013) mentions that the finance function is required to have the necessary digital skills and expertise to support the organisation. Digital expertise relates to the skills and attitudes towards IT (Martin & Grudziecki, 2006). The finance function adapts, learns and works with new technologies to further enhance its expertise and introduce new efficiencies to the business (IBM, 2017).

Figure 4 provides an overview of the digital maturity elements used to explore the finance function's ability to digitalize. The four digital maturity dimensions form a starting point to assess the digital maturity of the finance function, which is determined by digital recognition, role change, technology use and digital expertise.

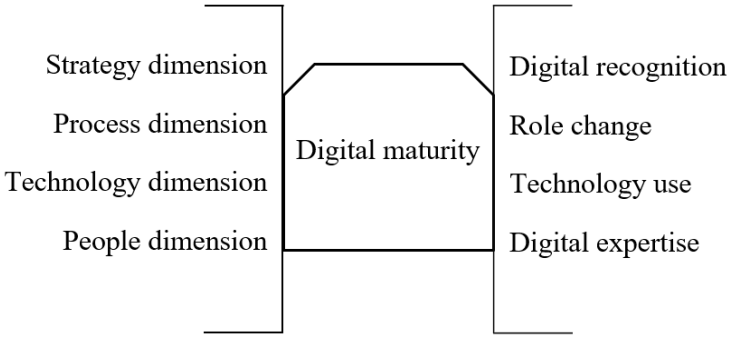

Figure 4: Digital maturity assessment of the finance function

Westerman, Tannou, Bonnet, Ferraris & McAfee (2012) explain that digital maturity is depicted by the recognition of digital needs and the undertaken actions to achieve digital maturity. Gill & VanBoskirk (2016) mention a similar distinction where the digital mature organisation can leverage digitalization and use it as a competitive advantage.

Technological development and human behaviour are triggers for the role change within the finance function (Hyvonen, Järvinen, & Pellinen, 2008; Sharma & Jones, 2010). Differences in finance functions can be identified by reviewing the lack of relevant expertise and the absence of technology tools (Adler, Everett & Waldron, 2000). The finance function is strengthened by the mobility and transferability of technology use within the organisation (Kurunmäki, 2004).

2.4 The strategy dimension of digital maturity

Strategy is a dimension of digital maturity and encompasses the set-up of a roadmap and the provision of the necessary resources (Schumacher, Erol, & Sihn, 2016). The digital strategy is the main driver for digital transformation and affects the degree of technology use in an organisation (Matt, Hess, & Benlian, 2015). A digital strategy encompasses organizational characteristics, digital threats and digital technology goals (Tadeu, Duarte, Taurion, & Jamil, 2019). An organisation has a digital strategy in place to achieve enhanced competitiveness, efficiencies and cost reduction (Müller, Kiel, & Voigt, 2018). The decision makers in the organisations need to recognise the importance of digital maturity and provide the necessary resources to support the strategic goal (Schumacher, Erol, & Sihn, 2016).

Digital transformation has an impact on the operational and functional strategy (Matt, Hess, & Benlian, 2015). The functional strategy determines the performance of the finance function (de Waal, Bilstra, & De Roeck, 2019). The finance function has control over the digital transformation of its own department but is affected by institutional restrictions of the organisation (DiMaggio & Powell, 1983). The digital development of the human assets within the finance function depends on the strategy of the organisation towards digital development and training (Løwendahl, Revang, & Fosstenløkken, 2001). Moodley & Saheed Bayat (2017) mention the need for training and the retention of skills when transforming the finance function. Intellectual capital in the form of human assets creates a competitive advantage for an organisation (Edvinsson & Sullivan, 1996; Beattie & Smith, 2013).

The finance function can achieve digital maturity by cultivating a knowledge culture and supporting open-innovation within the finance function (Schumacher, Erol, & Sihn, 2016). Ala-Mutka (2011) depicts the value of the acceptance towards technology from the finance function to advance digitally. The attitude towards digitalization is the motivator of digital performance (Ala-Mutka, 2011). The digital maturity model published by Forrestor (Gill & VanBoskirk, 2016) indicates the importance of the bottom-up support of the organisation to execute on the digital strategy.

2.5 The process dimension of digital maturity

The process dimension of digital maturity includes the organisational structure and the business processes of the organisation (Tadeu, Duarte, Taurion, & Jamil, 2019). Business processes include a multitude of actions resulting in a certain output (Davenport, 1993). The process dimension of the digital maturity model refers to the adoption of new digital tools to streamline and optimize processes in an organisation (Parviainen, Tihinen, Kääriäinen, & Teppola, 2017). Operational efficiency refers to automation, business process improvement and cost savings (Vial, 2019). The operations of an organisation are decentralised, interdisciplinary and interdepartmental to achieve digital maturity (Schumacher, Erol, & Sihn, 2016). ERP-systems for example allow for the diffusion of finance processes throughout the organisation (Caglio, 2003).

An operational backbone, which supports operational excellence, is a critical enabler of digital maturity (Ross, Beath, & Sebastian, 2017). The operational backbone is connected to the data and the processes of the organisation (Sebastian et al., 2017). Digital maturity of an organisation depends on a future proof workforce and up-to-date processes (Mckinsey, 2018). The lack of broader skills of the finance function on operational level can interrupt the implementation of process optimisation (Moodley & Saheed Bayat, 2017). Business process experts for example measure the performance of the processes and monitor business process tools (Hammer & Stanton, 1999). Process performance and enhanced digital maturity is achieved by the standardisation of processes (Münstermann, Eckhardt, & Weitzel, 2010).

Newman & Westrup (2005) also warn for a marginalization of the finance function due to the controlling of finance processes by other departments. The finance function can be marginalized and commoditized as a ‘foot soldier’ with other managers taking their claim in the finance space (Johnson & Kaplan, 1987; Donnell et al., 2004). Chang, Ittner & Paz (2014) argue that information system integrations reduce finance effectiveness by distributing control of finance information to other groups in the organisation. Automated systems allow for the outsourcing of data collection and implies a loss of control (Chang, Ittner, & Paz, 2014). Lu & Chen (2011) mention that the centralising of functionality is seen as a quick win but demands the lines of business to leave hold of their own processes.

2.6 The technology dimension of digital maturity

The technology dimension of digital maturity includes digital technologies, but also the organizational attitude towards adopting and exploring new technologies (Tadeu, Duarte, Taurion, & Jamil, 2019). IT includes software, hardware and communication technologies to provide information processing (Gartner, 2012). IT-integration proves to speed up routine tasks and liberate resources of the organisation (Grabski, Leech, & Schmidt 2011; Vakalfotis, Ballantine, & Wall, 2011). Transforming and organising technology change is complex due to the dynamic business environment (Miles, Snow, Meyer, & Coleman, 1978).

The progression in technology provided new ways of information dissemination in an organisation (Jablonsky & Barsky, 2000). The finance function is influenced by IT, because all financial transactions involve exchanges of information (Garg, Gupta, Jit, Bharti & Gupta, 2018). The technological developments increased the information chaos that needs to be made understandable to the organisation (Cash, Yoong, & Huff, 2004). The finance function transforms the data chaos into relevant financial information to the stakeholders of the organisation (Colton, 2001).

The International Accounting Standard Board (IAESB) indicates opportunities in service providing for the finance function in big data, blockchain and the cloud (Birt, Wells, Robb, & Bir, 2018). Emerging digital technologies include Internet of things (IoT), artificial intelligence (AI), Big Data, mobile devices and cloud (Tadeu, Duarte, Taurion, & Jamil, 2019). Enclosure 3.1 provides an overview of emerging digital technologies.

The Gartner technology cycle indicates that big data and analytics have reached the main stream. Robotics, AI, advanced analytics and IoT are emerging technology trends (Panetta, 2018). The emerging digital technologies are driven by increased processing power, improved storage capacity and continuous miniaturization (Legner et al., 2017). Deloitte (2018) predicts that the future finance function is fully automated, provides real-time insights and is mainly data driven. The technology dimension indicates that the finance function can automate finance processes and is able to implement IT-applications (De Waal, Bilstra, & De Roeck, 2019).

Table 1 provides a summary of key digital technologies employed in this master's dissertation.

Table 1: Summary of digital technologies

Digital technologies

Technology	Description	Author(s)
Analytics and big data	Collection and evaluation of data from different sources to support decision making.	Chen, Chiang, & Storey (2012)
Cloud technology	Machine data and processing enabling data-driven services.	Rüßmann, Lorenz, Gerbert, Waldner, Justus, Engel, & Harnisch (2015)
Internet of Things (IoT)	Physical objects are linked through a network and are connected among devices, systems, and humans.	Pisching, Junqueira, Santos Filho, & Miyagi (2015)
Artificial intelligence (AI)	Development where computers can think and interact as a human in a multitude of fields.	Rich (1985)
Advanced robotics and automation	Technical aids, which support physical work.	Lasi, Fettke, Kemper, Feld, & Hoffmann (2014).

To conclude on the main digital technologies, the acronym 'SMACIT' is used. The 'SMACIT' technologies refer to social, mobile, analytics, cloud and Internet of Things (IoT). Additionally, AI and robotics are added as digital technologies (Sebastian et al., 2017). Digital technology itself does not create value, but the use of these technologies uncovers new value propositions (Markus & Robey, 1988).

The people in the finance function are open towards these technologies to achieve digital maturity. An improved human-technology interaction supports the transition towards digital maturity (Schumacher, Erol, & Sihn, 2016). The finance workforce has the competences to understand the business impact of these technologies on the organisation (Tadeu, Duarte, Taurion & Jamil, 2019; Schumacher, Erol, & Sihn, 2016). The finance function can evaluate and interact with new technologies (Wessels, 2005).

2.7 The people dimension of digital maturity

The people dimension of digital maturity includes the expertise of the employees, the culture and the collaboration in the finance function (Schumacher, Erol, & Sihn, 2016; Vial, 2019). The people dimension plays a role in improving the effectiveness and the efficiency of the organisation (de Waal, Bilstra, & De Roeck, 2019). The role theory argues that people behave in a certain way depending on their social identity and context (Biddle, 1986; Jackson, 1998). The role transformation of the finance function depends on the reaction of the finance employees to this change (Burns & Baldvinsdottir, 2005). The roles in the finance function are the result of a reciprocal process between the finance employees and the decision makers in the organisation (Mouritsen 1996). The finance function is influenced by the managerial expectations (Wolf, Weißenberger, Claus Wehner, & Kabst, 2015) and the performance pressure from the organisation (Yazdifar et al. 2009).

2.7.1 Digital expertise of the finance function

Digital expertise includes the knowledge, the attitude and the skills to excel in the digital field (Lucia & Lepsinger, 1999). Scarborough & Corbett (1992) introduce a 'technology power loop' model in which expertise of technology affects development and control of technology. Control over technology development will in return define the expertise of technology. Technology expertise of the finance function results in a greater influence on the development of technology within the finance function (Scarborough & Corbett, 1992). Matt, Hess, & Benlian (2015) add that financial knowledge is a driver and a bounding force of technology expertise. Newman & Westrup (2005) warn that other groups in the organisation can take control of the technology in the finance function and reshape it in their image.

Expertise, social position and specialisation contribute to the increase in importance of the finance function in an organisation (Freidson, 1999). Digital expertise serves as an enabler and facilitator of finance work (Taipaleenmäki & Ikäheimo, 2013). The finance function has the resources to evaluate opportunities and risks generated by emerging technologies (Tudor, Gheorghe, Oancea & Robert, 2013). Ala-Mutka (2011) makes a distinction between technical IT-skills and knowledge. Knowledge refers to communication, information management and learning. The Association of Accountants and Financial Professionals in Business (IFAC, 2006) also indicates the importance of the necessary IT-competencies of the finance function. Goles, Hawk, & Kaiser (2008) divide digital expertise into technical IT-skills, project management skills and relational skills. Tudor, Gheorghe, Oancea, & Robert (2013) break down digital expertise of the finance function into digital knowledge and competences. The competences of the finance function refer for example to problem solving skills acquired by experience.

2.7.2 The technical IT-skills of the finance function

Wessels (2005) summarised the technical IT-skills within the scope of a ‘user’, ‘evaluator’, ‘manager’ and ‘designer’. The ‘user’ indicator refers to general technical IT-skills, whereas the ‘designer’ indicator describes more advanced technical IT-skills. The ‘user’ indicator depicts general technology knowledge and the ability to use technology competences. The ‘evaluator’ and ‘manager’ indicators relate to the monitoring and managing of IT (Wessels, 2005).

Mohamad, Hendrick, O’Leary, & Best (2014) describe the importance of technological adeptness, IT-managing skills and technology usage when evaluating digital expertise. The IT-competence framework proposed by Tudor, Gheorghe, Oancea & Robert (2013) suggests a distinction between the user roles and experience levels when analysing digital expertise. Steenkamp (2012) indicates the importance of an effective use of IT and the understanding of professional roles. Enclosure 2.1 provides an overview of the technical IT-skills employed in this master’s dissertation.

Basic IT-skills are indicated by Stoner (1999) as Microsoft office tools, spreadsheets, databases and email. Tam (2013) adds the knowledge of ERP-systems, databases, IT-controls and data security as important competences within the finance function. Spraakman, O'Grady, Askarany & Akroyd (2015) indicate that the finance professional can develop systems for transaction processing and information reporting. The finance function can train and advise non-finance personnel to work with financial information systems (Kristandl, Quinn, & Strauss, 2014). The finance function needs to develop communication capabilities to translate IT and finance issues to non-economists (Hagel, 2012). Cash, Yoong & Huff (2004) note the importance of interpersonal skills in a digital environment.

2.7.3 The personal skills of the finance function

The personal skills refer to the organisational, people and conceptual skills of the finance function (Bahador & Haider, 2013). Schumacher, Erol & Sihn (2016) note the importance of interdisciplinary and interdepartmental collaboration to achieve digital maturity. Newman & Westrup (2005) conclude that digital technologies allowed the finance function to engage with other departments in the organisation. Bahador & Haider (2013) add that finance technologies are process dependent and require collaboration with other departments in the organisation.

The interdependency of information flows and relationships allows the finance function to cross-collaborate by spreading finance knowledge throughout the organisation (Caglio, 2003). Gibbons et al. (1994) recognise an increase of interdisciplinary collaboration with a positive effect on the individual knowledge of the finance professional. Collaboration stimulates value creation through the collective capacity of skills and routines (Løwendahl, Revang & Fosstenløkken, 2001). Granlund & Lukka (1998) support the importance of cross-functional work orientation in the finance function.

The transformation of the finance function to a business partner implies new skills and competences such as business acumen and improved communication skills (Lepistö & Ihantola, 2018). The increasing involvement of technology in the business context requires improved conceptual thinking to get a hold of the complex digital environment (Zuboff, 1988). Analytical thinking and conceptual skills are fundamental competences of the finance function (Awayiga, Onumah, & Tsamenyi, 2010). Table 2 provides an overview of the personal skills needed to acquire digital expertise.

Table 2: Personal skills of the finance function (Bahador & Haider, 2013)

Personal skills

Skills	Elements	Description
Organisational Skills	Change Management Resource Management Business Prioritization Planning Organising/Designing Controlling Time Management	Evaluation, management, accessing, organising, motivating and integrating skills (Somerville, Smith & Smith Macklin, 2008).
People Skills	Leadership Communication and negotiation Delegation Teamwork and collaboration	Transmitting information and interactive communication skills (Van Laar, van Deursen, van Dijk & de Haan, 2017)
Conceptual Skills	Creative thinking Decision making Critical thinking Problem solving	Knowledge acquisition and application (Herde, Wüstenberg & Greiff, 2016), Assessment, linking, clarification and justification skills (Lee et al., 2016).

Van Laar, van Deursen, van Dijk & de Haan (2017) indicate communication, collaboration, creativity, critical thinking and problem-solving skills as core digital expertise indicators. The advancements in technology in the business environment allow organisations to achieve a distinctive digital maturity profile (Van Dijk & Hacker, 2003). The digital expertise of the finance function drives the organisations' competitiveness and transformation capability (Anderson, 2008).

3 Research methodology

3.1 Research question

This master's dissertation has the objective to discover the main elements to achieve digital maturity in the finance function. The aim of this master's dissertation is to provide practical relevance and achieve pragmatic science (Jansen, 2018). Tucker & Lowe (2014) indicate the importance of practical problem solving in finance research. The main research question is proposed as follows:

- What determines the finance function's ability to digitalize?

The case study approach of this master's dissertation provides a broad view on the potential elements affecting the digitalization ability of the finance function (Parker & Vannest, 2012). Previous literature investigates the change of the finance function with a top-down research approach by mainly focusing on the influence of strategy on the finance function (Iversen, 1998; Morgan, 2001; Zoni & Pippo, 2017). The top-down research approach targets the central perspective of the decision makers (Sabatier, 1986). The managers' point of view on digitalization allows for a better understanding of the finance function's transformation (Windeck, Weber, & Strauss, 2013).

This master's dissertation studies the digital maturity of the finance function by evaluating the role changes of the finance workforce and through the digital maturity assessment of the finance workforce. The first secondary question investigates the role of the finance function in an organisation. Secondly, to disclose the elements influencing the finance function's ability to digitalize, there is a need to assess the digital maturity of the finance function. The secondary questions are proposed as follows:

- What is the role of the finance function in an organisation?
- What are the dimensions and characteristics affecting the digital maturity of the finance function?

The degree of role changes within the finance workforce provides an insight on the digital transformation process of the finance function. This master's dissertation uses the digital maturity assessment of the finance workforce as an indication for the finance function's ability to digitalize. The digital maturity dimensions establish a set of potential elements that influence the digital maturity of the finance function.

3.2 Study design: Case studies

This master's dissertation employs a multimethod research approach (Lambert & Sponem, 2012) using case studies that involve semi-structured interviews and a questionnaire to analyse the digital maturity of the finance workforce. The multimethod research approach is also in line with the suggestion of Müller, Kiel & Voigt (2018) to use more than one source of data in qualitative research. The case studies are supplemented with a questionnaire to add quantitative data to the case studies and reduce bias (Yin, 2009). Additionally, job advertisements allow for a secondary insight on the digital maturity of the finance function.

3.2.1 The selection of the case companies

The main selection criteria for the case companies of this master's dissertation is the size of the company. The case studies include large organisations because smaller companies have less integrated and advanced technologies in place to impact the finance function (Adler, Everett, & Waldron, 2000; Cadez & Guilding, 2008). Cooper & Dart (2009) add that larger organisations have more resources available to change the finance function. The large organisation has enough scale to allow for a study of the finance department separately from other departments in the organisation (Byrne & Pierce, 2007). The size of the organization affects the formation of the finance function and determines the complexity of the finance work (Maas & Matejka, 2009; Hambrick & Mason, 1984). The case companies employ more than 250 people worldwide and are regarded as large organisations (European Union, 2003).

The decision support role of the finance function is prominently present in mature organisations (Granlund & Taipaleenmäki, 2005). Chang, Ittner & Paz (2014) indicate that large and international organisations place greater importance on control and reporting roles of the finance function. Libby & Waterhourse (1996) argue that size is not directly a predictor for the rate of finance change in an organisation. An additional consideration when selecting the case companies is the industry type. The variety of industries rules out industry specific determining elements regarding the finance function's ability to digitalize. Zoni & Merchant (2007) argue a need for research on the transformation of the finance function in various industries. This master's dissertation reviews case companies with various sizes and with distinct industry types.

3.2.2 The research process

Figure 5 represents the steps in the assessment of the case companies (Paulk, Curtis, Chrissis, & Weber, 1993).

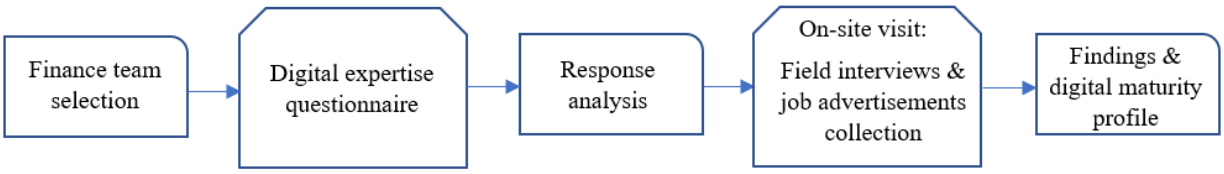

Figure 5: Steps in the assessment of the case companies (Paulk, Curtis, Chrissis & Weber, 1993)

The digital maturity assessment of the case companies employs the use of questionnaires. The questionnaire collects quantitative data of an individual's perceived digital knowledge and expertise. The paper evaluates the digital expertise of the finance workforce using a questionnaire based on the digital maturity framework of Bahador & Haider (2013). The interviews and the evaluation of the job advertisements provide an additional research element for the evaluation of the digital maturity of the finance function. The on-site visits allow insight on the use and design of digital technologies in the finance function.

3.2.2.1 Digital expertise questionnaire

The questionnaire is based on the digital maturity research from Bahador & Haider (2013) where respondents were asked to self-assess each of the digital expertise indicators. The digital expertise is measured through four main skill indicators on a 5-point Likert scale, ranging from 1 (poorly developed) to 5 (strongly developed). A similar measurement method is used for the 'capability maturity model' (Paulk, Curtis, Chrissis, & Weber, 1993). The questionnaire provides a multi-dimensional insight on the digital expertise of the finance function through the four skill indicators.

The questionnaire measures the averages of the various digital skill indicators for each respondent. Secondly, the mean of each skill indicator is determined for every case company. Lastly, the overall mean number provides the guiding indicator for the digital maturity profile (Paulk, Curtis, Chrissis, & Weber, 1993). Pre-testing of the questionnaire was done by providing the questionnaire to first contacts within each case company to evaluate the questionnaire. This master's dissertation takes the corporate policy into account when distributing the questionnaire in the case companies. The questionnaire can be consulted in the separate attachment.

3.2.2.2 Field interviews

The interviews with different finance professionals in the organisation provide knowledge on the interactions and activities between group members in the finance function (Katz & Kahn, 1966). The one-to-one interviews are conducted in a semi-structured manner as the interview questions are prepared in advance. The main interviewees are the chief financial officer (CFO), the management accountants and controllers of the finance function. These roles are indicated as business partner roles by Pickard & Cokins (2015). Enclosure 1.1 provides an overview of the interviews. The interviews are anonymously processed in this master's dissertation, as requested by the CFO's of the case companies.

The structure of the interview is affected by the background of the interviewee. Each digital maturity dimension is examined to analyse how the characteristics of these dimensions impact the finance function's ability to digitalize. During the interviews there is an evaluation of the finance roles and the technology use in the finance function. The overview of the interview questions can be found in enclosure 1.2.

3.2.2.3 Job advertisement analysis

Job advertisements present an indication on the finance function's required digital expertise to perform at the case companies (Ahmed, 2005). Job descriptions are an accessible expression of the finance function's awareness and attitude towards digitalization (Kim, Warga, & Moen, 2013). The recruitment of personnel is part of human resource (HR) management and allows the finance function to introduce role changes (Järvenpää, 2007). The job advertisements add understanding on the current and future composition of the finance function (Johnson, Winter, Reio Jr, Thompson, & Petrosko, 2008).

The job descriptions are described by job title, experience level, skills and digital expertise. The publishing years of the reviewed job advertisements for this master's dissertation range between years 2011 and 2019. The analysis of the job advertisements, illustrated in section 4.1, makes a distinction between finance management roles and finance support roles. The finance management roles are responsible for the group performance and the role instructs subordinates to reach certain goals (Kraut, Pedigo, McKenna, & Dunnette, 1989). The junior role is not regarded as a management function yet, as the junior role is assigned to a senior supervisor in the first years (Chong & Monroe, 2015).

3.2.3 Cross-case analysis

The cumulative nature of this study brings together a multitude of findings from the case studies in a descriptive manner (GOA, 1990). The case studies attempt to capture the dynamics within and across cases (Eisenhardt, 1989). The case studies allow for the development of hypotheses, which can be tested in the future with quantitative research methods (Lukka, 2005). Ryan, Scapens, & Theobald (2002) indicate that case studies are part of a qualitative research approach that facilitates exploratory studies. The within-case study design requires a clear indication of the discussed topics, the roles of the individuals and the unit of analysis (Yin, 1981).

A cross-case analysis is employed using a case-comparison method. The case-comparison method juxtaposes the explanation of the case company with the explanations of the other case companies. The similarities and disparities of the explanations allow for the development of a more general explanation (Yin, 1981). External and internal antecedents (Byrne & Pierce, 2007) regarding the digital transformation of the finance function are evaluated to provide a description of the case companies. The contextual basis of the finance function's digital transformation is considered when comparing the case companies (Snowden, 2002).

3.3 Reliability of the research

The interpretative research approach suggests that subjective experiences provide insights on the social reality (Lukka, 2014). The field interviews are supplemented with the insights from the annual reports to build a reliable description of the case companies. The cross-case analysis takes the size and the business context into account when evaluating the explanations of the case companies. The cross-case analysis depicts associations between the various studied elements, but not causality (Zoni & Merchant, 2007).

The research balances its depth and width by using multiple interviews from various organisations and industries. To improve the depth of the research, an additional questionnaire and job advertisement review is used. The questionnaire is addressed to the finance employees and the finance managers to obtain reliable results (Müller, Kiel, & Voigt, 2018). Internal validity of the findings is aimed to be high due to the nature of the case studies (Lambert & Sponem, 2012). The interviews are transcribed to increase reliability and are available in the separate attachment.

4 Results

4.1 Case studies

The case companies have a Belgian origin or a substantial Belgian footprint. Company B for example is founded in the Netherlands but has a strong Belgian establishment. Company E represents a smaller Belgian division compared to the global operations, but the finance function in Belgium works independently from the mother company. The case companies have a substantial finance team in Belgium. The finance teams are consistent of five or more full time equivalents (FTEs). An overview of the organisations can be found in table 3.

Table 3: Overview of the case companies

Overview of the organisations

Org.	Industry	Total employees (#)	Finance workforce Belgium (#)	Revenue (euro)	Operational regions
A	Food	5000	110	1,4 bn	Europe
B	Human resource service provider	37000	40	23 bn	Europe, Asia, Americas, Australia
C	IT-service provider	1900	32	1,8 bn	Benelux, France
D	Biotechnology	1500	12	108 m	Belgium
E	Advertising and media	70000	9	15 bn	Worldwide
F	Education	1300	16	200 m	Belgium

The case companies depict various revenue and employee numbers. Table 3 provides an overview of the industry types, the total number of employees, the revenue numbers and the operational regions. The table also describes the amount of FTE's in the finance function for every case company, specifically for the Belgian branch.

To evaluate the case companies, an overview of the backgrounds of the evaluated organisations is given in the following sections. The case study overview provides a summary of the backgrounds of the organisations and is supported by an organisational chart of the finance function. The organisational charts are visualised with lines and boxes to provide an overview of the relations and job positions within the finance function (Long, Ajagbe, Nor, & Suleiman, 2012; McKinsey, 2016). The circles illustrate the various finance teams in the finance function. The organisational structure allows insight on the hierarchy and responsibilities within the finance function (Baron & Greenberg, 1990). The organisational charts provide the number of total FTE's in the finance function for each of the case companies.

A total of 58 questionnaire respondents from the case companies are taken into consideration when evaluating the digital maturity of the finance workforces. The questionnaire results can be found in the separate attachment. In total 20 job advertisements are analysed in this master's dissertation. The overview of the job advertisements can be found in enclosure 4.2 and 4.3. The original job advertisements can be found in the separate attachment.

In total 25 interviews were performed with the finance professionals from the case companies. For each case study a summary of the interviews is provided. The summary is based on the digital maturity dimensions defined in section 2.4. The opinions of the different interviewees are indicated by the company letter and a number indicating the specific interviewee. Table 4 illustrates the letter and the corresponding interviewee at the case company. The full interviews can be found in the separate attachment and the summaries of the interviews can be found in enclosure 1.4.

Table 4: Overview of the interviewees from the case companies

A	B	C
A1: BPO controlling	B1: Finance director	C1: Chief financial officer
A2: BPO finance	B2: Administration manager	C2: Corporate reporting manager
A3: Divisional controller	B3: Credit manager	C3: Group controlling manager
A4: Chief financial officer	B4: Accountancy manager	C4: Business support manager
	B5: Robotics lead	
D	E	F
D1: Chief financial officer (1)	E1: Chief financial officer	F1: Chief financial officer
D2: Management accountant (2)	E2: Accountant general expenses	F2: Finance coordinator
D3: Accountancy manager (3)	E3: Chief accountant	F3: Internal audit finance
D4: Finance project officer (4)	E4: Accountant	F4: Accountancy manager

4.1.1 Company A

Company A is a food company founded in 1899. Company A reaches 17 European markets and has establishments in 12 European countries. Company A has two distinct business lines, namely bakery products and lipids. The company has its core business line in margarines, culinary oils and fats. The frozen bakery products are the most significant provider of total revenue. Total revenue of the company is 1,4 billion euro. Figure 6 provides an overview of the finance function of company A.

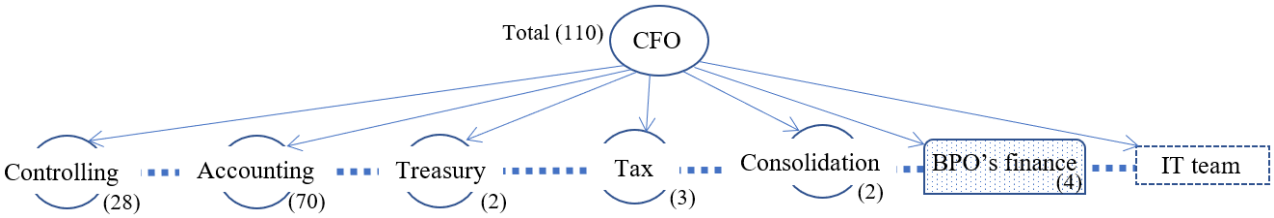

Figure 6: Organisational structure of company A

Company A employs a total of 5200 FTE's and the finance function in Belgium includes 110 FTE's. In Belgium, 3200 employees are active, and the finance function covers 3,4 percent of the total employees in Belgium. Noteworthy is the introduction of business process owners (BPO) at company A. The BPO's form a bridge between the finance department and the IT-department. The IT-department does not represent a core business of company A, thus the CIO reports to the CFO. Figure 6 indicates that a substantial portion of the finance function is incorporated by the accounting personnel with 70 FTE's.

4.1.1.1 Interview results

Table 5 provides an overview of the interview results from the finance function at company A.

Table 5: Interviews summary for company A

Digital maturity dimensions of the finance function			
Strategy	Processes	Technology	People
A1 ▪ Innovation vs. Stability ▪ Adoption vs. innovation ▪ Managers define digital needs **A2** ▪ Finance takes ownership, bottom up roadmaps ▪ Set clear priorities towards whole organisation ▪ CFO can only shape technology roadmap **A3** ▪ Pressure of workload & cost reduction ▪ CEO pushes & demands commitment **A4** ▪ Priorities determine progress ▪ Finance provides ideas	**A1** ▪ First have a defined core process, then innovate on it **A2** ▪ Size of organisation determines ability to digitalize ▪ Standardization is the core of digitalization **A3** ▪ Interoperability of the organisation ▪ Complexity processes translates in technology ▪ Adapt processes to technology **A4** ▪ Lack of standardization of processes slows down progress	**A1** ▪ Use of technology creates value ▪ Need for new technology is created by market ▪ Focus on core tasks ▪ Automation of administrative tasks ▪ Choose lasting trends **A2** ▪ Automation demands customization, which is negative **A3** ▪ Set value adding as priority ▪ User creates value ▪ Design phase is crucial **A4** ▪ Digital platforms incorporate all stakeholders ▪ Technology depends on needs of users ▪ Customization is disadvantage	**A1** ▪ Importance of the layer between IT and business ▪ Mix of competences in finance ▪ Creative roles are created **A2** ▪ Importance of IT buffer **A3** ▪ Increased collaboration between departments ▪ Self-service finance **A4** ▪ Motivated team with essential skills ▪ Transactional tasks are no added value ▪ Importance of role to bridge finance and IT

Company A indicates the importance of the ownership taken by the finance function to develop digital initiatives (A2, A4). The bottom-up strategy approach proves to be successful in this organisation. The respondents also indicate the importance of a digital strategy provided by the top of the organisation (A2, A3, A4). The CFO of company A indicates the importance of a digital story and the right people to support it.

A4:" You need money, a story, a team, who believes in it [digitalization] and the skills to run those applications. If you don't have the skills, then you have to hire them."

Priorities and goals need to be established in the strategy, as such the employees can work towards those goals (A2, A4). Interviewee A3 indicates the importance of the re-thinking of the processes when implementing new digitalization projects.

A3: "Some complexities for the business are almost a monster that is going to be created in the systems."

Interviewee A4 adds that standardization of processes is needed to advance efficiently regarding digitalization.

A4: "The processes are not standardized. But it does not stop us, but it will take longer."

Interviewee A2 indicates the negative effect of too much customization of digital technologies.

A2: "The downside is, a part of automating is customization."

Digital projects only succeed if the user of the technology can create value from it (A1, A3). The organisation clearly indicates the importance of a separate finance role, which can form a bridge between the IT-department and the finance department (A1, A2, A3, A4). Respondent A3 indicates the importance of self-service finance and the collaboration between departments.

A3: "Everything is more connected, such as in globalization of the world, you also have a globalization of the organisation."

4.1.1.2 Questionnaire results

Table 6 provides an overview of the digital maturity results of the finance workforce at company A. The questionnaire was sent to 15 managing finance roles, as requested by the CFO. Ten respondents were registered, resulting in a response rate of around 66 percent.

Table 6: The results of digital expertise for company A

Job description	*Years of experience*	*Technical IT-skills*	*Organisational skills*	*People skills*	*Conceptual skills*	*Overall*
			Mean results			
Head of Finance	18	2,5	3,0	3,8	3,8	**3,3**
BPO finance	12	3,5	3,5	4,0	4,3	**3,8**
Finance Country Manager	22	3,4	3,7	4,5	4,5	**4,0**
Head of Finance	10	3,3	3,0	5,0	4,8	**4,0**
Accounting Manager	10	2,7	3,2	4,3	4,0	**3,5**
Business Process Owner	9	4,1	3,5	4,0	4,3	**4,0**
CFO	15	2,7	3,8	4,3	4,5	**3,8**
Head of Finance	10	3,0	3,3	4,0	3,8	**3,5**
Country Manager	12	2,7	3,8	4,0	4,0	**3,6**
Business Process Owner	6	3,6	3,0	4,0	4,0	**3,6**
Total results	**12,4 (4,7)**	**3,5 (0,5)**	**3,8 (0,3)**	**4,6 (0,3)**	**4,6 (0,3)**	**4,14 (0,2)**

The digital maturity of the finance function of company A is described as ‘managed’ or ‘optimised’. These levels indicate that the digital skills are integrated in job descriptions within various levels of the finance function. Digital expertise is recognised and accepted in finance work.

The personal skills are indicated as developed by most of the respondents. The technical IT-skills are indicated with an average score of 3,5. The standard deviation of the technical IT-skills is 0,5 percent, indicating that the technical IT-skills are similarly developed between respondents. The overall digital expertise indicates a low standard deviation of 0,2. The three BPO's indicate an average technical IT-skills score above 3. The CFO and the other heads of finance mainly indicate an average technical IT-skill score between 2 and 3. Enclosure 2.2 provides further insight on the scores of the respondents within the technical IT-skills indicator. Figure 7 displays the results from the technical IT-skills.

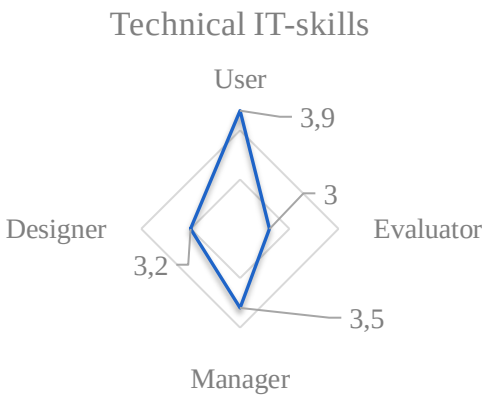

Figure 7: Overview of technical IT-skills for company A

The finance workforce illustrates the highest average score within the 'user' indicator of 3,9. The 'evaluator', 'manager' and 'designer' scores are all above 3. Noteworthy is the high average 'manager' score of 3,5. The finance workforce at company A interacts with IT as a 'user', 'evaluator', 'manager' and 'designer'. The technical IT-skills of the finance workforce at company A are developed.

4.1.1.3 Job advertisement results

Enclosure 4.2 provides an overview of the job advertisements addressed towards finance management roles. The managing finance roles of company A indicate a clear digital focus. The BPO-role forms the bridge between the IT-department and the business. The BPO-role requires digital expertise. The accounting process manager also requires automation skills and forms the liaison with IT. The controller demands less extensive digital expertise, as the job advertisements indicate basic MS office and ERP-knowledge. The controller role description from year 2016 indicates the business partner role. Both controllers require proactive behaviour, which refers to the business partner role. The BPO works interdepartmental and has a focus on IT.

Enclosure 4.3 provides an overview of the job advertisements regarding the supporting finance roles at company A. The digital focus of the finance function is mentioned in the supporting finance roles. The additional ERP-knowledge is seen as an advantage when applying for the job. This indicates that basic digital expertise is needed for the supporting finance roles. Knowledge of MS Office is stated as a must. The proactive behaviour towards digitalization of the finance function is demanded from the junior BPO. The junior BPO creates and designs IT-change, thus matching its senior equivalent. This indicates that the digital expertise of the finance function in company A is recognised on all levels. Note the mentioning of proactive behaviour of the business analyst and the interdepartmental work of the junior BPO, which indicates a recognition of the business partner role for the finance function in company A.

4.1.2 Company B

Company B is a human resource (HR) service provider. Company B is active worldwide and has a strong footprint in the Benelux. Company B started in 1965 in the Netherlands and incorporated on Belgian soil in 1970. The organisation started with an internationalization strategy in 1992 and has become one of the biggest providers of HR-services worldwide. Company B is active in 40 countries with 37 thousand employees. Company B employs around 120 thousand temporary workers in Belgium with around 13 thousand clients. The worldwide revenue of the company is around 23 billion euro, with the Belgian branch generating around 1 billion euro revenue. Figure 8 provides an overview of the organisational structure of company B.

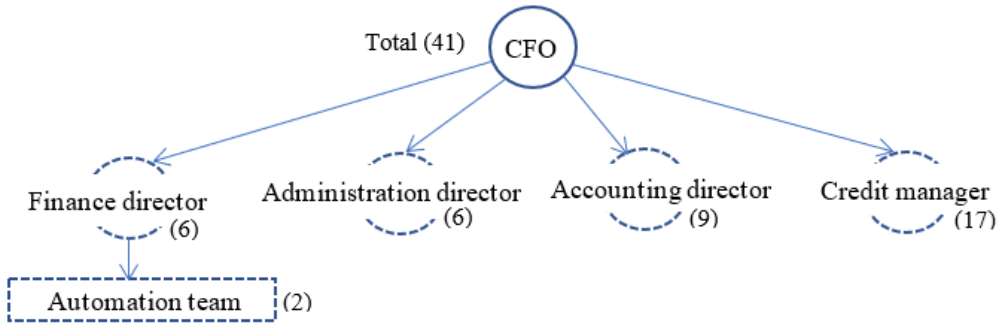

Figure 8: Organisational structure of company B

Company B retains 1800 employees in Belgium, with a finance team of 41 FTE's. The finance function contains 2,2 percent of the total employees in Belgium. The finance director takes the lead regarding the digitalization projects in cooperation with the CFO. The finance director has an automation team of two people under his supervision to further advance automation. The CFO of company B was not interviewed because the CFO left the company to pursue other opportunities.

4.1.2.1 Interview results

Table 7 provides an overview of the results from the interviews at company B.

Table 7: Interviews summary for company B

Digital maturity dimensions of the finance function			
Strategy	Processes	Technology	People
B1 ▪ Set priorities ▪ Young CFO with a strong vision who pushes ideas ▪ Vision has to support motivation of the employees **B2** ▪ CFO is driver of change ▪ Finance takes control of advancements **B3** ▪ IT-resources needed **B4** ▪ Focus on value adding when automating ▪ Top down push needed ▪ Value adding strategy	**B1** ▪ Benchmarking to increase continuous improvement ▪ Business determines cost focus & complexity ▪ Lean working is the foundation for digitalization ▪ SSC is at the foundation of standardization **B2** ▪ SSC provides scale advantage ▪ Dependency on suppliers **B4** ▪ Uniformity is needed	**B1** ▪ Focus on value adding, not on cost reduction ▪ Human approach towards technology **B2** ▪ Balance technology advancement & people **B3** ▪ IT-bottleneck **B4** ▪ Goal is one button reports	**B1** ▪ Mature workforce is a strong foundation ▪ Separate innovation team **B2** ▪ Indicate project owners in finance ▪ Strong dependency on IT team **B3** ▪ Adjust expectations to the skills of the people ▪ Mix of people needed **B4** ▪ Older generation scared of digitalization **B5** ▪ Motivation & interest biggest drivers of change ▪ Finance takes control of improvements

Company B indicates the importance of a digital vision of the CFO, but also the drive from the CFO to demand commitment from the finance workforce (B1, B5). A digital vision focuses on value adding activities and not solely on cost reduction (B4, B5). Company B indicates the importance of a shared service centre (SSC) and the implementation of lean methods towards the goal of advanced automation (B1). Standardization and uniformity of working are crucial in the automation process (B4).

B2: "Automating is easier when everyone is working in the same way. We uniformized the procedures. We created a standard first."

Interviewee B3 mentions the IT-bottleneck as an obstruction when trying to digitalize the finance function. Interviewee B2 describes that IT has *"time problems regarding IT implementations"*. The finance director of company B mentions a possibility to create a hybrid finance team to combine technology innovation and finance.

B1: "A solution could be, day to day and innovation, split them [teams] with different employees for each. But then, why would people want to work for the less innovative, more boring job?"

The older generation in the finance function is indicated as a strong foundation (B1), but this older generation is also more hesitant towards digitalization (B4). Respondent B3 mentions the need to adjust the digital expectations to the expertise of the finance workforce.

B3: "Shape your expectations to this [the digital expertise of the finance workforce]. Sometimes you have to continue in a semi-manual manner."

4.1.2.2 Questionnaire results

Company B preferred to only send the questionnaire to certain finance managers and employees due to corporate policy. The questionnaire reached 9 out of the 10 invited employees, resulting in a response rate of 90 percent. Table 8 illustrates the results from the digital expertise questionnaire.

Table 8: The results of digital expertise for company B

Job description	*Years of experience*	*Technical IT-skills*	*Organisational skills*	*People skills*	*Conceptual skills*	*Overall*
			Mean results			
Finance manager	31	1,8	4,0	4,0	4	**3,5**
Director Administration	20	2,2	4,0	4,8	4,25	**3,8**
Finance Director	9	4,3	5,0	5,0	5	**4,8**
Senior controller	15	3,0	4,3	3,5	4,5	**3,8**
Business Controller	1	2,2	3,8	3,8	4	**3,4**
Business Analyst	24	1,9	3,0	3,0	4	**3,0**
Business analyst	16	3,5	3,7	3,8	4,25	**3,8**
Business controller	15	1,5	3,0	4,3	4,25	**3,2**
Business controller	25	3,3	3,2	4,0	4	**3,6**
Total results	**17,3 (8,9)**	**2,6 (0,9)**	**3,8 (0,6)**	**4,0 (0,6)**	**4,25 (0,3)**	**3,7 (0,5)**

The digital maturity of the finance workforce is indicated as ‘defined’ and almost reaching the ‘managed’ level. The finance function recognises and understands the importance of digital expertise related to finance work. The average score of the technical IT-skills from the finance workforce is 2,9, with a standard deviation of 0,9. The technical IT-skills are not equally developed between the respondents of company B.

The overall digital maturity indicates a score of 3,7 and the standard deviation is 0,5. The overall digital expertise is more similar between the respondents than the technical IT-skills. The conceptual skills of the finance workforce at company B show less differences between respondents with a standard deviation of 0,3. Figure 9 denotes the results from the technical IT-skills for company B.

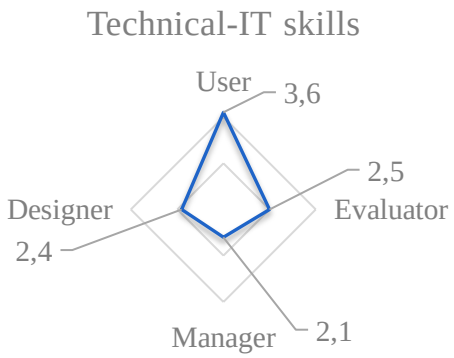

Figure 9: Overview of technical IT-skills for company B

The results from the technical IT-skills indicate differences between the ‘user’ indicator and the other indicators of the technical IT-skills. The ‘manager’ indicator scores are low. The ‘designer’ indicator scores higher than the ‘manager’ indicator, with an average score of respectively 2,4 and 2,1. The finance workforce at company B interacts with IT mainly as a ‘user’, but also as a ‘evaluator’ and ‘designer’. This implies a developed finance workforce regarding the technical IT-skills.

4.1.2.3 Job advertisement results

Enclosure 4.2 provides the job descriptions of managing finance roles for company B. The job description of the controller indicates that the role is a main point of contact and requires organisational skills. The business controllers require a digital focus such as process automation and the ability to adapt to new systems. Systems optimisation is also indicated in the job description. The job advertisements also indicate the business partner role and the importance of standardization. Company B is working with a shared service centre (SSC) and this is also indicated in the job description. Note that both business controllers require proactive behaviour and business partner tasks.

Enclosure 4.3 provides an overview of the job advertisements regarding supporting finance roles at company B. The junior business controller does not yet fulfil a managing function but requires the digital expertise to work with finance tools. Data management and analysis is also indicated in the job description. Company B emphasizes the IT-minded requirement of this position, which indicates the importance of digital expertise in the finance function. The junior business controller requires proactive behaviour and combines operational and financial information as a business partner.

4.1.3 Company C

Company C is an IT-service provider and was formed after a fusion between two Belgian software companies in 2008. In 2018 the organisation was acquired by a French IT-service provider. Before the acquisition, company C was listed on the stock exchange. Company C has a revenue of 1,8 billion euro and a revenue of around 300 million euro in the Benelux. Figure 10 provides an overview of the core finance function from Company C in Belgium.

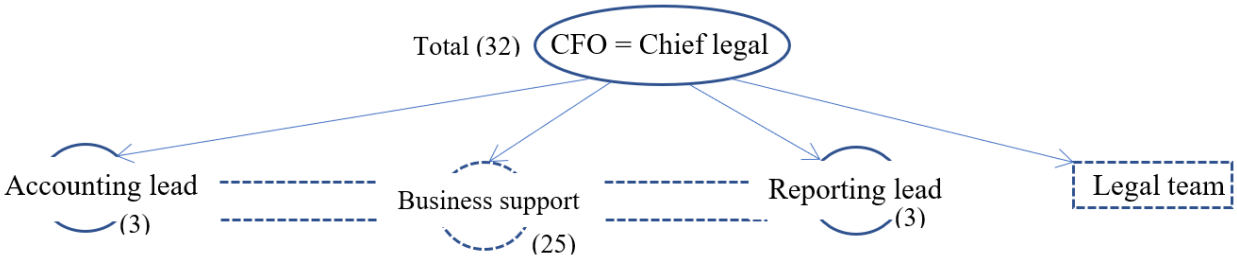

Figure 10: Organisational structure of company C

Company C has around 1900 employees and the finance function includes a team of 32 FTE's. The finance function amounts to 1,6 percent of the total workforce in Belgium. The CFO also functions as head of legal for company C. The organisational structure indicates the importance of the business support team in the finance function. The business support team is mainly responsible for the rethinking of processes and the improvement of the administrative operations. The business support team is appointed as a hybrid finance role in the organisation. Noteworthy is that the business support team is not exclusively working for the finance department.

4.1.3.1 Interview results

The summary of the interviews with the finance functions at company C is provided in table 9.

Table 9: Interviews summary for company C

Digital maturity dimensions of the finance function			
Strategy	Processes	Technology	People
C1 ▪ Finance is a cost department, thus needs to be more efficient ▪ Finance provides input for digitalization opportunities **C3** ▪ Not enough time to evaluate improvements ▪ Attitude towards software purchasing	**C1** ▪ Process dimension is the driver of digitalization ▪ Balance between innovation & coherence **C4** ▪ Policy against island working ▪ Need for a structured way of working	**C1** ▪ Flexibility leads to complexity ▪ Technology backbone is the depending factor **C2** ▪ One version of the truth ▪ Central data warehouse ▪ Big data not yet possible **C3** ▪ 90% of manual work automated ▪ Adjust behaviour to technology **C4** ▪ Paper to paperless ▪ Central archive	**C1** ▪ Legacy people ▪ Need for digital coaches in teams ▪ Multidisciplinary ▪ Cross-departmental ▪ Proactive ▪ Service provider **C2** ▪ Communication ▪ Business partners **C4** ▪ Need for centralised thinking ▪ End-to-end working is needed ▪ Need for collaboration

Company C mentions the dilemma between adapting software development to the behaviour of the finance workforce or in contrast rethinking the working methods first before implementing them in software (C1, C3).

C3: "You have the adjust the behaviour to let the systems work better. The buyer [the finance workforce] has to adapt their behaviour to the software and not the other way around"

Flexibility towards the technology development allows further complexity of the systems and processes (C1). The CFO of company C indicates that the processes are the drivers of digitalization in the finance function. Interviewee C1 notes that there is a legacy backbone problem to achieve digital maturity, but also a legacy challenge regarding the people. Everything is built around the legacy backbone and the flexibility of the systems is limited (C1). Collaboration and structured ways of working are essential in the digitalization process (C4). Interviewee C4 describes the current available digital structure where *"the culture has to change"* to take advantage of the digital opportunities.

C4: "It's a little bit the uphill battle. It's not in the genes of the finance function."

Company C clearly indicates the business partner role of the finance function regarding its proactive and multidisciplinary nature (C2, C3). The finance function at company C is service oriented and contains cross-departmental work (C2, C3). Interviewee C3 illustrates that the finance function must be *"offensive and not reactive"*. Interviewee C2 mentions a conscious decision to transform the finance function from *"hocus pocus finance"* to finance business partners. The finance function at company C supports the business with financial expertise (C2).

C2: "We wanted to be small CFO's in those divisions and departments. So as department, we wanted to transition from only spitting financial numbers and providing them, we wanted to be finance business partners."

4.1.3.2 Questionnaire results

Table 10 provides the results from the questionnaire for company C. The questionnaire reached 15 respondents, which is 50 percent of the contacted finance workforce of that organisation.

Table 10: The results of digital expertise for company C

Job description	*Years of experience*	*Technical IT-skills*	*Organisational skills*	*People skills*	*Conceptual skills*	*Overall*
			Mean results			
Controller	20	3,1	5,0	5,0	5,0	**4,5**
Business Support Manager	10	2,6	3,5	4,0	4,8	**3,7**
Group Controller	20	1,3	3,2	4,3	4,0	**3,2**
Fleet	5	3,1	4,7	3,8	4,0	**3,9**
Fleet Manager	12	2,5	3,8	4,0	3,5	**3,5**
Contract Coordination	11	3,1	3,5	4,3	4,8	**3,9**
Office Manager	35	1,4	4,0	4,0	4,0	**3,4**
Office Administration	35	1,6	2,0	3,3	4,0	**2,7**
Credit Controller	15	1,4	1,0	3,3	3,8	**2,3**
Credit and collection	30	1,2	1,0	2,8	3,5	**2,1**
Business Controller	13	1,5	3,7	4,0	4,0	**3,3**
Accounting assistance	28	3,0	3,0	3,0	3,5	**3,1**
Project Office manager	5	2,0	4,0	5,0	5,0	**4,0**
Credit and collection	10	1,5	2,8	4,0	3,8	**3,0**
Management Assistant	14	1,2	4,3	4,3	4,5	**3,6**
Total results	**17,5 (10)**	**2,0 (0,8)**	**3,3 (1,2)**	**3,9 (0,6)**	**4,1 (0,5)**	**3,3 (0,6)**

The results indicate that the finance function of company C is located between the ‘defined’ and ‘managed‘ maturity level with an overall average score of 3,3. The ‘defined’ level reveals that there is no formal organisational agreement on the integration of the digital expertise. Additionally, the skill level is inconsistent throughout the organisation. To conclude on the maturity level of company C, additional evaluation of the job advertisements is needed.

Noteworthy is the high digital maturity score of the project office manager with an average score of 4 and only possessing 5 years of experience. The lowest digital maturity can be found for the finance employee with 30 years of experience. The conceptual skill indicator is noted as the most developed personal skill with an average score of 4,1. The review of the technical IT-skills indicates that most of the respondents have an average score between 1 and 2. The technical IT-skills indicate a standard deviation of 0,8, which indicates that the respondents are not similarly developed for this indicator. Figure 11 depicts the results from the technical IT-skills.

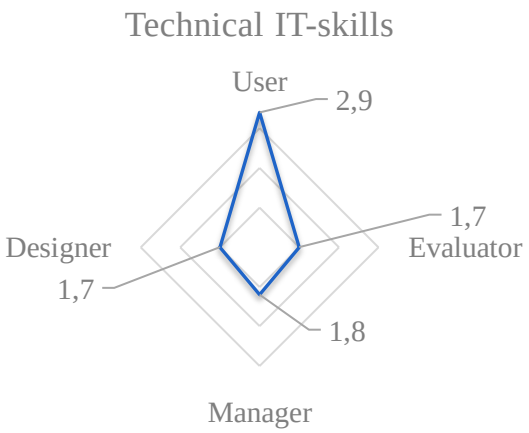

Figure 11: Overview of technical IT-skills for company C

The 'user' indicator has the highest average score of 2,9. The 'manager' indicator is second in line with an average score of 1,8, mainly driven by the management roles of the finance function at company C. The 'evaluator' and 'designer' indicators have an average score of 1,7. The finance workforce at company C interacts with IT as a 'user', implying less developed technical IT-skills.

4.1.3.3 Job advertisement results

Enclosure 4.2 provides the job advertisements of the managing finance roles at company C. The managing finance roles require more than three years of experience and demand a certain maturity of the applicant, as described in the job advertisements. The administration officer is a managing finance role, indicated by the senior description.

Company C depicts the importance of IT in the finance function. The group reporting manager and business analyst role indicate the need for an IT-minded person. Additionally, specific tooling knowledge and dashboarding is indicated in the business analyst job. The senior manager needs to be digitally mature to implement and test digital projects. The group reporting role requires strategic alignment skills and the senior administration officer requires the ability to evaluate business opportunities. Both job advertisements refer to the business partner role of the finance function.

Enclosure 4.3 provides the overview of the job advertisements for the supporting finance roles at company C. The job advertisements for supporting finance roles at company C mention specific IT-tooling knowledge. The project office administrative role mentions the advantage of experience with archive systems. There is no absence of the digital focus, but the finance supporting roles are not required to have digital expertise beyond the basic IT-skills such as Excel. The supporting finance role of the accountant assistant is described as a finance contact point for the organisation.

4.1.4 Company D

Company D is a non-profit organisation with 1700 employees in Belgium. The company employs 1400 scientists working on molecular research. The 300 administrative workers support the eight research centres, accommodate bio-tech start-ups and find new ways of fundraising. Company D works closely with all Flemish universities and is supported by the Flemish government. The earnings mainly come from subsidies of around 73 million euro and cooperation agreements of around 30 million. Figure 12 describes the organisational structure of the finance function at company D.

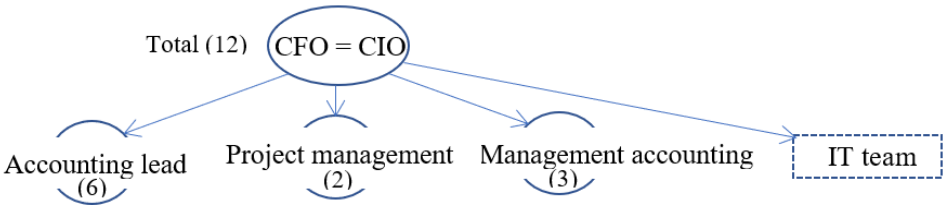

Figure 12: Organisational structure of company D

The finance function contains around 12 FTE's and amounts to 0,7 percent of total employees in Belgium. The CFO of company D also fulfils the role as CIO. The combination of both responsibilities allowed the CFO to optimize the finance function in an efficient manner. The ability to lead both teams supports the broad overview of the business processes and the efficient allocation of resources. Company D illustrates that finance and IT can work together in a complementary manner. The finance project manager is responsible for the process optimisations and further digitalization of the finance function. The finance project officer fulfils the role as hybrid finance professional, combining digital and finance expertise.

4.1.4.1 Interview results

The summary of the interviews at company D is provided in table 11.

Table 11: Interviews summary for company D

Digital maturity dimensions of the finance function			
Strategy	Processes	Technology	People
D1 ▪ Clear strategy without lay-offs ▪ CFO is driving force of digitalization **D2** ▪ Priorities need to be set	**D1** ▪ Continuous improvements ▪ Rethink processes with every digitalization project **D3** ▪ Digitalization allows increased interaction & collaboration ▪ Business context determines transformation process	**D1** ▪ Dependency on software provider ▪ Dependency on suppliers **D2** ▪ Additional work compensated with automation ▪ ERP is biggest driver of digitalization **D3** ▪ Leveraging technology is important ▪ Customization has advantages & disadvantages ▪ Dependency on software provider **D4** ▪ IT provides technical support	**D1** ▪ Need for a specific person appointed to rethink finance ▪ Balance automation & finding additional work ▪ Mix of people and culture are important **D2** ▪ Diverse role ▪ Motivation to learn **D3** ▪ Job allocation is important ▪ Motivation and group effort are important drivers **D4** ▪ Dependency on external consultants ▪ Close collaboration with IT

Company D employs a CFO who also functions as the CIO. This combination of roles proves to be successful for company D.

D1: "So I think as a CFO you have a unique view on all the processes and this has helped to introduce this ERP-tool."

Lack of strategic support is not indicated as a problem in the finance function of company D. The organisation focuses on continuous improvement and increased collaboration between departments (D1, D3). The CFO only indicated the dependency on the software provider as a possible obstruction for further digitalization of the finance function (D1). Additionally, company D indicates the dependency on internal and external partners (D1, D3, D4).

D4: "So that [digitalization progress] doesn't depend on the company itself, but we are dependent on external parties."

The appointment of a finance project officer and the implementation of ERP-systems are indicated as core elements in achieving digitalization of the finance function (D1, D3, D4).

D1: "So someone who is really driving those digital projects. So, the finance project officer. Because we had our own finance project officer, we didn't need a consultant for every project, we did it quite no-nonsense, straight forward."

The motivation of the workforce (D3, D4) and the open culture (D1) are also important indicators to achieve digitalization in the finance function. The open culture is created by new technologies allowing increased collaboration (D3).

D3: "So that's an example of an institute with open walls."

4.1.4.2 Questionnaire results

The questionnaire was sent out by the CFO, but not all the finance employees were requested by CFO to participate due to corporate policy. Four finance employees were requested to fill in the questionnaire. The questionnaire was filled in by these four people, resulting in a 100 percent response rate.

Table 12 illustrates the results of the digital expertise assessment of the finance workforce at company D.

Table 12: The results of digital expertise for company D

Job description	*Years of experience*	*Technical IT-skills*	*Organisational skills*	*People skills*	*Conceptual skills*	*Overall*
			Mean results			
CFO	11	3,5	5,0	5,0	4,8	**4,6**
Finance and project officer	2	3,1	3,5	3,5	4,0	**3,5**
Management Accountant	8	1,7	3,8	3,5	3,0	**3,0**
Accounting Manager	35	3,9	4,7	5,0	5,0	**4,6**
Total results	**14 (12,5)**	**3,1 (0,9)**	**4,3 (0,7)**	**4,3 (0,9)**	**4,2 (0,9)**	**3,9 (0,8)**

The digital maturity level of the finance workforce is indicated as 'managed' but reaching the 'optimised' level. The digital maturity level of the finance function suggests that the digital skills are fully accepted in finance work and are also integrated in job descriptions. The years of experience vary between the respondents of company D. The standard deviation of the years of experience is around 12,5 years.

The average scores of personal skills of the finance function for company D are all above 4, with the accounting manager indicating a strongly developed level for the people and conceptual skills. The less experienced finance project officer indicates lower scores for the technical IT-skills and personal skills compared to the CFO and the accounting manager. The standard deviation of the technical IT-skills indicates differences in skill development between the respondents.

Figure 13 visualizes the division of the technical IT-skills.

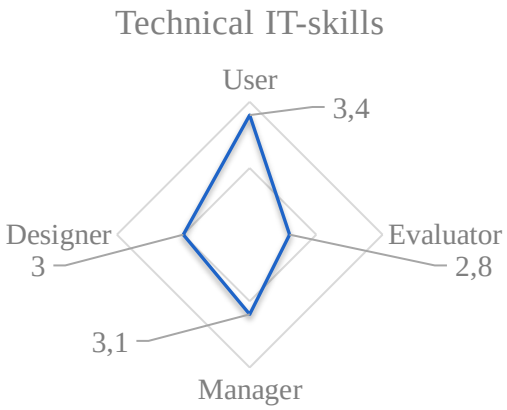

Figure 13: Overview of technical IT-skills for company D

The average 'user' indicator score is 3,4, followed by the 'manager' indicator scoring 3,1. The technical IT-skill indicators are all close to an average score of 3, with the average 'designer' score being 3. The average 'designer' and 'manager' scores are higher than the 'evaluator' score. The finance workforce of company D interacts with IT as a 'user', 'manager' and 'designer', implying developed technical IT-skills.

4.1.4.3 Job advertisement results

Enclosure 4.2 provides the managing finance roles at company D regarding the job advertisements. The finance project officer fulfils the role as a bridge between the finance and the IT-department. The role requires the managing skills to participate in cross-functional teams. Company D notes ERP-knowledge for the finance project officer as an advantage. The hybrid finance role at company D requires tooling implementation skills and software knowledge. Additionally, company D emphasizes the passion for IT in the job description. The finance project officer works interdepartmental and takes control over IT-projects in finance, which is related to the hybrid finance role.

Enclosure 4.3 provides more insight on the supporting finance roles at company D. The supporting finance roles described in the job advertisements indicate strong knowledge of Excel and MS Office. Company D mentions specific digital tools as required knowledge, thus the finance function of company D emphasises the importance of digital expertise. The junior management accountant has a decision support role within the finance function at company D.

4.1.5 Company E

Company E is a media and advertising company. The Belgian entity reports to the headquarter in the United Kingdom (UK) and the UK entity reports to the seat in the United States of America (USA). Company E has three main subsidiaries with each their own managing director. The three subsidiaries have their own expertise in the media space. The finance function at company E is responsible for the three subsidiaries. The group in Belgium uses the same ERP-system for all the subsidiaries. The ERP-tool provides input for the accounting tool, which is the main accounting platform of the finance function. Figure 14 provides an overview of the organisational structure of the finance function at company E.

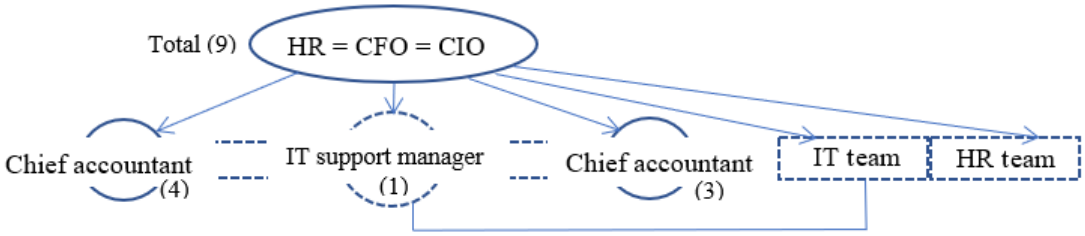

Figure 14: Organisational structure of company E

Company E has around 115 employees and the finance function includes 9 FTE's. The finance function covers 7,8 percent of the total employees in Belgium. The CFO takes on the role as human resource (HR) manager and IT-manager of company E. The current CFO was appointed only 2 years ago. The previous CFO did not stimulate the proactive behaviour of the finance personnel. The revenue of Company E in Belgium is around 118 million euro. The CEO and CFO of Company E are responsible for Europe, the Middle East and Africa.

The IT-manager is a supporting role within the finance function and aids in the digitalization of the finance function. The IT-manager is not able to allocate enough time and effort to improve the finance function. The IT-manager operates mostly outside of the finance department and is not able to fulfil a hybrid finance role.

4.1.5.1 Interview results

Table 13 provides the overview of the interview results from the finance function at company E.

Table 13: Interviews summary for company E

Digital maturity dimensions of the finance function			
Strategy	Processes	Technology	People
E1 ▪ No clear vision on IT ▪ Resource problem **E3** ▪ New dynamic, carte blanche **E4** ▪ Priorities need to be set	**E1** ▪ Constant process improvements ▪ No clear vision on architecture **E2** ▪ Day to day workload to high, less time to improve **E3** ▪ Lack of time to improve	**E1** ▪ Lack of self-service finance ▪ Tailor-made tools are a big risk ▪ Real-time information is needed ▪ Flexibility increases complexity **E2** ▪ Paperless invoices ▪ No BI-tools ▪ Template & mapping in Excel **E3** ▪ 40% manual work automated ▪ Interconnectivity ▪ Cloud platform for tools ▪ Custom ERP system **E4** ▪ Complexity technology depends on complexity business	**E1** ▪ Lack of system investment compensated by people ▪ Lack of proactive behaviour **E2** ▪ Role changes of reporting **E3** ▪ IT-manager helps to improve finance function ▪ Reporting job less boring ▪ Initiative is appreciated **E4** ▪ Job evolution ▪ Proactive ▪ Support from IT person is advantageous, but increases complexities

Company E has recently given the finance function the ability to digitalize (E3).

E3: "The CEO is very open to the [digitalization] process. Also, the CFO is now very attentive to improve."

There is also a need to set priorities and define a digital strategy in the finance function of company E (E1, E4). Company E indicates the importance of the availability of time and resources to allow the finance function to digitalize (E2, E3).

E4: "It takes time [to digitalize], we have to build a plan and I know there are more urgent things to do."

The lack of self-service and real-time finance information are recognised as less developed in the finance function of company E (E1).

E1: "I want the managing directors to allow them to access their information by their own means."

The customization and the flexibility towards software development are indicated as possible pitfalls regarding digitalization of the finance function (E1, E3, E4).

E1: "But they [digital tools] are all built by one IT-person here in-house. But I find that a big risk. And it is impossible to change one stone and not let the building collapse."

The lack of technology investment is compensated with additional people in the finance function of company E (E1). This is in line with the high 7,8 percent coverage of the finance workforce against the total workforce in Belgium. The lack of resources from the IT-department is also indicated as a bottleneck (E2, E4).

E3: "Sometimes it [IT-support] is a bit slowly. In the past IT was not fully operational."

The support of the IT-manager leads to less proactive behaviour of the finance function itself (E1, E4). The IT-manager provides the tailor-made software customization demanded from the individual finance employees. The widespread custom programming increases complexity due to the lack of an overall digital strategy and IT-architecture (E1).

4.1.5.2 Questionnaire results

The results from the questionnaire of the finance workforce at company E can be found in Table 14. The questionnaire was sent to the nine finance employees and seven people responded. The response rate for company E is 80 percent.

Table 14: The results of digital expertise for company E

Job description	*Years of experience*	*Technical IT-skills*	*Organisational skills*	*People skills*	*Conceptual skills*	*Overall*
			Mean results			
Financial Controller	20	2,7	4,0	4,0	3,5	**3,5**
Accountant	13	1,8	3,2	3,3	3,3	**2,9**
Accounting Manager	20	3,2	4,2	4,0	4,0	**3,8**
Accountant	12	3,2	3,2	3,5	3,5	**3,3**
Accounting assistant	1,5	2,0	3,0	2,8	3,3	**2,7**
Assistant Accountant	5	1,5	3,0	3,5	4,0	**3,0**
CFO	2	2,9	4,5	4,8	4,8	**4,2**
Total results	**10,5 (8)**	**2,5 (0,7)**	**3,6 (0,6)**	**3,7 (0,6)**	**3,8 (0,5)**	**3,4 (0,5)**

The digital maturity of the finance function of company E is between the 'defined' and 'managed' level. The 'defined' level indicates that there is no organisational agreement on the integration of the digital expertise within finance job descriptions and the skill level is inconsistent throughout the finance function. The technical IT-skills score 2,5 on average, with differences of the skill development between the respondents. The standard deviation of the technical IT-skills is 0,7.

The organisational skills are the lowest regarding the personal skill indicators, with an average score of 3,6. The conceptual skills are the highest regarding the personal skills with an average score of 3,8. The management accountants indicate a technical IT-skill level of 3,2 followed by the CFO with an average score of 2,9.

Figure 15 provides a visualization of the results from the technical IT-skills.

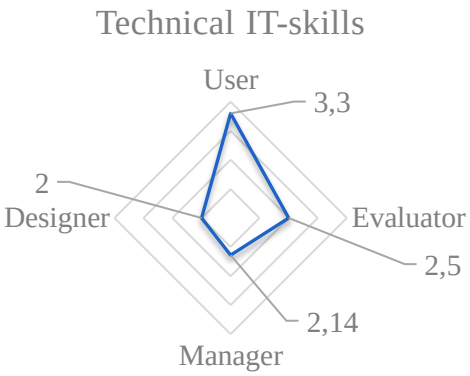

Figure 15: Overview of technical IT-skills for company E

The finance function of company E indicates an average score for the 'user' indicator of 3,3. The average 'designer' score is 2. Figure 15 indicates a gradual decrease in the scores of the technical IT-skill indicators. The finance workforce at company E mainly interacts with IT as an 'user', indicating less advanced technical IT-skills.

4.1.5.3 Job advertisement results

Enclosure 4.2 indicates that there are no recent job advertisements available for company E. The current CFO argues that past finance jobs were filled in internally or candidates were directly selected by the previous CFO. Additionally, company E has no separate human resource (HR) manager. The current CFO functions as the HR manager. The lack of recent job advertisements for the finance function could also indicate that the finance team at company E is not growing in FTE's.

Enclosure 4.3 provides the job description for an accounting assistant at company E. The job advertisement of the accounting assistant is compact and does not provide substantial insight on the needed requirements of the role. The job description describes the basic job requirements and there is no focus on digital requirements. The lack of documentation of the job descriptions and the lack of past HR support results in a situation where the digital expertise of the finance function is not recognised in company E. The business partner role of the finance function is not identified in the description of the job advertisement. The accounting assistant fulfils a traditional finance role.

4.1.6 Company F

Company F is a college institution founded in 1995 and participated with the association of higher education of Flanders in 2002. In 2013 company F fused with a competing college in West-Flanders. Company F is the biggest college of West-Flanders with campuses on five locations and the school incorporates six different study areas. Company F has a total revenue of 200 million euro. Figure 16 provides an overview of the organisational structure regarding the finance function of company F.

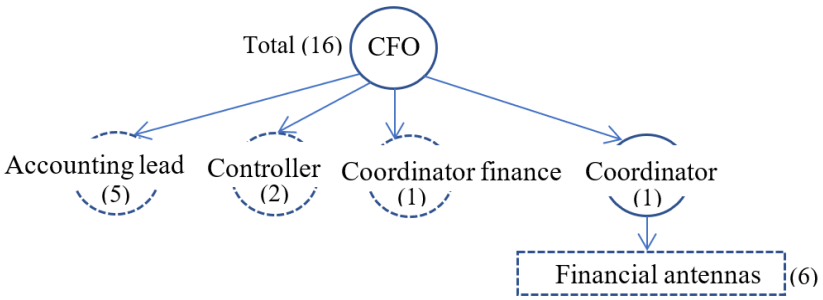

Figure 16: Organisational structure of company F

Company F has around 1500 employees in Belgium and the finance function includes 16 FTE's. The finance function covers around 1 percent of the total employees in Belgium. The finance 'antennas' are the responsible finance professionals at the different departments and study areas. Figure 10 indicates the existence of a coordinator in the finance department. The coordinator role supports the 'financial antenna's' regarding organisational planning and centralisation of information. Additionally, the coordinator takes on the role as digital coach within the finance function.

4.1.6.1 Interview results

The results of the interviews in the finance function at company F are displayed in table 15.

Table 15: Interviews summary for company F

Digital maturity dimensions of the finance function			
Strategy	Processes	Technology	People
F1 ▪ More business support demanded ▪ Create culture to share problems ▪ Priority setting is needed ▪ Recognition digital importance ▪ Lack of IT resources **F2** ▪ Need to draw digitalization card ▪ Need to economize & automate **F3** ▪ Finance innovation driven top-down **F4** ▪ Support from management needed	**F1** ▪ Island working ▪ Self-centred ▪ Digitalization as a breaker to rethink processes **F2** ▪ Investments needed in process automation ▪ Sequential improvements **F3** ▪ Processes & controls not clear **F4** ▪ Harmonizing processes	**F1** ▪ Workload increases, only option is automation ▪ Interconnection & clustering of software ▪ Technology does not solve organisational problems ▪ Technology supports processes ▪ Flexibility increases complexity & reduces agility ▪ Dependency on software provider is a risk ▪ Use technology to provide tactical advantage **F2** ▪ Customization allows for user-friendliness & less disruption ▪ Goal is one-click reports **F3** ▪ Need for integrated data **F4** ▪ Shift from central system to modular system	**F1** ▪ Younger people digital driven ▪ Behaviour change is reciprocal ▪ Coordinator as a digital coach ▪ Mix of skills needed **F2** ▪ Balance between digital advancements and people abilities ▪ Decision support role ▪ Business partner role ▪ Social digitalization **F3** ▪ Lack of IT support **F4** ▪ IT-bottleneck ▪ Additional training needed

Company F indicates the need to automate and to comply with the increased demand to economize (F1, F2). The demand for efficiency and increased reporting is stimulated top-down by the board of the company (F2).

F2: "So, we have to economize, and there is an increased demand [to report] from the organisation, this only leaves us with automation."

The CFO mentions that the digital and open culture is created top-down by the managers (F1). Company F also mentions the lack of IT-resources, which depends on the strategy of the organisation (F1, F3, F4). Digitalization allows for the rethinking of processes and the opening of the physical borders through virtualization (F1, F2).

F1: "On the other side of the spectrum, you can use an application as a kind of breaker to rethink and rationalize current processes."

Interviewee F1, F2 and F4 indicate that excessive flexibility and customization of software can obstruct the ability to further digitalize. There is a need for more modular and flexible systems (F4).

F4: "So in the past everything was centralised in one package, such as SAP, but now we want to leave this model, because those [ERP] packages are static and are not easily upgradeable."

Company F agrees on the importance of a digital coach within the finance function to spread digital expertise in the finance team. The positive attitude towards digitalization is backed by the organisation, but the attitude must be supported by the finance workforce (F1, F3). Interviewee F2 adds that the digital progression is obstructed by the lack of cooperation of the older generation within the finance function, but interviewee F2 indicates that this is common in public organisations. Public organisations feel less pressure to optimize and to evolve digitally (F2). The natural outflow of the older generation shapes the digital strategy of the finance function (F2).

F2: "It's like social digitalization. We have to work sequential."

Interviewee F4 indicates the hesitation from certain finance employees regarding digitalization changes.

F4: "You always have some hesitating people, but all changes, even positive ones, results in opposition."

4.1.6.2 Questionnaire results

The results from the questionnaire are represented in table 16. The questionnaire reached the total finance workforce of 16 people and 13 respondents filled in the questionnaire. This results in a response rate of around 81 percent.

Table 16: The results of digital expertise for company F

Job description	*Years of experience*	*Technical IT-skills*	*Organisational skills*	*People skills*	*Conceptual skills*	*Overall*
			Mean results			
CFO	22	3,1	4,0	4,8	4,3	**4,0**
Financial employee	5.5	3,1	4,0	3,3	3,0	**3,3**
Financial employee	5	2,3	3,7	3,8	4,0	**3,4**
Controller	15	2,4	3,3	4,0	4,0	**3,4**
Head of accountancy	9	2,5	3,3	3,3	4,5	**3,4**
Accountant	20	2,8	3,3	3,5	4,0	**3,4**
Financial employee	3	3,1	3,5	3,5	4,0	**3,5**
Financial employee	15	2,2	3,7	4,5	4,5	**3,7**
Financial antenna	5	1,8	4,3	4,0	4,5	**3,6**
Credit employee	20	2,2	3,0	3,5	4,0	**3,2**
Financial coordinator	23	3,4	4,5	4,5	5,0	**4,4**
Financial employee	8	2,2	1,8	2,3	4,3	**2,6**
Financial employee	1	1,8	2,8	4,0	5,0	**3,4**
Total results	**11,7 (7,8)**	**2,5 (0,5)**	**3,5 (0,7)**	**3,8 (0,7)**	**4,2 (0,5)**	**3,5 (0,4)**

The overview of the results of the questionnaire indicates that the finance function of company F lies between the ‘defined’ and ‘managed’ digital maturity level. This maturity level indicates that company F formally recognises the importance of the digital expertise and understands the value of digital skills. The standard deviation of the overall digital maturity score of the finance workforce at company F is 0,4. The CFO and the financial coordinator indicate the highest overall average scores of 4 and 4,4. The average years of experience of the finance workforce at company F is 11,7 years. The CFO and the financial coordinator have the highest years of experience with respectively 22 and 23 years of experience.

The conceptual skills are indicated as the most developed skills with an average score of 4,2. The technical IT-skills are the lowest and note an average score of 2,5. The financial coordinator describes the highest technical IT-skills with an average score of 3,4. The lowest technical IT-skills are indicated by the supporting finance roles with low years of experience. Figure 17 visualizes the results from the technical IT-skills.

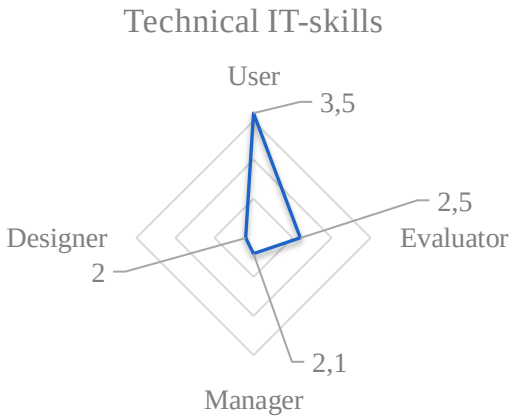

Figure 17: Overview of technical IT-skills for company F

The highest digital maturity is reached for the 'user' indicator with an average score of 3,5. The lowest average score of 2 can be found for the 'designer' indicator. The 'manager' indicator illustrates an average score of 2,1. The finance function of company F clearly indicates a gap between the 'user' skills and the other more advanced technical IT-skill indicators. The finance workforce at company F mainly interacts with IT as an 'user', indicating less advanced technical IT-skills.

4.1.6.3 Job advertisement results

The job advertisements of company F are indicated in enclosure 4.2 and 4.3. Only two recent job advertisements were provided to analyse during the on-site visit at company F. The lack of job advertisements for the finance function indicates that the finance workforce at company F is not growing in FTE's.

The financial adviser job description indicates the business partner elements such as 'service-oriented behaviour' and 'being a contact point' to the organisation. The digital focus can be found in the wording of a 'transformation process' in the finance function. Company F limited the description of other digital requirements in the job advertisements. The 'financial vision' and the 'customer focus' described in the job advertisement are indicators of the business partner role in the finance function. The proactive behaviour of the business partner role within the finance function is also indicated in the job description.

Enclosure 4.3 provides the job description of the finance administration employee. The job advertisement for the supporting finance role indicates a digital focus on MS Office and internet knowledge. Internet knowledge is a broad term and can be interpreted as a basic digital skill. Additionally, specific knowledge of the accounting package is described as an advantage. Company F recognises the importance of digital expertise through all levels of the finance function. The proactive behaviour for the supporting finance role in the job description is not supplemented with any mentioning of a strategic role, indicating a more traditional finance role for the finance administration employee at company F.

4.2 Cross-case analysis

The job advertisements are compared in section 4.2.1 and support the description of the digital maturity of the case studies in section 4.2.2. The explanations from the interviews are summarised in section 4.2.3.

4.2.1 Job advertisement analysis

Wessels (2005) provides the indicators for the technical IT-skills, being the 'user', the 'evaluator', the 'manager' and the 'designer'. The personal skills contain the organisational, people and conceptual skills (Bahador & Haider, 2013). A similar structure is used for the questionnaire allowing for a comparison between both results. Table 17 provides the overview for comparison between the job advertisements of the case companies.

Table 17: Cross-case review of the job advertisements

Organisations		*A*	*B*	*C*	*D*	*E*	*F*
		Managing finance roles					
Technical IT- skills	User	✓	✓	✓	✓	none	✓
	Evaluator	✓	✓	✓	✓	none	X
	Manager	✓	✓	✓	✓	none	X
	Designer	✓	✓	X	X	none	X
Personal skills	Organisational	✓	✓	✓	✓	none	✓
	People	✓	✓	✓	✓	none	✓
	Conceptual	✓	✓	✓	✓	none	✓
Digital expertise	Total of 7	7	7	6	6	none	4
	% of total	100%	100%	86%	86%	none	57%
		Supporting finance roles					
Technical IT- skills	User	✓	✓	✓	✓	✓	✓
	Evaluator	✓	✓	✓	✓	X	X
	Manager	✓	✓	X	✓	X	X
	Designer	✓	X	X	X	X	X
Personal skills	Organisational	✓	✓	✓	✓	X	X
	People	✓	✓	✓	✓	✓	✓
	Conceptual	✓	✓	✓	✓	X	X
Digital expertise	Total of 7	7	6	5	6	2	2
	% of total	100%	86%	71%	86%	29%	29%

The comparison of the job advertisements in table 17 indicates differences in recognition of digital expertise within the finance functions. Company A integrates the required digital skills on all levels of the finance function. Both the managing finance roles and the supporting finance roles indicate the importance attached to the 'designer' indicator of the technical IT-skills. Company B also recognises the importance of the digital expertise in the finance function. Companies C and D describe the digital skills mostly in the managing finance roles. Companies E and F only indicate basic technical IT-skills in the job advertisements.

Note that all case companies, except company E, indicate the importance of the business partner role in their job advertisements for the finance function. Companies C and D focus on the decision support role of the finance function when describing the supporting finance roles. Companies E and F describe a traditional finance role for the job description of the supporting finance role.

Company A describes analytics and dashboarding tools in the job advertisements. Company B indicates the importance of analytical tools for the finance function. Companies A, B, C and D mention ERP-tools in their job descriptions, indicating that this tool is a central part of the finance job. Excel knowledge is omnipresent in all job descriptions. Table 18 provides an overview of the digital practises described in the job advertisements.

Table 18: Digital practices mentioned in the job advertisements

Digital practices

Org.	Description
A	Automation, IT-alignment, IT-change, process design, IT-systems, Shared Service Centres
B	Automation, process improvements, standardization, system adaption & optimization, data management
C	Digital archive management, ERP-management, digital trend follow-up, process optimization, IT-training, IT-testing, IT-implementations, dashboarding, organisation and function of programs, process optimization
D	E-invoicing, Finance software management, ERP-management, tool implementation
E	None
F	Process transformation

The job advertisements of the case companies, except company E, mention the importance of process management for the finance function. Company F describes the importance of process transformation. Automation management is described by companies A and B. Companies A, B and C recognise the importance of an interaction with IT-systems as an 'user' but also as a 'manager' of the systems. Companies A and D indicate the alignment and implementation of digital tools as an important skill. Company E did not include any digital practices in the job advertisement.

*4.2.2 **Digital maturity of the finance function***

The digital expertise scores of the finance workforces from the case companies is represented in table 19.

Table 19: Digital maturity overview of the case companies

Org.	*Years of experience*	*Technical IT-skills*	*Organisational skills*	*People skills*	*Conceptual skills*	*Overall*
			Mean results			
A	12,4 (4,7)	3,5 (0,5)	3,8 (0,3)	4,6 (0,3)	4,6 (0,3)	**4,14** (0,2)
B	17,3 (8,9)	2,6 (0,9)	3,8 (0,6)	4,0 (0,6)	4,25 (0,3)	**3,7** (0,5)
C	17,5 (10)	2,0 (0,8)	3,3 (1,2)	3,9 (0,6)	4,1 (0,5)	**3,3** (0,6)
D	14 (12,5)	3,1 (0,9)	4,3 (0,7)	4,3 (0,9)	4,2 (0,9)	**3,9** (0,8)
E	10,5 (8)	2,5 (0,7)	3,6 (0,6)	3,7 (0,6)	3,8 (0,5)	**3,4** (0,5)
F	11,7 (7,8)	2,5 (0,5)	3,5 (0,7)	3,8 (0,7)	4,2 (0,5)	**3,5** (0,4)

The comparison between the case studies indicates that the digital maturity levels of most finance workforces are evaluated as ‘defined’, although some companies reach the ‘managed’ and ‘optimised’ level. Note that company C is considered as a ‘defined’ finance function, supported by the evaluation of the job advertisements. The ‘defined’ digital maturity level indicates that the digital skill level is inconsistent throughout the finance function. The job advertisements indicate the digital skill differences between the managing finance roles and the supporting finance roles for the case companies. The questionnaire indicates that the finance function of company E is ‘defined’, but the job advertisements evaluation argues the ‘emerging’ digital maturity level. The digital expertise of the finance function in company E is not recognised in the job advertisements.

Figure 18 provides a cross-case visualization for the digital maturity assessment of the finance workforces.

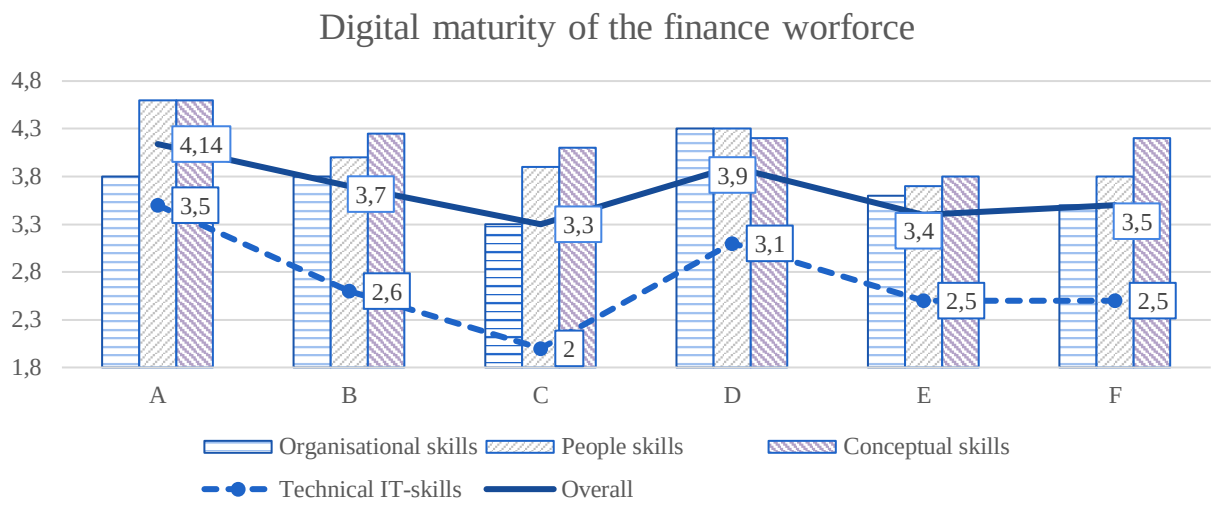

Figure 18: Cross-case analysis of the digital maturity of the finance workforces

The finance workforce of company A receives the 'managed' level and the evaluation of the job advertisements indicate the fully embedded digital skills in the various levels of the finance function. Company A fully recognises and agrees on the digital expertise of the finance function. Note that company A has an average of 12,4 years of experience in the finance function, which is lower than companies B, C and D. Companies B, C and D have lower digital maturity levels than company A. Companies E and F have lower years of experience than company A and also receive a lower digital maturity level. This observation indicates that lower years of experience, thus a younger workforce, is not directly related to a higher digital maturity score of the finance function. Noteworthy is that the companies E and F have the lowest average years of experience and the lower digitally maturity levels for the finance functions.

All companies describe a high conceptual skill level. This is supported by the job advertisements, where all companies, except E and F, mention the conceptual skills as important. The organisational skills score the lowest of all the personal skill indicators. Company D reports the highest average score of 4,3 regarding the organisational skills, mainly driven by the CFO and the accounting manager. Company A reveals high people and conceptual skills, influencing the overall average digital expertise score.

The average technical IT-skills of company A are the highest of all case studies with a score of 3,5. Company D is second in line with an average score of 3,1, followed by company B with an average score of 2,6. Company E and F have an average technical IT-skill score of 2,5. Company F has a lower standard deviation regarding the technical IT-skills than company E. Noteworthy is the low average technical IT-skill score of 2 for the finance function of company C.

Table 20 provides further insight on the indicators of the technical IT-skills.

Table 20: Overview of technical IT-skills of the case companies

Org.	*Years of experience*	*User*	*Evaluator*	*Manager*	*Designer*	*Technical IT-skills*
			Mean results			
A	12,4	3,9	3,0	3,5	3,2	**3,5**
B	17,3	3,6	2,5	2,1	2,4	**2,6**
C	17,5	2,9	1,7	1,8	1,7	**2,0**
D	14	3,4	2,8	3,1	3,0	**3,1**
E	10,5	3,3	2,5	2,14	2,0	**2,5**
F	11,7	3,5	2,5	2,1	2,0	**2,5**

Companies D and E reveal a downward trend of technical IT-skills, where the 'user' indicator on average scores above 3 and the 'designer' indicator on average scoring 2. Figure 19 provides a cross-case illustration of the technical IT-skills.

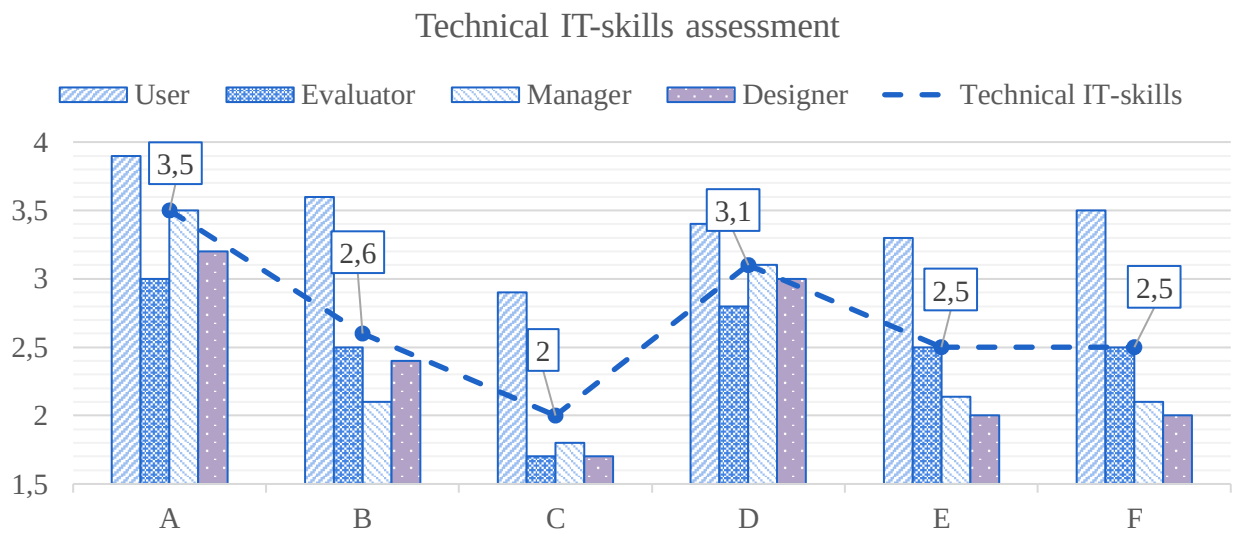

Figure 19: Cross-case analysis of the technical IT-skills

The case companies evaluate their 'user' skills substantially higher than the other three indicators. Company D indicates a higher 'design' indicator than the 'manager' indicator. Companies A and D illustrate similar scores across the technical IT-skills. Company B indicates substantial differences between the average 'user' indicator score and the other technical IT-skill indicators.

Important to note is that the ‘evaluator’ indicator for companies A, C and D scores lower than the ‘manager’ indicator. This could be explained because the respondents from companies A and D are mainly managing finance roles. Company C scores lowest on the technical IT-skills compared to the other case companies. Company C mainly describes the technical IT-skills as a ‘user’, with an average score of 2,9. The ‘user’ indicator of the finance function in company C scores on average 1 point higher than the other indicators.

4.2.3 The digital maturity dimensions of the finance function

The overview of the explanations provided by the case studies is depicted in enclosure 1.5.

4.2.3.1 Strategy dimension of digital maturity

The increased workloads and the top-down demand for advanced reporting results in the recognition of digitalization in the finance function (F2, F3, F4). Interviewee A3 indicates the importance of a CFO *"who pushes digitalization and demands commitment from everyone"*. Company B refers to the young CFO as *"the foundation of lean working and having a strong vision".* Companies B and D emphasise the importance of a digital strategy in the finance function. It is important to have a human forward approach and stimulate *"tech and touch"* (B1). Similarly, the CFO of company D argues the importance of a digital strategy where *"no one should be scared to lose their job"*.

Company C indicates that the finance workforce needs to take control of digitalization in the finance function and that proactive behaviour in that sense is important (C1, C4). Companies A and B indicate that the finance function takes control over digital advancements. Interviewee A2 mentions that the *"roadmap is fed bottom up"*. Interviewee C4 indicates the lack of proactive behaviour of the finance workforce regarding digitalization because "*it's not in the genes of the finance function."* Additionally, companies A, B and D emphasise the importance of control taking over digitalization by the finance function.

The CFO of company A adds that it is all about storytelling to acquire resources and money for digitalization projects (A4). Notice that finance functions with lower digital maturity levels, such as companies E and F, put strong focus on the corporate digital strategy and priorities. The digitally mature finance functions mention the importance of setting priorities to advance digitally (A1, B1, D2). Interviewee A2 indicates that *"focusing on too much things sometimes works as a brake."* Table 21 provides an overview of the main elements influencing the finance function's ability to digitalize regarding the strategy dimension.

Table 21: Cross-case analysis of the strategy dimension

Strategy dimension of digital maturity			
Bottom-up strategy building	Human forward approach	Setting digitalization priorities	Corporate digital strategy

4.2.3.2 Process dimension of the digital maturity

The architecture of the processes determines the complexity of the digital tools (A3). The CFO of company A indicates that a lack of standardization slows down the digitalization process (A4). Company F describes a need for more cooperation and implementation of best practices (F1). The size of the organisation determines the ability to standardize processes (A2, C1, D1). Companies A, B and C explain that the complexity of the processes is dependent on the business context.

Interviewee C1 and C3 warn for the customization of technology influencing the increased complexity of the processes. Interviewee D3 mentions the complexity of the processes resulting from the *"dependency on external parties."* There is also a dependency on suppliers to improve processes (B2). Interviewee E3 notes that *"the suppliers have the play the game with them".*

Companies B and D focus on continuous process improvement. Interviewee B1 adds that continuous benchmarking within the company proves successful for company B. Additionally, the shared service centre (SSC) and lean working provided a foundation for further digitalization of the finance function (B1). Digitalization allows for the rethinking of processes, people and systems (C1). Interviewee D1 mentions the introduction of business process re-engineering for every digitalization project. Interviewee F1 notes an opportunity to *"rethink and rationalize current processes."*

Company C indicates a lack of interdepartmental cooperation and too much silo working (C2, C4). Interviewee D3 notes the increased virtualization and interoperability resulting in an *"organisation with open walls."* Interviewee F1 describes the individual groups within the organisation as being too self-centred. Table 22 provides a summary of important elements influencing the ability of the finance function to digitalize regarding the process dimension.

Table 22: Cross-case analysis of the process dimension

Process dimension of digital maturity				
Standardization of processes	Business process re-engineering	Dependency on external parties	Continuous improvement	Interoperability

4.2.3.3 Technology dimension of digital maturity

Automation is customization, which is not always an advantage, because of the increased complexity of the systems (B2). Customization is related to tailor-made programming added to standard tools to support the way of working in the organisation (F1). Arguably, customization is introduced to make processes and technologies more user-friendly (F2). The CFO of company E feels that *"it is impossible to change one stone and not let the building collapse"*, referring to the complexity of the IT-architecture. Company E describes a lack of an overview on the IT-architecture of the finance function (E1).

The CFO of company D describes the obstacle to digitalize the finance function as the dependency on the resources and services of the software provider (D1). Interviewee F4 indicates the change from a central technology to a modular system without extensive tailor-made programming. The CFO of company F notes that one central organisational technology *"will not solve the organisational problems in the organisation"* (F1). The CFO of company C describes the main restriction regarding technology being the legacy backbone and the lack of flexibility of the ERP-tool (C1). An optimized ERP-system can also be a driver for further digitalization, as indicated by interviewee D2. Interviewee C2 notes that a central data warehouse allows for the availability of data interaction for the whole organisation. Interviewee C2 notes that *"everything stands or falls with the quality of the data".* Interviewees B4, F3 and F4 note the importance of uniformity in the data input and integration.

Important is the leveraging of the implemented technologies because it is important *"to look how you work with technology"* to create value (D3). Interviewee A3 adds that true value of technology implementations happens at the end of the project, when the employees get value out of the introduced technology. The finance function is slower in the adoption of new technologies compared to other departments (B1). The CFO of company E adds that lack of technology investment is compensated by people (E1). The finance function needs to keep focus on the core activities and let the need for new technologies be driven by the organisation itself (A1). Table 23 provides a summary of the above described elements influencing the finance function's ability to digitalize regarding the technology dimension.

Table 23: Cross-case analysis of the technology dimension

Technology dimension of digital maturity				
Value adding proposition	Customization	Control taking of technology	Modular and flexible systems	Data integration

4.2.3.4 People dimension of digital maturity

Companies A and D introduced a hybrid finance role that is bridging the gap between the IT-department and the finance department. Interviewee A1 describes the hybrid finance role as *"the glue so the two departments are less colliding"*. Interviewee B1 describes a hybrid finance team looking for digital advancements, but questions why people still would want to work in the traditional finance role. The case companies that did not introduce such a role, indicate a substantial dependency on the IT-department (E1, F1). The finance function must actively strive for a non-dependency on IT to drive digitalization, as noted by interviewee B5.

Company F introduced a finance coordinator who acts as a digital coach for the finance function (F1). Company E depends on the IT-manager for the digitalization of the finance function (E1, E2, E3). Company E describes the lack of time and IT-resources to focus on digitalization (E3). Company B depends on the business support team to provide digitalization of the finance function. Interviewee B3 notes that the finance function needs to take control over the digitalization process, because the IT-department lacks the resources. The hybrid finance role of company D depicts the collaboration with the IT-department, without mentioning a substantial dependency on each other's department (D4).

Companies B and F add that there is a need to balance the digitalization advancements with the seniority of the employees (B3, F2). Companies B and D indicate a balance between attracting new tasks to the finance function and reducing less value adding tasks (B2, D1). Interviewee F2 adds a description of *"social digitalization"*, depicting the dependency of digitalization improvements on the natural outflow of senior employees. Interviewee F4 adds that the finance workforce needs to be educated, but not all employees are eager to change working methods. The CFO of company A notes the importance of *"a team who has the skills to support the digitalization project."*

Arguably, interviewee B1 notes the importance of a mature finance team with a strong process knowledge. Interviewee B3 adds that a mix in maturity of the finance function is advantageous. Interviewee B4 notes that the core of accountancy is still providing timely and accurate information, which is compatible with an older workforce. The CFO of company C describes the legacy people obstacle and requires a digital native in every finance team to provide a mix of multi-disciplinary skills (C1). Interviewee C4 describes the importance of cross-departmental work and the need for end-to-end thinking.

Motivation is the biggest driver of change within the finance function (B5). Motivation and culture form the foundation of change in the finance function, as described by the CFO of company D. The CFO of company E describes a lack of proactive behaviour and motivation within the finance function (E1). Interviewee E3 adds that the current CFO allowed the finance team to get a *"carte blanche"* and this induced a new motivation within the finance workforce to improve.

Interviewee A3 notes that they *"cannot be report dumpers, they have to communicate it to the people"* and adds that *"everything is related to each other, where in the past there were more silos."* Interviewee C2 emphasises the business partner role of the finance function and the resulting importance of communication. The summary of previous mentioned findings is depicted in table 24.

Table 24: Cross-case analysis of the people dimension

People dimension of digital maturity				
Hybrid finance role	IT-bottleneck	Motivation is driver for change	Communication	Balance digitalization and people

5 Discussion

The discussion contains the conclusion on the digital maturity profiles of the finance functions in section 5.1 and the analysis of the digital maturity dimensions regarding the finance functions in section 5.2.

5.1 Digital maturity of the finance function

Figure 20 illustrates the digital maturity profiles of the finance functions from the case companies.

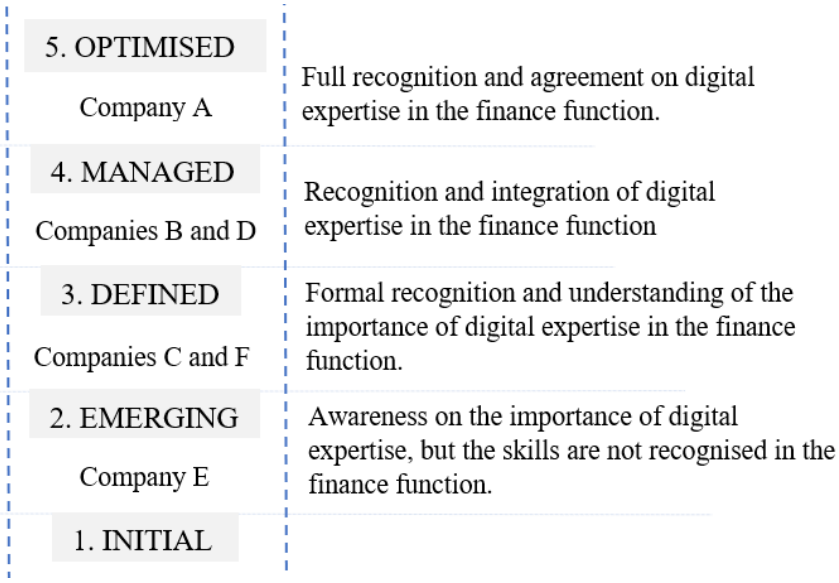

Figure 20: Digital maturity level of the finance functions (Bahador & Haider, 2013)

The finance workforce of company A indicates a digital maturity score based on the questionnaire of 4,14. Additionally, the job advertisements of the finance function describe the requirement of digital expertise throughout the managing and supporting finance roles. Arguably, the finance function of company A is reaching the 'optimised' maturity profile, because the digital expertise is fully recognised in the finance function.

The finance function of company A is digitally 'optimised', thus more advanced digital technologies are expected. Interviewee A1 indicates that company A *"uses fewer fancy applications, but still wants to be best in class"*. Company A has a 'wait and see' approach because the software providers *"put a tool on the market before it works"*. Interviewee A4 argues that company A is dependent on the wave they are on and *"every four years, they enter a new wave"*.

Company B depicts the ‘managed’ digital maturity profile. The digital expertise is accepted and recognised throughout all levels of the finance function. Company B has a digital maturity score of 3,7 for the finance workforce, which is the third highest of the case studies. Company B shows substantial integration of advanced digital technologies compared to the other case studies. Company B indicates for example a low automation potential, due to the advancements already made in robotics. The constant benchmarking and the pressure from the CFO pushed the finance function of company B to adapt more rapidly to new digital technologies (B1).

Company C depicts the ‘defined’ digital maturity profile of the finance function. The finance function of company C scores lowest on the digital maturity level of the questionnaire. The self-assessment of the technical IT-skills for company C is more nuanced, because the company is active in the IT-service sector. The job advertisements of company C recognise digital expertise on all levels of the finance function, but the skill level is inconsistent throughout the finance function. Company C understands the importance of digital expertise in the finance function, but there is no organisational agreement on the integration of these skills. Company C does not employ a separate hybrid finance role in the finance function but depends on the assistance of the business support team.

The finance function of company D is evolving to the ‘optimised’ maturity profile with a current digital maturity score of 3,9. The finance function lacks more advanced technologies due to the smaller scale of the company (D1). Company D recognises a hybrid finance role in the finance function. The job advertisements of company D indicate less integration of digital expertise throughout the finance function than for example company A.

The finance function of company E describes awareness towards digital expertise, but the skills are inconsistent throughout the finance function. The finance function depicts an ‘emerging’ digital maturity profile of the finance function. The finance function of company E lacks the support of a hybrid finance role and is fully dependent on the IT-manager. Companies E and F indicate the lowest digital maturity of the finance functions and use less advanced digital technologies than the other case companies.

The finance function of company F gets the ‘defined’ digital maturity profile. The job advertisements of company F indicate a lack of digital expertise in the finance function. The finance function of company F recognises the importance of digital expertise, but the digital skills are inconsistent throughout the finance team. Company F introduced a coordinator in the finance function to support the finance team as a digital coach. The coordinator role lacks additional tasks regarding process optimisation and digital strategy building to be considered as a true hybrid finance role.

5.2 Digital maturity dimensions of the finance function

Figure 21 provides a visualisation of the dimensions and corresponding characteristics affecting the finance function's ability to digitalize.

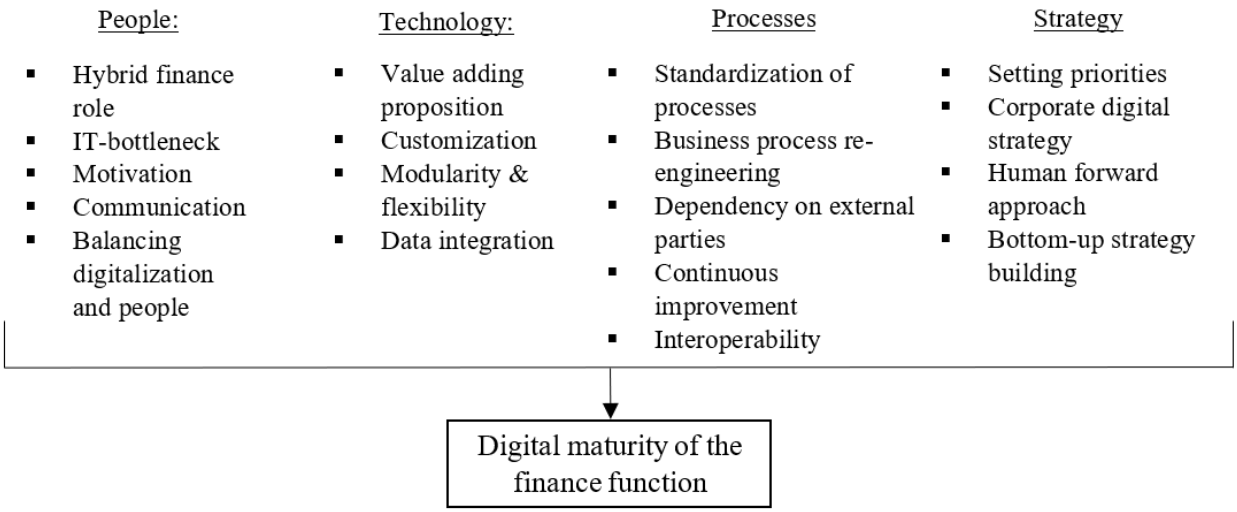

Figure 21: Overview of the dimensions and characteristics influencing the digital maturity of the finance function

The results from the strategy and process dimension are discussed in section 5.2.1 and 5.2.2. The technology dimension of digital maturity is discussed in section 5.2.3 through the evaluation of 'industry 4.0' design principles. Additionally, specific digital technologies are listed and designated to the case companies incorporating those technologies. The results from the case studies indicate the importance of the people dimension and specifically the hybrid finance role. The people dimension is further discussed in section 5.2.4.

5.2.1 The strategy dimension of the finance function

5.2.1.1 Setting priorities

The case studies mention the need for a top-down digital strategy providing clear goals for the organisation. Matt, Hess & Benlian (2015) support this by describing that the digital strategy of the organisation can define the functional strategy of the finance function. The corporate digital strategy sets priorities and provides the necessary resources for the organisation (Schumacher, Erol, & Sihn, 2016). Company E mentions the lack of a companywide digital strategy (E1). Company A also mentions the lack of corporate priorities regarding digitalization, but the finance team counters this by defining its own digital goals (A2). The digitally mature finance functions of companies A, B and D are driven by a digital strategy of the CFO.

5.2.1.2 Bottom-up strategy approach

The case studies indicate a need for a proactive mindset and attitude towards digitalization. Ala-Mutka (2011) describes the willingness to improve as an important driver of digital maturity. Secondly, the decision makers need to recognise the importance of digital expertise of the finance function (Schumacher, Erol, & Sihn, 2016). Companies E and F only recently recognised openness towards cultivating a digital culture (F2) and supporting open-innovation (E3).

The job advertisements describe that companies A and D emphasise the importance of digital expertise in the finance function more than the other case companies. Both companies note the necessary bottom-up digital expertise to support digitalization of the finance function. The CFO of company D also fulfils the role as CIO and indicates the importance of a hybrid finance role taking on IT-projects for finance (D1). The CFO of company A introduced a similar position and describes the hybrid finance role as the driver for all digitalization projects (A4).

5.2.2 The process dimension of the finance function

5.2.2.1 Standardization

Standardization of the processes is indicated as a necessary objective by the case companies. Schafermeyer, Grgecic & Rosenkranz (2010) indicate advantages in collaboration, decision making and cost reduction due to the standardization of processes. Additionally, the business partner role of the finance function aims to increase collaboration and improved decision making (Burns & Baldvinsdottir, 2007). The finance function is seen as a cost department (C1) and aims to reduce costs through process standardization (A4). The organisation can rethink the processes and streamline individual processes to reduce costs (Talwar, 1993).

A standardized IT-architecture includes standardized applications and data to enable flexibility and local differences (Ross, 2008). The CFO of company E indicates the need for a standardization of the IT-architecture (E1). Schumacher, Erol & Sihn (2016) add the importance of decentralised and interdisciplinary finance work to increase efficient processes. Companies A, B and C depict that the complexity of the business can constrain the standardization process, which is also indicated by Schäfermeyer, Rosenkranz & Holten (2012). Lack of standardization delays digital progress of the finance function but does not limit the digitalization opportunities (A4).

5.2.2.2 Business process re-engineering

The rethinking of processes refers to business process re-engineering, as mentioned by interviewee D1. Business process re-engineering refers to the implementation of fundamental change in processes to achieve improvements in business performance (Kochan & Useem, 1992). Interviewee F1 mentions a need to *"rationalize the processes".* Process standardization through business process re-engineering proves to reduce costs, improve process time and increases quality of the processes (Münstermann, Eckhardt, & Weitzel, 2010). To improve digitally, continuous improvement is needed (D1). Digitalization is supported by ongoing change to support process optimisation (Davenport, Harris, & Cantrell, 2004).

Company D indicates the dependency on the software provider, to advance digitally (D1). The finance function is dependent on external parties to deploy further process change (D3, E3). Interviewee A3 mentions that the *"systems adapt to the processes"*, allowing the technologies to get shaped by the complex processes. The people using the technologies can adapt their behaviour to the new technologies to decrease complexity of the processes (C3). In contrast, the CFO of company F notes that technology is a tool to support the finance function, thus new technologies need to support the current processes and working methods (F1).

*5.2.3 **The technology dimension of the finance function***

Table 25 provides an overview of the 'industry 4.0' design principles and the 'SMACIT & AR' technologies that form an indication of the finance function's use of digital technologies.

Table 25: Overview of digital design principles and technologies of the case companies

Organisations		*A*	*B*	*C*	*D*	*E*	*F*
Industry 4.0 design principles	Interoperability	✓	✓	X	✓	X	✓
	Decentralization	✓	✓	✓	✓	X	✓
	Modularity	✓	✓	X	✓	X	X
	Virtualization	✓	✓	✓	✓	✓	✓
	Service orientation	✓	✓	✓	✓	X	✓
	Real-time capability	X	✓	✓	✓	X	X
SMACIT & AR	Social	✓	✓	✓	✓	✓	✓
	Mobile	✓	✓	✓	✓	✓	✓
	Analytics	X	✓	✓	X	X	X
	Cloud	✓	✓	✓	✓	✓	✓
	IoT	X	X	X	X	X	X
	AI	X	✓	X	X	X	X
	Robotics	✓	✓	X	X	X	X
Automation potential		40%	10%	30%	10%	60%	50%
Finance FTE's / Total FTE's		3,4%	2,2%	1,6%	0,7%	7,8%	1%
Digital technologies	Total (13)	9	12	8	9	4	7
	% of total	70%	92%	62%	70%	30%	54%

The 'industry 4.0' design principles and 'SMACIT & AR' technologies provide insights on the attitude of the finance function towards digitalization and the selection of digital solutions (Santos, Mehrsai, Barros, Araújo, & Ares, 2017). Higher percentages of automation potential indicate a possibility to use automation technologies to improve the efficiency of the finance function. Lower integration of 'SMACIT & AR' technologies indicates higher automation potential.

5.2.3.1 Decentralization

Decentralization allows for faster decision making and less dependency on top-down strategy building (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014). Company A indicated the importance of the decentralized finance function where digital innovation is driven by the bottom-up ownership taken by the finance team (A1, A4). Digitally mature finance workforces proactively take control over the digital strategy building within the finance function (A2, D4).

Noteworthy, is the demand from the case companies for a companywide digital strategy, indicating a need for an overhauling centralized vision towards digitalization (A2, B1, E1, F2). DiMaggio & Powell (1983) add that the finance function can take control of the digital transformation, but the finance function is limited by institutional restrictions of the organisation. The finance function is dependent on the operational backbone of the organisation, which drives the processes and connects the organisation (Sebastian et al., 2017). The Boston Consultancy Group indicated in 'How digital CFO's are transforming finance' that the finance workforce is burdened by slow legacy systems, which inhibits proactive behaviour of the finance function (BCG, 2017).

5.2.3.2 Modularity and interoperability

Modularity drives flexibility of systems and allows the adaptation to a changing business environment. Flexibility of systems is driven by modularity and allows the finance function to adapt to a changing business environment (Hermann, Pentek, & Otto, 2016). All the case studies indicate the negative effect of redundant tailor-made programming, hindering the ability to adapt to changing business environments. Interviewee F1 refers to the lack of agility by indicating the *"baked and programmed in"* technologies at company F.

Interoperability describes the interconnection of systems and humans regarding information distribution (Imran, 2018). Company C argues difficulty in connecting the databases in an efficient way and being limited by the interoperability of the business processes (C2). Interviewee C2 notes the need to *"incorporate operational information from other departments."* Companies C and F feel a need to transform the data chaos into operational and financial information. The operational backbone of an organisation has an impact on the data integration (Sebastian et al., 2017). Company C argues the obstructive impact of a legacy backbone, inhibiting further flexibility of systems (C1). Companies A and D have a flexible backbone in place that allows for continuous improvements (A4, D1). Interviewee D1 explains the *"continuous improvement modus"* and mentions the importance of flexible systems.

Interviewee F4 mentions that "*central software packages are static"* and describes a need for easily accessible and interchangeable tools. Interviewee F4 concludes on a change in technology architecture, moving from a central ERP-tool to a modular system requiring a limited amount of additional programming. A trade-off between standardization and adaptation depends on the modularity design. Modularity leads to the decomposing of processes and programmability allows processes to adapt to a multitude of requirements (Lehrer & Behnam, 2009).

5.2.3.3 Service orientation and real-time capability

The service orientation allows the shift from a finance product mindset, to a finance role with a service mindset (Iivari, Ahokangas, Komi, Tihinen, & Valtanen, 2016). Company E indicates the need to shift to a service providing finance function, providing the ability for managers to access self-service finance tools (E1). Interviewee C2 indicates the need for *"a CFO in every department".* The digitally mature case companies A, B and D pursue and accompany a service orientation for the finance function.

The real-time capability integrates data efficiently to allow for a constant availability of usable information to the organisation (Drath & Horch, 2014). Companies B and C employ integrated analytics in the finance function with business intelligence (BI) tools. Companies A and F indicate a need to improve real-time reporting (A1, F1). Company A requires a shift to a modern reporting environment with business intelligence (BI) tools allowing for real-time and mobile dashboarding (A4). Interviewee F4 indicates a limited use of real-time BI and notes a need for more integrated operational data sources. BI allows the finance function to provide unique business insights (Chou, Bindu Tripuramallu, & Chou, 2005). Interviewee E1 notes that *"real-time finance information is necessary"* for the organisation. The finance function provides real-time finance information streams to support efficient reporting (Donnell et al., 2004).

5.2.3.4 Social and mobile virtualization

Virtualization decouples the inherent limits of a digital infrastructure from the digital services, thus increasing flexibility and scalability (Chowdhury & Boutaba, 2009). The social and mobile design elements of 'industry 4.0' take advantage of the propositions from virtualization. The digital technologies and applications are accessible and readily available for the whole organisation. This creates value adding connections and interactions within the organisation (Sebastian et al., 2017). Interviewee A4 indicates that modern reporting tools are mobile, interactive and accessible. Company E indicates a cloud platform to allow social and mobile interaction (E3). Company D indicated their social and mobile environment as *"an institute with open walls"* (D3).

5.2.3.5 Artificial intelligence and Internet of Things

Artificial intelligence (AI) is the overhauling term for humanlike decision making of machines and systems (Rich, 1985). Machine learning is a result of AI, where humans teach machines to perform tasks and let the machine learn from its mistakes (Brynjolfsson & Mcafee, 2017). Company B uses AI in the finance function to perform credit predictions (B1, B5). Company B is also looking at more advanced AI by using one central data warehouse and integrating statistical tools (B1). The CFO of company A does not believe in AI yet because it is only *"about regressions and computational power"* (A4). The CFO of company D investigated AI and robotics, but the CFO claims that the value generated by AI is not relevant due to the small scale of company D (D1). The CFO of company F argues that AI and IoT is still too expensive to deploy at company F (F1).

Internet of Things (IoT) makes use of the cloud-based environment and connects physical objects in a network supported by systems and humans (Pisching, Junqueira, Santos Filho, & Miyagi, 2015). The case companies mention no active employment of Internet of Things (IoT). The interviewees were asked to have a future look on technology within the finance function, but only company B indicated the possibilities of IoT. Interviewee B1 mentions that IoT is currently too expensive, but the technology could be very useful in the future.

5.2.3.6 Robotics and automation

The introduction of ERP-tools allowed for companywide automation of the finance function (Rieg, 2018). Company D mentioned the increased automation potential due to the implementation of the ERP-tool (A3). Advanced robotics allows for automation of repetitive finance work (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014). Company B uses robotic process automation (RPA) in the finance function (B1, B5). Company A started the set-up process for RPA in the finance function (A4).

Table 25 illustrates that the finance functions of companies E and F indicate higher possibilities to automate. Company E indicates a 7,8 percent coverage of the finance function relative to the total employees and has an automation potential of 60%. Company A indicates a 3,4 percent coverage of its finance FTE's compared to the total employees. Company A indicates a high automation potential of 40%. The CFO of company A is aiming to take full advantage of the automation potential regarding the majority of the finance FTE's in the transactional accounting team.

The automation potential of the finance functions in the case companies is estimated between 10 and 60 percent. This is in line with the prediction of McKinsey (2018) indicating automation potential of 42 percent of the finance activities due to emerging digital technologies. As indicated by Derksen & Luftman (2013), the main advantage of automation is cost reduction. Companies A, B and D argue a human first approach to make the finance job more interesting and to reduce non-value adding activities.

Company D has the leanest finance team compared to the other case companies, but the CFO of company D emphasises the absence of layoffs due to automation (D1). The CFO of company D is actively attracting new work to the finance function to cope with the increased automation of the traditional finance tasks (D1). Company B indicates high automation achievements within the finance function, but the amount of finance FTE's is retained compared to the other case companies. The finance function of company B replaced the non-value adding tasks with value adding tasks and created new roles within the finance function. The RPA-team is an example of this role change within the finance function.

5.2.4 The people dimension of the finance function

5.2.4.1 The business partner and hybrid finance role

Table 26 provides an overview of the finance roles at the case companies.

Table 26: Overview of the finance roles in the case companies

Role	*A*	*B*	*C*	*D*	*E*	*F*
Finance transition	Business partner	Business partner	Business partner	Business partner	Decision support	Decision support
Finance hybrid role	Business process owner	Finance director	Business process support	Finance project officer	IT-manager	Finance coordinator

The finance functions of the case companies mention the importance of the present and future orientation of the business partner role, which is supported by Granlund & Lukka (1998). The finance functions of companies E and F support in decision making, but the finance function is still mainly seen as a 'scorekeeper' in these companies.

Companies A and D indicate a hybrid finance role with the BPO and the finance project officer, forming a bridge between the finance department and the IT-department. The multi-disciplinary nature (Allott, Weymouth, & Claret, 2001; Maas & Matejka, 2009) of the finance function is described by companies A and D. The hybrid finance role aligns the finance function with its technology needs (Burns & Baldvinsdottir, 2005). The finance project officer of company D mentions the close collaboration with the IT-counterpart and describes *"the ability to work independently"* (D4).

Company B describes the dominant push of a young CFO demanding hybrid finance activities from all finance teams (B1). The CFO and the finance director of company B take on the hybrid finance roles. Company C recognises the multi-disciplinary role of the finance workforce as a service provider and cross-departmental worker (C2). The CFO of company C emphasises the importance of business process support to optimize the finance function (C1). The hybrid finance role absorbs IT-responsibilities, such as IT-process optimisation, in those of the finance function (Donnell et al., 2004). The business process support team of company C is only tasked with process optimization, thus lacks the bridging role between IT and finance.

Company E depends on the support of one IT-manager, who develops the requested tools for the finance function (E2, E3). The finance workforce of company E takes no proactive control over digitalization in the finance function (E1). The CFO of company F describes the finance coordinator as a digital coach supporting the finance workforce (F1). This role increases collaboration within the finance function of company F but does not actively seek cross-departmental work.

5.2.4.2 Motivation of the finance workforce

Companies B, D and F indicate the hesitating and counterproductive behaviour of the senior finance personnel towards digitalization. The hesitating reaction towards digitalization can be found with an older generation in the finance function (D4). Interviewee B1 indicates the lack of proactive behaviour towards the rethinking of finance working methods and processes by the older generation in the finance function.

Companies A, B and D emphasise the importance of a bottom-up motivation to digitalize. The attitude towards digitalization is a foundation for digitalization in the finance function. The finance workforce is willing and accepting to advance digitally (Ala-Mutka, 2011). Companies E and F depict that only recently *"the digitalization card"* was drawn (F2) and a *"carte blanche"* was given (E3) by their respective managers. The motivation of the finance workforce to digitalize is dependent on the organisational context (Jackson, 1998).

5.2.4.3 IT-bottleneck of the organisation

The results from the case studies indicate a dependency of the finance department on the IT-department. Case companies scoring higher digital maturity levels of the finance function eliminate the dependency on the IT-department by introducing a human buffer between finance and IT. The buffer is a hybrid finance role, incorporating digital tasks and projects regarding finance. The companies A, B, C and D recognise a collaboration with the IT-department, but do not allow the partnership to slow down the digitalization process of the finance function.

A possible reason for the IT-bottleneck is the introduction of ERP-tools, which distribute decision power regarding finance to the IT-department (Chang, Ittner, & Paz, 2014). The IT-department can take control over technology development in the finance function, as depicted by Newman & Westrup (2005). This is in line with the 'technology power loop' from Scarborough & Corbett (1992), where expertise of technology leads to substantial control over technology development. Donnell et al. (2004) describe the finance function being trapped as a 'foot soldier' by depending on the IT-department.

5.3 Limitations of the research

Geographical restrictions need to be considered when comparing the organisations (Färm & Jönsson, 2018). The case companies have a core finance function in Belgium, thus depicting a specific geographical restriction. The research has a limitation related to the cultural specificity due to the investigation of the Belgian finance teams (Lambert & Sponem, 2012). Ahrens & Chapman (2000) mention that the finance function can develop differently depending on the country. Noteworthy is the difference in size of the selected case companies. The variety of the size of the case companies can influence the deployment of resources to increase digital maturity of the finance function (Cadez & Guilding, 2008; Cooper & Dart, 2009). The difference in size of the companies can obstruct the relevant comparison of the results.

Katz & Kahn (1966) indicate that organisational roles cannot be observed in a direct way. Rieg (2018) indicates the possible lack of reliability regarding self-assessment of digital expertise and professional roles. Mezulis, Abramson, Hyde & Hankin (2004) indicate the dissonance between a self-perceived role and the actual role. The interviews and the job advertisements provide an additional viewpoint on the finance roles and the attitude of the finance function towards digitalization. Arguably, the job descriptions are made more attractive to increase the appeal towards new applicants (Ahsan, Ho, & Khan, 2013). Bums & Baldvinsdottir (2005) warn for social desirability when interviewing finance professionals. Reliability of the interviews is preserved by asking respondents within the case company the same questions and detecting inconsistencies between the explanations (Spraakman, O'Grady, Askarany, & Akroyd, 2015).

6 Conclusion

Figure 22 illustrates the hybrid finance role, the 'industry 4.0' design principles, the digital maturity dimensions and the corresponding characteristics influencing the digital maturity of the finance function.

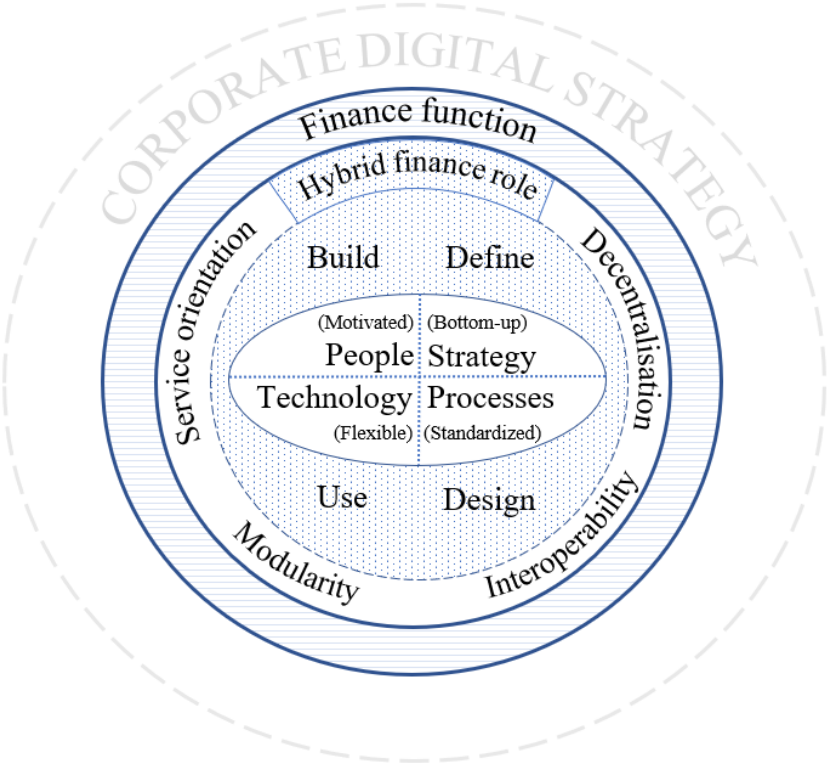

Figure 22: The overview of elements influencing the finance function's ability to digitalize

Figure 22 indicates the overarching importance of a corporate digital strategy, which provides the framework and the resources for the finance function to drive digitalization (Schumacher, Erol, & Sihn, 2016). The finance function decentralises the definition of a digital strategy. The hybrid finance role encourages the definition of a bottom-up digital strategy in the finance function. A digitally mature finance function takes control of its own digital strategy.

A digitally mature finance function employs a hybrid finance role to build the digital development of the finance workforce. The finance function incorporates a service orientation to operate as a business partner for the organisation. The finance function gains control over digitalization by increasing the digital expertise of the finance workforce. The hybrid finance role can design process optimisations and incorporates the dynamic use of technology. The finance function combines the interoperability of the processes with the modularity of technology to achieve digital maturity.

6.1 The people and the strategy dimension

The overall corporate digital strategy, or lack thereof, stimulates or obstructs the finance function's ability to digitalize. The strategy dimension is indicated as the main driver of digitalization by Tadeu, Duarte, Taurion & Jamil (2019). The results of this master's dissertation indicate that the absence of a corporate digital strategy can be circumvented by a proactive finance function defining its own digitalization priorities. This proactive behaviour requires digital expertise and defined digital roles within the finance function.

The finance function needs the bottom-up digital expertise and motivation to support the digital goals set by the CFO. The motivation of the finance workforce is essential to build a bottom-up digital finance strategy. Vakalfotis, Ballantine & Wall (2011) describe a hesitating reaction of the finance workforce towards digitalization. The CFO builds a human forward digital strategy to motivate the finance workforce and reduce possible hesitation regarding digitalization. Digitally mature finance functions describe the importance of a CFO who is digitally driven and who demands the necessary digital commitment from its employees.

The digital expertise of the finance workforce supports the digitalization of the finance function. The finance workforce requires the necessary digital resources and expertise to provide the proactive behaviour in a field that is traditionally not appointed to the finance function (Maas & Matejka, 2009). A hybrid finance role adds digital expertise to the finance workforce and acts as a mediator between the finance and IT-department. The hybrid finance role absorbs IT-tasks (Donnell et al., 2004) and decreases the dependency on the IT department.

The hybrid finance role is an initiator of digitalization within the finance function and proactively defines digitalization priorities. The case companies describe the importance of a human forward and bottom-up digitalization culture, to reduce dependency on the IT-department. The increased digital expertise of the finance workforce allows the finance function to take control over technology development (DiMaggio & Powell, 1983) and thus limiting the restrictions from the IT-bottleneck.

6.2 The process and the technology dimension

The digital maturity of the finance function is affected by the complexity of the processes and the IT-infrastructure. The complexity of systems reduces the flexibility to adapt to a changing digital business environment (Hermann, Pentek, & Otto, 2016). The operational backbone impacts the operational excellence and enables digitalization (Ross, Beath, & Sebastian, 2017). The finance function is limited in the shaping of the technology backbone, as this is part of the corporate digital strategy. The goal of digitalization is to enable flexibility and to allow for local differences in finance working methods (Ross, 2008). Niles (2011) adds that flexibility and modularity increase agility and reduce costs. The hybrid finance role combines its digital expertise and finance knowledge to influence technology use and development in the finance function.

Noteworthy is the reasoning given for the complexity of the IT-architecture, mainly pointing to the complexity of the business processes. A digitally mature finance function can rethink processes and initiate business process re-engineering to increase standardization of the processes. Standardization allows the finance function to increase interoperability and to improve decision making (Schafermeyer, Grgecic & Rosenkranz, 2010). Digitally mature finance functions find a balance between standardised processes and modular technologies. Interoperability of business processes depends on the ability of the finance workforce to rethink finance processes and stimulate process optimisation. The hybrid finance role takes on this task and allocates time and effort to support business process re-engineering in the finance function.

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APPENDIX

Enclosure 1.1: Interviews overview

Table 27: Overview of the interviews

Org.	Location	Interviewee	Date	Duration	Background of the interviewee
A	Ghent, Belgium	Business process owner controlling (1)	3/05/2019	30min	IT, controlling IT
		BPO finance (2)	3/05/2019	15min	Controlling, finance consultancy
		Divisional controller (3)	3/05/2019	20min	Finance, controlling
		Chief financial officer (4)	7/05/2019	40min	Financial management, consulting
B	Brussels, Belgium	Financial director (1)	30/04/2019	30min	Controlling, business intelligence
		Administration manager (2)	30/04/2019	15min	Finance, infrastructure, invoicing, wage management, security
		Credit manager (3)	30/04/2019	20min	Credit management
		Accountancy manager (4)	30/04/2019	15min	Accountancy
		Robotics lead (5)	30/04/2019	15min	IT, finance, controlling
C	Huizingen, Belgium	Chief financial officer (1)	15/04/2019	1h	Finance & Legal
		Corporate Reporting Manager (2)	15/04/2019	45min	Budgeting, forecasting, BI and controlling
		Group Controlling Manager (3)	15/04/2019	30min	Accounting
		Business Support Manager (4)	15/04/2019	30min	Process, operations, order to cash
D	Ghent, Belgium	Chief financial officer (1)	1/05/2019	30min	IT, finance
		Management accountant (2)	1/05/2019	20min	Accountancy, reporting
		Accountancy manager (3)	1/05/2019	30min	Accountancy
		Finance project officer (4)	1/05/2019	15min	Finance consulting
E	Brussels, Belgium	Chief Financial officer (1)	25/04/2019	20min	Finance, HR, IT
		Accountant general expenses (2)	25/04/2019	40min	Accounting
		Chief accountant (3)	25/04/2019	30min	Budgeting, Accounting
		Accountant (4)	25/04/2019	20min	Invoicing, accounting
F	Bruges, Belgium	Chief Financial Officer (1)	17/04/2019	30min	Consultancy, audit
		Finance Coordinator (2)	17/04/2019	30min	Accountant, coordinator
		Internal audit finance (3)	7/05/2019	15min	Internal audit
		Accountancy manager (4)	8/05/2019	20min	Accounting, budgeting

Enclosure 1.2: Interview questionnaire

Introduction

- Project
    - Presentation of the research project, the code of ethics and the interviewer
- Interviewee
    - Presentation of the interviewees, their background, their professional career, etc.
- Company
    - What is the core business of the company?
    - How is the company structured?
    - How many employees does the company have?
    - How many employees work in the finance department

Finance function

- Starting questions:
    - How would you rate the digital maturity of your organisation and why?
    - Is your finance function able to digitalize?
    - What are the reasons for not being able to digitalize the finance function?
- Role of the finance function
    - What is the role of the finance function in the organisation?
    - What is the role of the finance function in the context of digitalization?
    - How has the finance function changed due to digitalization?
- Digital maturity of the finance function
    - How digitally mature would you rate the finance function in your organisation and why?
    - Has the finance function taken advantage of emerging technologies?
    - Is the finance function in your organisation a leader or a follower in the context of digital innovation?

- Strategy dimension of the finance function
    - Who is the initiator of digital innovation within the finance function?
    - Does the CEO or the CIO create a digital technology road map?
    - Is the digital vision of the finance function clearly communicated both internally and externally?
- Process dimension of the finance function
    - How is the finance function structured in the organisation?
    - How is digitalization organised in the finance function?
    - Are the processes defined and ready to implement in the management of digital programs?
    - What are the main challenges when facing process change of the finance function?
- Technology dimension of the finance function
    - What current technologies are used to digitalize the finance function?
    - Who takes control over technology innovation and efficiencies within the finance function?
    - Is there a fluid technology budget to allow for shifting priorities within the finance function?
    - Is there a flexible, iterative and collaborative approach in place to support technology development within the finance function?
    - Does the organisation leverage emerging technologies (Cloud, Big data, advanced analytics, etc.) to improve efficiency and effectiveness of the finance function?
- People dimension of the finance function
    - Does the finance function possess the digital skills to adapt to new digital innovations?
    - Does the finance function encourage cross-functional collaboration?
    - Does the finance function invest in targeted digital education and training at all levels of the finance department?
    - Does every employee of the finance department understand how their performances tie in with the corporate digital goals?
    - How is finance information distributed in the organisation?
    - What is the influence of new technology innovation on the expertise of the finance function?
    - What IT knowledge and skills do you need at the finance function at your organisation?

Ending

- Thanking of the interviewee for participating
- Providing follow-up information about the next steps in the research process
- Answering of additional questions of the interviewee

Enclosure 1.3: Interview transcripts

The interview transcripts can be found in the separate attachment.

Enclosure 1.4: Interview summaries

Company A

Business process owner controlling company A (1)

- People
    - Need for a buffer between IT and Business: "We have to explain what the business wants from IT and what IT wants from the business. So, we are a little bit the squeeze. We are the concrete layer. Or the glue so the two departments are less colliding. We also look at optimizing the processes."
        - Competence: "There is a need for a good mix who come from business and IT. You have to have an overview on the processes."
    - More creative jobs: "That is positive, because no one would not like to do those jobs, be more creative."
    - Value of technology comes from the use of technology: "There will be value, but you will first need to work with it, learn to use it and then it will come."
- Technology
    - Be critical towards constant new technologies: "For a company, the speed at which systems change is not always that useful, but you get sucked into it by the market."
    - Focus on core: "IT sells itself, it reinvents itself again and again. But is that advancement? Sometimes you lose track on your core tasks."
    - Better communication: "But also for example Skype for Business, introduced a few years ago, this allows us to communicate better."
    - RPA is part of next industrial revolution: "This is advancement, but some people only do those administrative tasks. But that is the industrial revolution."
    - Constant new innovation isn't needed: "The need is driven by the market."
    - Chose lasting trends: "But you have to select the right trends and that's the job of IT. Some trends are gone very fast."

        - SSC and RPA: “For example Shared Service Centre, that was a whole trend. All the people that did the SSC are now coming to the RPA. RPA was the initial goal, not the SSC. So, we skipped this SSC.”
    - Open culture towards new technology against culture of stability
- Strategy
    - Let other test new digital innovations: “That’s how it works now, the companies have to test it, mainly because of the competitive pressure between the sellers. We don’t want to test the risks.”
    - Business strategy and culture influences technology advancements
    - Digital advancements depend on the way of working and needs of the managers
- Processes
    - First make core solid, afterwards start implementing tools: “But the core is solid, but we don’t use fancy technologies to show it. So, we don’t have the best reporting tools.”

Business process owner finance (2)

- People
    - Bridge IT and business: “So I am a finance business process owner, we make the link between finance and the rest of the organisation, with a magnifying glass on IT. We make the bridge between IT and finance. We need to defend IT at finance and vice versa.”
- Technology
    - Automation demands customization, but is a disadvantage: “The downside is, a part of automating is a part customization.”
- Processes
    - Size of organisation determines ability to digitalize faster
    - Standardization is core of digitalization
- Strategy
    - Finance function takes ownership: “Yes, a part is ownership that we can take. A big part of this kind of projects is started bottom up. I think, here, the roadmap is fed bottom up.”
    - Set priorities formed by top of company: “Yea, it’s is sometimes focusing on to much things, that sometimes it works as a brake. You have to set priorities.”
    - CFO cannot fully influence technology roadmap, only shape it

Divisional controller company A (3)

- Strategy

    - Pressure to optimize: “Like in every company, there is a pressure on the costs, there is more work to be done. In this regard, we have to organize ourselves more optimally.”
    - CEO needs to push and demand commitment: “For example, you need a clear support from the CEO, who pushes it, and demands commitment of everyone.”
- Processes
    - Adapt processes to systems: “Traditionally, the SAP implementations, we try to much to use the existing working methods in the new systems. Rethink the processes and make them implement ready.”
    - Complex processes create complex systems: “Some complexities for the business are almost a monster that is going to be created in the systems.”
    - Organisation is interconnected: “Everything is more connected, such as in globalization of the world, you also have a globalization of the organisation.”
- Technology
    - Focus on value adding when implementing: “Yea, maybe also system implementations and what you get out of it of value. It has to be as standard as possible, but in the end it has to be valuable.”
    - Value is created with the user: “You see this in de accumulation of projects, where projects are following each other but the projects are not fully ended, so the true value at the end is not realised.”
    - Take time to have a solid design: “And secondly, the design phase, the conceptual phase is very important, because in the end it will follow you.”
- People
    - Collaboration between departments: “The people need a basic know how of finance, but also we as finance people have to know their processes. Everything is related to each other, where in the past there were more silos.”
    - Self-service finance is needed: “We cannot be report dumpers, we have to communicate it to the people.”

Chief financial officer company A (4)

- Processes
    - Lack of standardization: “The processes are not standardized. But it does not stop us, but it will take longer.”
    - SSC was not needed, RPA is the solution to automate processes

- People
    - Controlling as a business partner
    - Team is essential: ”You need money, a story, a team, who believes in it and also the skills to run those applications. If you don’t have the skills, then you have to hire them.”
    - New profiles: “Yes, we will need to hire new profiles. We don’t need to train everyone in RPA, but we also need to let people go clearly.”
    - Difference in tasks: “You have the transactional and relational activities. The transactional activities are not added value. You only bring something from non-digital to digital, but the computer can do this.”
    - Bridge IT and finance: “This is a very important key function. That’s so essential to understand business and make a translation to IT. The role functions listens to the needs.”
- Technology
    - Scanning digital objects: “Than the next step was pdf reading, but again that’s fake digitalization, because you still have to read those pdf’s with OCR.”
    - Real digitalization incorporates suppliers: “Programs such as Ariba is a real digital platform. Where the supplier is integrated in that process.”
    - Advancement depends on company history: “Now we have to go to the next wave. It depends on what wave you are. Every four years, we enter a new wave.”
    - Needs indicated by the business: “Core is very good, but today our people want to dashboard and currently we only use BO and BW and this is very static. Dashboarding or drilldowns are currently not possible.”
    - AI still not interesting: “The relational is not impacted. For example, I believe less in artificial intelligence. For example, forecasting, that’s good for linear prognoses.”
    - Customization is too complex: “The maturity of the applications are still too complex, too much customizing, business dependent.”
- Strategy
    - Top down strategy: “We are also not the big player, resources are scarce, dividend gets priority before investing everything. It’s all about belief.”
    - Situational context: “It was integrated in our strategy, but then we did an acquisition and it was left behind.”
    - Innovation comes from CFO: “I would say, you have to have a good case a good story. It’s all about story telling. You have to sell something in an organisation. We can have cost reduction, but you can work more efficiently.”

- Priorities: “Mostly it has to do with priorities. But then again it’s about resources and money.”

Company B

Financial director company B (1)

- People
  - Strong mature teams with a strong process knowledge is a strong foundation
  - Value adding approach: “With RPA, we introduce the ability to educate people and to eliminate less interesting tasks. They automate it themselves, so they have more time in the end to spend on more value adding activities.”
  - Set priority on process improvement: “You have to make choices. Make priorities. This is the most important.”
  - Specific innovation team: “A solution could be, day to day and innovation, split them with different employees for each. But then, why would people want to work for the less innovative, more boring job?”
- Technology
  - Lack in faster innovation in finance: “In other sectors, I see faster evolution. For example big data, artificial intelligence. We do that in the business, but not in finance.”
  - Goal: use of central data warehouse, use of statistical tools, artificial intelligence, machine learning and Internet of Things (IoT)
  - Human approach: “This is also our policy, that’s our brand, human forward, but also tech and touch. We try to put human first, with a good mix of human and technology”
- Processes
  - Continuous benchmarking in house: cost perspective
  - Allow ownerships of the companies, benchmark internationally
  - Business determines cost focus and cost structure
  - Lean working is the base for further improvements
  - Shared Service Centres (SSC) were necessary to improve and to automate: need for standardization and harmonization
- Strategy
  - Young CFO with a strong vision that is pushed

- Humanlike strategy: “And everyone has something in their job which is repetitive, which is boring. And this is what we want to eliminate.”
- First a vision, then motivation and then a good balance

Administration manager company B (2)

- People
  - Balance technology and people: “This is relative. There was some outflow, but we used this automation to get new tasks to our teams. So it’s a combination of reducing FTE’s and bringing in new tasks, to allow the business to focus on their jobs and not the administration.”
  - Select specific owners of the improvement projects
- Processes
  - Centralise operations: driven by efficiency increase
    - Shared service centre start of automation
    - Scale advantage: “Automating is easier when everyone is working in the same way. We uniformized the procedures. We created a standard first.”
  - Process knowledge needed to improve
  - Dependence on the suppliers, to improve processes
- Strategy
  - CFO is the main driver
  - “But the trigger on the broader scope, the savings on the FTE’s was the main driver.”
- Technology
  - Stability of the systems needed: improvements need to be hardcoded
  - Finance takes control of technology improvements: “But then we have the solutions in place, and if we have to wait on IT, they have some time problems regarding implementation.”
  - Dependence on IT teams: “My ideas are always there, but if we go with IT, we lose immensely a lot of time.”
  - Wild grow of applications of external partners make things more complicated

Credit manager company B (3)

- Processes
  - “The business really has influence on how much you can automate.”
  - Resources from IT: “the team members, who know the possibilities, but also an IT department who makes time to help us.”

    - IT can be a bottleneck: “We have a limited amount of programming time available, and you’ll have to wait, or you’ll have to indicate the importance of your business case and gain priority.”
- Technology
    - “Digitalization can help us in the transactional tasks.”
- People
    - Seniority: “The ages rand from 28 to 58. This is typical, younger people have a broader spectrum towards tool usage and change.”
    - Balance people and technology: “Shape you expectations to this. Sometimes you have to continue in a semi manual manner.”
    - Diverse mix of team: “Yes, persons with an older age, have the experience, and younger employees search for advice to those more mature people.”
- Strategy
    - Balance IT resources: “It will be something in the middle. You have to know, to take in more IT people, this is sensitive, and there are of course also peeks of workload. Thus is quite hard.”

Accountancy manager company B (4)

- People
    - Reduce workforce: “We let someone go, and this forces us to be more efficient and think about this transformation through automation.”
    - Seniority of managers: “But our core function is to provide accurate and timely information. But I am a little behind indeed myself. I am a little cautious also, does this all need to be happening?”
    - Scared reaction: “This idea needs time to grow. If we want to automate everything, then left and right they look and say what about us?”
- Technology
    - One version of the truth: “But, how can I say this, there is one version of the truth in every database.”
    - Goal: “Our goal is, we have one button and the computer does everything.”
- Strategy
    - Balance cost efficiency and people: “We have the goal to do the job with less. The goal is to eliminate boring less value adding work. To be clear.”

- Processes
    - Uniformity: “Al the working methods need to be standardized and automated. Thus uniformity in the data.”

Robotic process automation lead (5)

- People
    - Motivation is the biggest driver of change: “It is indeed quite important to get the people on board. There are some people who are motivated, but also some people who are cautious. This is the biggest obstacle.”
    - Technical skills not needed: “You have to be motivated to be future oriented, you will need to open to learn new things and be future proof and this is not related directly to an IT background.”
- Process
    - Change of processes depends on people: “We know our process and we know our world, so why are we going to change that.”
- Strategy:
    - Top down push: “And secondly, is it driven by the top down and is it pushed or is it a little bit free and not that strongly pushed.”
    - IT resources: “IT focusses on the core business critical processes. Our processes are not business critical, you can do it manual, but it is more pleasing to make it more efficient.”
    - Value adding strategy: “More efficient work is obvious, but the way how you tell this story is important to gain support and give them added valuable.”
- Technology
    - Do not depend on IT: “Secondly, it was not an IT story, not another story where we depend on IT.”
    - Technology will be more user friendly

Company C

Chief financial officer company C (1)

- Process dimension is the driver of digitalisation
    - There is a need to rethink the processes, the infrastructure and the people
    - Rethinking of processes is disruptive

    - Industry specific problem: IT business is driven by too much flexibility making architecture too complicated
        - Advantage: Agile working with room for autonomy and innovation
        - Find balance between individual innovation and coherent overview
- Technology dimension is the enabler
    - The backbone is the depending factor
        - E.g. Legacy systems: limited by legacy systems such as old ERP systems which are updated and current add-ons have to be rebuild from scratch
        - Everything is built around the backbone
        - The flexibility of the system is limited
    - Finance is seen as a cost department: constant need to be more efficient, thus investment possibilities are limited
        - Customer at own company for ERP provider: Company pays fixed amount, thus stimulating the internal ERP provider to find efficiencies to improve own margin
    - Emerging technologies
        - Use of artificial intelligence in process support tool
        - E-invoicing
        - Digital signing
        - In-and outbound invoicing is digitalised
        - Automatization of incoming invoices
    - Future goals
        - Predictive analytics
        - Big data: Implementation of commercial an finance information
- Also, the people dimension can suffer from legacy systems
    - Rethinking way of working is disruptive
    - Solution: There has to be one ‘digital native’ in every team who can coach the group and set objectives
    - Pitfalls: Only looking for young digital natives
        - Experience is needed to understand the processes
    - The finance function is multi-disciplinary and has to think about other departments: cross-departmental work is essential
        - Provide internal quality
    - Role of the CFO: Business driven (E.g. influence on positioning company, pricing, etc.)
        - Supporting role to the organisation

- Strategy dimension
    - CFO is strongly included in strategy decision making and IT roadmap
    - Finance function provides solely the input for the digitalisation opportunities
        - IT infrastructure is decided on by the CIO

Corporate reporting manager company C (2)

- People dimension: Mature group of three people providing reporting and controlling
    - Proactive transformation to bean grower role
        - Be a support to the organisation
        - Provide a strategic overview towards external investors
        - Implementation of automatization, efficiency, stabilisation, one place of the truth, what if scenario's
        - Being a trusted service provider
        - Finance should be able to explain data to the company: "Because there were a lot of people who said that finance it is Hocus Pocus what happens in the finance function. As manager, you have to be able to explain it, and make it clear."
        - Accounting information is past information: the numbers can be tested against the budgeting to analyse the progress of strategy
    - "We wanted to be small CFO's in those divisions and departments."
    - Communication is important
        - Embed change in a positive manner
        - Allow the provided quantitative data to be the sole version of the truth and don't lose time on discussing the correctness of the information
        - Free up time to search for causes of the numbers
        - Support administration: "So as department, we wanted to transition from only spitting financial numbers and providing them, we wanted to be finance business partners."
- Technology dimension
    - Transformation ten years ago from Excel based analytics to specific tooling
    - Currently all data is collected on-premise and data is transferred to other databases to allow access in other tools
    - Current tools
        - SAP Business Objects

        - IBM Cognos TM1: analytics tool from French mother company
        - SAP BPC
        - Central data warehouse: one version of the truth, fixed rules
            - Self-service possible but rules cannot be changed
            - Only one way to determine KPI's
    - Cloud will become more important because of recent acquisition by French mother company
    - Future goals: Better use of Big Data
        - Better access to data
        - Better structures in place
        - Better input of data
        - Harmonise data
        - "Everything stands or falls with the quality of the data"
    - Problems:
        - Lack of data efficiency from other departments
            - E.g. CRM is not integrated with data warehouse
        - Marketing information not fully leveraged for predictive possibilities
- Strategy dimension: strong strategy and support from CFO
    - Decision ten years ago to stop using Excel as main tool
    - Tooling is not goal on itself
        - Excel is purely financial
        - The goal was to combine operational with financial information and allow for better follow-up of KPI's
- Processes
    - Gap between sales processes and finance: sales is sometimes a company in a company
        - Transfer and structure of information is not optimal

Accounting and tax of Company C (3)

- Technology dimension
    - Interfaces on the mainframe are the problem for the increased complexity
    - History: Started with mainframes, then transformation to networking systems and not again to a modern type of mainframe called ERP, which has more capabilities than in the past
    - Goals

        - "We still have to manually adjust the information and put information from one application to another. That's around 10% of our work. That's repetitive work. This could be automated."
        - The only work should be done on analysing abnormalities and the understanding of the numbers
- Process dimension
    - The balance sheet gets less attention in an organisation: underestimated role
        - Balance sheet shows if a company survives or not and the Profit and Loss (P&L) is only cashflows
        - Board has only attention for cashflows
    - Complexity is created due to the different input sources of data
        - "The process scheme is very complex, it fits on two A3 papers to show in what systems the data sits. That's the whole problem. You have the adjust the behaviour to let the systems work better."
        - The processes and flows are impossible to understand
    - Reasons for complexity
        - Buyer changes software to their needs
    - Solution for complexity processes
        - "The buyer has to adapt their behaviour to the software and not the other way around"
- People dimension
    - Not enough time or resources to investigate optimisation
    - "We have to be offensive and not reactive. We don't get extra budget for this."
    - The culture in an organisation has an influence on the software attitude
- The strategy dimensions
    - The top management another view on software purchasing: Software has to be custom made to the likings of the users

Business support manager company C (4)

- Technology dimension
    - "The finance function has only just started to adapt to digitisation, thus the transition from paper to paperless"
    - Current situation:

        - Policy against island tools, not supported by other teams or departments
        - Creation of central administrative hub
            - One version of the truth
            - Archive
            - Ability to train rules and parameters
            - Further development needed
- People dimension
    - Need for centralised thinking
    - The finance function is less IT-technical developed
    - "The setup is there, but the culture has to change"
    - Cross-departmental teams have to be stimulated: end to end work thinking is needed
    - Need for common practise and collaboration
    - "Yes, absolutely, that's a little bit the uphill battle. It's not in the genes of the finance function."
- Strategy dimension
    - A strong strategic framework is needed to support change of the way of working
    - The suggestions of improvements mainly come from the business support
        - Business case has to be provided
        - Overhauling technologies are presented by the CIO: CIO doesn't decide on finance technologies
    - Digital way of working is not obligated but also the interest in the finance function is not there
- Process dimension
    - Need to have a more structured way of working
    - "Also from the administration, they give the handles, we have to organise to it, but where is the support. Where is the framework, with a goal."

Company D

Chief financial officer company D (1)

- Processes
    - Continuous improvement: "Well, I would say, we argue continuous improvement. We could always improve, we are in that modus."

    - Rethink processes: “So there has to be some interest, but indeed, with every project we did a business process engineering.”
- Technology
    - Dependency on suppliers: “. We have introduced a fixed protocol, but in the past we could not force supplier to use this.”
    - Dependency on software providers: “So you are dependent on the software provider and their resources.”
    - Complexity systems depends on scale and business
- People
    - Person who drive digital finance projects: “So someone who is really driving those digital projects. So the finance project officer.”
    - Balance efficiency, automation and additional work: “So the answer there was, that no one should be scared to lose their job. I have also attracted additional work, related to our activity.”
    - Motivation is important: “But motivation is very important clearly.”
    - Culture is important: “Yes, there is a mix, and also the culture of your organisation.”
- Strategy
    - CFO needs to have a total overview: “So I think as a CFO you have an unique view on all the processes and this has helped to introduce this ERP tool.”
    - CFO is a driving force of digital change: “I think that the CFO should play a role in the digital transformation. I think even in the other way around, if you are as CFO not a driving force on it, then nothing will happen.”
    - Clear strategy to improve and intention to keep people
    - Drive from finance function itself: “I had the ability to drive this myself. I thought myself it was important. Because we had our own finance project officer, we didn’t need a consultant for every project, we did it quite non nonsense, straight forward.”

Management accountant company D (2)

- People
    - Diverse role: “My role has is not quite defined. It’s very diverse and depends on the projects.”
    - Technical training regarding Excel: motivation is important and time management
- Processes

    - More work is compensated with automation
- Strategy
    - Top decides on priorities: “It depends on the demand from the top. If we have more time, you can put more time on it.”
- Technology
    - ERP systems had the biggest influence towards further digitalization

Accounting manager company D (3)

- Technology
    - Using and leveraging of technology is important: “Everyone knows Excel is important, but important is to look how you work with it.”
    - Data protection is important: “Everything is driven by job allocation. We also strongly focus on data protection, which indicates that you also see and interact with things you need to see. “
    - Customization: “Those projects take time and money. Another advantage or disadvantage is the customization.”
- Processes
    - Increased interaction: “So that’s an example of an institute with open walls.”
    - Business context determines transformation process
- People
    - Motivation is important
    - Group effort
- Strategy
    - Dependency on supplier
    - Dependent on strategy

Finance project officer company D (4)

- Processes
    - Dependency on external parties: “So that doesn’t depend on the company itself, but we are dependent on external parties.”
- People
    - Older people are more cautious: listen and interact to find solution

- Specific role for digitalization: “So I didn’t know what the job would entail, but know, I don’t understand that not more organisations have someone like me, because, who else is doing those things then? So I think external consultants do those jobs.”
- Depend on IT for technical side

Company E

Chief financial officer company E (1)

- Technology
  - Custom made tools: “But they are all built by one IT person here in-house. But I find that a big risk.”
  - Current tools: Qlikview, Navision
  - Future: Tableau
  - Lack of investment: “We don’t invest enough in systems and we compensate that with people.”
  - Architecture: “The IT manager gets different questions and makes add-ons for everything but in the end you have a complexity of custom made programs.”
    - “And it is impossible to change one stone and not let the building collapse.”
- Strategy
  - Lack of strategy: “Also there is no clear vision from the group regarding IT. So the biggest stop for me is, the support from EMEA, they are not hands-on, they don’t have enough vision on it.”
- Processes
  - Operational improvement: “That is also the reason why I have challenged my two controllers to have a weakly process and workflow improvement ready. And they reach it.”
  - Architecture: “I want to have a visualization. I have a high level vision, but I want to go one or two levels deeper. It is a human problem. “
- People
  - Resources to improve: “And that is maybe above all the problem to go faster. The resources. Maybe I need an extra person, who is better, who can say on the long term how it has to go.”

    - Lack of proactive behaviour: “I want to have the architecture, so I know how all the things work, explain to me, but that seems impossible. Is that because of protectionism, maybe he is scared for his job.”
    - Lack of self-service finance: “I want the managing directors to allow them to access their information by their own means.”
    - Real-time information: “Some profitability evaluations only happen every three months. So that’s a shame. Yes, clearly, real-time finance information is necessary.”

Accountant general expenses company E (2)

- Technologies
    - Digital invoices: Through e-mail and pdf. Manual input in the system. Thus paperless.
        - Even cloud based input on websites from suppliers or third parties (E.g. OB10)
    - No visualization tools
    - Template usage: Accounting templates for reporting in IFRS and US GAAP
    - Accounting tool: Navision
    - Mapping: Use of tools to map numbers from Excel to Navision
- People
    - Role change: mainly reporting side
    - Learning: two days a year able to have training, mainly on Excel
    - IT support manager: development
    - Workload: Day to day workload too high and not enough time to look at improvements
- Strategy: improvement suggestions came from the mother company
- Processes: connections between tools need to be made due to complexity of tooling

Chief accountant company E (3)

- Processes
    - Automation: 40% is automated and doesn’t need direct human interaction
    - Improvements: “We have internally, a person that helps us to improve.”
    - Interconnectivity: “We contact the suppliers to play this digital game with us.”
- Technology
    - Intranet platform: tools are cloud based to allow for reporting, budgeting, cash management, timesheets
    - ERP: Custom made ERP system called ‘System Achat Media’

- People
    - Lack of time: “We have a lot of ideas. Often the problem is the day to day.”
    - Culture: “They understand there is another dynamic in the company the last year. We got carte blanche.”
    - Job change: “The job has changed, it not as boring now, I like myself to be a project leader to improve processes.”
    - Lack of IT resources: “Sometimes it is a bit slowly. In the past IT was not fully operational.”
- Strategy
    - Open culture: “The CEO is very open to the process. Also the CFO is now very attentive to improve.”
    - Support CEO: “The CEO likes initiative and in the past it was not that easy to go out of the box.”

Accountant company E (4)

- People
    - Role change: “First it was more accounting and accounts payable. My job has evaluated and now it is more analysis, evaluating differences and matching. Looking at the why.”
    - Proactive role: “Yes, I am proactive in that sense.”
- Technology
    - Tools: “Problem solving is easier and quicker. We have a lot of tools. We have ERP, SAM.”
    - Automated system: “The SAM generates the invoicing and sends it to the Navision tool. Through xml files. Everything is automatic.”
    - When people change behaviour in tool, a lot of problems occur.
    - Excel is main tool: “But we mainly use Excel. Maybe we use to much Excel. I see that Excel is not always perfect for the big databases we use.”
- Strategy
    - Not enough time allocated to improvement searching: “Time we don’t have. We have a lot of day to day work.”
    - Priorities are not always set: “It takes time, we have to build a plan and I know there are more urgent things to do.”

- Processes
    - Complexity technology dependent on complexity business: “Our job is very specific. Our business.”
    - Too much customization: “It would be better if we had more IT guys. But it is already a luxe that we have an IT guy who can do it and help us. He is a direct contact to help us. We improve, then I becomes more complicated.”

Company F

Chief financial officer company F (1)

- Company structure: Central accounting in Bruges with 8 people
- Main positions: Coordinator finance, accounting lead, controller and coordinator financial contacts
    - Financial contacts on the different study locations for every department
    - Financial contacts have control over their study area’s and relating budgeting, direction support, invoicing, service providing
- Maturity: mainly bad
    - No e-invoicing
    - To much manual labour
    - No digital scanning of invoices: still paper focused
- processes
    - There is more business support demanded, but FTE’s are not increasing, thus only solution is freeing up of time with increased automatization
    - There are still a lot of manual tasks
        - Input of the ledger to differentiated, too much time in manual checking
    - Best practices not implemented: work is done too much on an island
    - Scale advantage of the association not used
        - Individual organisations too self-centred: no collaboration
    - Now processes are being streamlined
    - Automation of repetitive tasks: interactions with other systems
    - Link growth with increased digitalization
    - “On the other side of the spectrum, you can use an application as a kind of breaker to rethink and rationalize current processes.”

- Technology
    - Software packages are to clustered and not interlinked
    - SAP implementation in for the whole association was a disaster
        - Rollout stopped at student administration due to the high expectations and the technical problems
    - Previously there was a thought to implement SAP and all organisational problems would be solved
    - "Yes, I think we have a lot of customization, it's really baked in, programmed in it. We want to use the package as a tool. It has to stay a tool. It has to support what we do."
    - "The downside is that, when we ask for an upgrade, it is harder. It is a brake. There is an absolute negative on it, we are dependent on the software provider."
    - Tools are used in a tactical matter: "To conclude, I use the software in such a way that gives me the most tactical advantage."
    - Future technologies:
        - Paperless (inbound, outbound)
        - Advanced self-service finance
        - Customer integration
        - Automatization: AI
- People
    - Younger people are apply technology faster
    - Coordinator is the lubricating oil between finance and IT: coach
    - Change of behaviour towards IT is a reciprocal process, both internally developed and adjusted by culture
    - Create culture: share problems and don't feel targeted
    - Only digital natives are too focused on one thing: there is a need of a mix of skills
    - The workload determines the amount of people, but there is also a need for new profiles
- Strategy
    - Automatization was not the priority
    - First deal with coherence after the fusion
    - IT has been put on hold
    - Recognition of importance was too low
    - Low investment in IT resulting capacity shortage and lack of resources

Finance coordinator company F (2)

- Processes:
    - Need for process automatization: investments are not there
    - "We continue with the resources we have"
- People:
    - "We need to find a balance between improved efficiencies and the people that are still here"
        - The company will need to pay the tenured employees: brake on digitalization
    - Increased responsibilities and workload due to business partner role: need to support decision support making
    - Young workforce and the new working methods are not that hard
    - "We have to take into account the natural outflow and link with the progress in digitalization, to not make drastic changes in workforce."
- Strategy:
    - "But with the increased pressure on the results of the organisation, the labour intensive work, you have to draw the digitalization card. We only drew that card recently."
    - Education is the core and not administration: "So we have to economize, and there is an increased demand from the organisation, only leaves us with automatization."
    - "Hm yea, it could all go faster. But it can be stretched over a bigger time, as we are not a commercial organisation. That is different."
    - "It's like social digitalization. We have to work sequential."
- Technology:
    - Flows are visualised: now they make it paperless
    - Customization of tools is the base of their operations: "The advantage of customization, we try to make it all very user-friendly."
    - Started with pilot projects
    - Goal: "And the dream is, to have a one click annual report."

Internal auditor finance (3)

- Processes
    - Data is scattered: "And when I make reports, they ask me where I got the numbers. And then I think, we are lacking behind. The data is not integrated. Afterwards I have to link all the data."
- People
    - Non value adding activities: 3 out of 15 could be automated
    - Lack of IT support: "Yes, I think IT still does not support enough."
    - Innovation team: "I think we do this together. We are a core team with the coordinators and we have to come up with the needs and the requirements."
- Technology
    - Limitations of accounting package: "So I heard there was a tool to work directly on the database of Navision. And then the digitalization of the purchasing orders."
- Strategy
    - More demanded from finance function: "I think mainly the demand from the board was not big enough. And now they want more and more information when we give them information. The increased questions force us to provide more."

Accounting manager company F (4)

- People
    - Finance job has changed
    - Obstruction by the finance team to change: "Also the people, if something changes, you have to educate the people, the whole organisation has to be trained. You always have some hesitating people, but all changes, even positive ones, results in opposition."
    - IT bottleneck: "But you don't decide alone on those topics, and I know IT is over demanded. And we want to implement something, all our deadlines are not met and get postponed. Those people have a lot of work."
- Technology
    - Following trends: "The question if you want to jump on every trend. We do some efforts, but it is not easy to be up to date."

    - Shift from central tool to modular tool: “A few years ago, there were not a lot of plugins for this package, but now there are some plugins that allow more modularity, so limit the custom made tools. So in the past everything was centralised in one package, such as SAP, but now we want to leave this model, because those packages are static and are not easily upgradeable.”
- Processes
    - Harmonizing: “So were are still working on the harmonising and centralizing of the company.”
    - Data integration: “We want to incorporate operational information from other departments. We want to align those data and make clear analysis.”
- Strategy
    - Support from management needed: ““But on the other side, they have to want it, the management, there is a lot of counter reaction if you want to change something.”

Enclosure 1.5: Overview of the interviews

Table 28: Overview of summaries from the interviews

Interviews A-F

Org.	Strategy	Processes	Technology	People
A	Bottom-up digital roadmaps; priorities set, and commitment demanded	Standardization of processes; adapt processes to technology; business determines complexity level	Usage of technology creates value; too much customization is a disadvantage	Layer between finance and IT; mix of skills needed; self-service finance; motivation needed
B	Finance can take control; top down push needed; digital strategy focussed on value adding	Business context creates complexity level; lean working; shared service centre; standardization; dependency on suppliers	Balance technology progress and people; focus on value of technology to working methods of people	Project owners; IT-bottleneck; older generation more hesitant; motivation strongest driver for change; adjust expectations to the progress of the people
C	Finance takes control; attitude towards software purchasing and customization	Processes are the driver of digitalization; structured way of working	Flexibility of software results in complexity of technologies; legacy technology backbone; adjust behaviour to technology	Legacy people backbone; more end-to-end thinking and collaboration needed; business partner role
D	People forward strategy; finance takes control; set priorities	Continuous improvement; rethink processes; business context determines complexity processes; Dependency on external parties	Dependent on IT; dependency on suppliers; automation compensates additional work; usage of technology creates value; customization can be disadvantageous	Finance project officer; people first culture; increased collaboration; motivation is important driver of change
E	Common digital strategy needed; need to set priorities and related resources; innovation and optimization culture needed	Architecture overview is needed; provide time and resources to rethink processes	Customization is a risk; interconnectivity is needed; complexity of business determines complexity technology; Self-service and real-time finance needed	Technology legacy compensated by people; lack of proactive behaviour; high workload; need for IT support, but inhibits finance employees to evolve themselves
F	Business digital strategy needed; open culture is needed; priorities need to be set and resulting resources	Interdepartmental work is needed; rethink processes with digitalization; technology doesn't solve organisation problems	Economizing leads to automation; interconnection of tools needed; software dependence is a risk; customization increases user-friendliness	Behaviour change is reciprocal; digital coach is needed; balance digital change with people change; IT-bottleneck

Enclosure 2.1: Digital expertise questionnaire

Table 29: Questionnaire technical IT-skills

Technical IT-Skills

User	Skill	Description
	Data Analyses and reporting tools	Business Intelligence (Bieńkowska, Kral & Zabłocka-Kluczka, 2017), Reporting applications provide reports and dashboards (Marx, Wortmann & Mayer, 2012), Spreadsheet software, presentation software (Bahador & Haider, 2013).
	Information processing tools	Word processing (Stoner, 1999), Ability to take in information, process information and summarize information (Wessels, 2005), Information search and retrieval (Bahador & Haider, 2013).
	Integrated systems for business management tools	Enterprise Resource Planning System: facilitate business transactions (Bahador & Haider, 2013; Marx, Wortmann & Mayer, 2012; Tam, 2013), ERP, CRM (Tam, 2013; IFAC, 2006; Bahador & Haider, 2013).
	Network Configuration and Management tools	Internal and external network, server hosting (IFAC, 2006; Bahador & Haider, 2013; Goles, Hawk & Kaiser, 2008)
	Database operation tools	Creation, manipulation and management of data, data coding, data dictionary, data control and extraction, ETL, Data warehousing, Querying (Bahador & Haider, 2013; Goles, Hawk & Kaiser, 2008), Data mining (IFAC, 2006), Data integration storage for analytical applications, OLAP (Marx, Wortmann & Mayer, 2012).
	Data communication/sharing tools	Voice/data communications, e-mail, social networks, web 2.0 (Bahador & Haider, 2013; Goles, Hawk & Kaiser, 2008; Zwieg et al., 2006), Training and advising (Kristandl, Quinn & Strauss, 2014).
	Role related tools	Accounting packages, financial audit, tax software (Bahador & Haider, 2013)
	Desktop support/helpdesk	Desktop sustainability and continuity, hardware knowledge (Goles, Hawk & Kaiser, 2008; Cash, Yoong & Huff, 2004), data communication devices, storage devices, workstation (IFAC, 2006)
	Operating systems	Windows, Linux (Bahador & Haider, 2013; Goles, Hawk & Kaiser, 2008)
Evaluator		
	Information quality Management tools	Data management and lifecycle: Including data cleansing, purification, aggregation (Bahador & Haider, 2013), Systems testing (Zwieg et al., 2006).

	IT Security tools	Continuity, disaster recovery (Goles, Hawk & Kaiser, 2008), Antivirus software, firewall, backup and recovery (Bahador & Haider, 2013), Risk treatment and monitoring (Tudor, Gheorghe, Oancea & Robert, 2013), Encryption (IFAC, 2006).
	IT Audit tools	Audit trail, fraud control, financial audit tools (Bahador & Haider, 2013), Data audit (IFAC, 2006), Systems analysis (Goles, Hawk & Kaiser, 2008).
Manager		
	IT strategy and architecture implementation tools	Understanding IT impact on business and setting goals in the digital landscape, IT risk and opportunities (Van Deursen, Courtois & Van Dijk, 2010; IFAC, 2006; Van Deursen, Helsper & Eynon, 2014; Catlin, Scanlan & Willmott, 2015; Goles, Hawk & Kaiser, 2008), Formulation and visualization as well as the subsequent definition and tracking of strategic initiatives (Marx, Wortmann & Mayer, 2012).
	IT Governance and control management tools	IT resources management, risk management, IT performance evaluation, business IT alignment (Bahador & Haider, 2013), IT control assessing and monitoring, Information system development and acquisition, IT policies, performance, change control (IFAC, 2006).
	IT Project Management tools	Time management (IFAC, 2006), Program management, project risk management (Goles, Hawk & Kaiser, 2008).
Designer		
	Development tools	Programming language knowledge, systems design (Goles, Hawk & Kaiser, 2008; Sawyer, 1998; Spraakman, O'Grady, Askarany & Akroyd, 2015), Unified Modelling Languange (UML) (IFAAC, 2006).
	Workflow automation	Automated processes and systems, process optimisation, transaction flows (Marx, Wortmann & Mayer, 2012; IFAC, 2006; De Waal, Bilstra & De Roeck, 2019), Financial Audit Automation (Bahador & Haider, 2013).
	Business process reengineering	Business process design (Goles, Hawk & Kaiser, 2008; Zwieg et al.), Multidimensional data modelling and analysis (Marx, Wortmann & Mayer, 2012; IFAC, 2006), Technical architecture, system analysis, business process integration, (IFAAC, 2006).

Enclosure 2.2: Digital expertise questionnaire on technical IT-skills

Company A

Table 30: Results questionnaire technical IT-skills company A

Job description	*Years of experience*	*User*	*Evaluator*	*Manager*	*Designer*	*Technical IT-skills*
			Mean results			
Head of Finance	18	3,4	1,7	3,0	2,0	**2,5**
BPO finance	12	3,7	2,7	4,0	3,7	**3,5**
Finance Country Managers	22	3,9	2,7	3,3	3,7	**3,4**
Head of Finance	10	3,7	3,7	2,3	3,7	**3,3**
Accounting Manager	10	3,1	2,0	2,7	3,0	**2,7**
Business Process Owner	9	3,4	3,7	4,3	5,0	**4,1**
CFO	15	3,1	2,0	3,3	2,3	**2,7**
Head of Finance	10	3,3	2,7	3,0	3,0	**3,0**
Country FA Manager	12	3,9	2,7	1,7	2,7	**2,7**
Business Process Owner	6	3,9	3,3	4,0	3,0	**3,6**
Total results	**12,4**	**3,9**	**3,0**	**3,5**	**3,2**	**3,5**

Company B

Table 31: Results questionnaire technical IT-skills company B

Job description	*Years of experience*	*User*	*Evaluator*	*Manager*	*Designer*	*Technical IT-skills*
			Mean results			
Finance manager	31	3,0	2,3	1,0	1,0	**1,8**
Director Administration	20	2,9	2,3	2,0	1,7	**2,2**
Finance Director	9	4,4	4,0	4,3	4,3	**4,3**
Senior controller	15	3,7	2,7	2,7	3,0	**3,0**
Business Controller	1	3,7	2,0	1,0	2,0	**2,2**
Business Analyst	24	4,0	1,7	1,0	1,0	**1,9**
Business analyst	16	4,0	3,3	3,3	3,3	**3,5**
Business controller	15	2,2	1,3	1,0	1,3	**1,5**
Business controller	25	4,2	2,7	2,7	3,7	**3,3**
Total results	**17,3**	**3,6**	**2,5**	**2,1**	**2,4**	**2,6**

Company C

Table 32: Results questionnaire technical IT-skills company C

Job description	*Years of experience*	*User*	*Evaluator*	*Manager*	*Designer*	*Technical IT-skills*
			Mean results			
Controller and Corporate Reporting Manager	20	3,9	2,0	3,3	3,3	**3,1**
Business Support Manager	10	3,9	2,0	2,3	2,3	**2,6**
Group Controller	20	2,1	1,0	1,0	1,0	**1,3**
Fleet	5	3,4	3,0	3,0	3,0	**3,1**
Fleet Manager	12	2,8	2,7	3,0	1,7	**2,5**
Contract Coordination	11	3,2	3,3	3,7	2,0	**3,1**
Office Manager	35	2,8	1,0	1,0	1,0	**1,4**
Office Administration	35	3,3	1,0	1,0	1,0	**1,6**
Credit Controller	15	2,6	1,0	1,0	1,0	**1,4**
Credit and collection	30	1,4	1,3	1,0	1,0	**1,2**

Business Controller	13	2,6	1,3	1,0	1,0	**1,5**
accounting assistance	28	3,0	3,0	3,0	3,0	**3,0**
Contract Project Office manager	5	2,8	1,3	1,0	3,0	**2,0**
Credit and collection	10	2,8	1,0	1,3	1,0	**1,5**
Management Assistant	14	2,8	1,0	1,0	0,0	**1,2**
Total scores	**17,5**	**2,9**	**1,7**	**1,8**	**1,7**	**2,0**

Company D

Table 33: Results questionnaire technical IT-skils company D

Job description	*Years of experience*	*User*	*Evaluator*	*Manager*	*Designer*	*Technical IT-skills*
			Mean results			
CFO	11	3,0	3,3	4,0	3,7	**3,5**
Finance and project officer	2	2,9	2,7	3,3	3,7	**3,1**
Management Accountant	8	3,2	1,0	1,0	1,7	**1,7**
Accounting Manager	35	4,4	4,0	4,0	3,0	**3,9**
Total results	**14**	**3,4**	**2,8**	**3,1**	**3,0**	**3,1**

Company E

Table 34: Results questionnaire technical IT-skills company E

Job description	*Years of experience*	*User*	*Evaluator*	*Manager*	*Designer*	*Technical IT-skills*
			Mean results			
Financial Controller	20	3,7	3,3	2	1,7	**2,7**
Accountant	13	2,7	1,0	2	1,7	**1,8**
Accounting Manager	20	2,9	4,0	3	3,0	**3,2**
Accountant	12	3,7	3,0	3	3,0	**3,2**
Accounting assistant	1,5	3,2	2,0	1	1,7	**2,0**

Assistant Accountant	5	3,1	1,0	1	1,0	**1,5**
CFO	2	3,6	3,3	3	1,7	**2,9**
Total results	**10,5**	**3,3**	**2,5**	**2,14**	**2,0**	**2,5**

Company F

Table 35: Results questionnaire technical IT-skills company F

Job description	*Years of experience*	*User*	*Evaluator*	*Manager*	*Designer*	*Technical IT-skills*
			Mean results			
CFO	22	3,0	3,0	3,7	2,7	**3,1**
Financial employee	5.5	3,6	3,7	3,0	2,0	**3,1**
Financial employee	5	3,2	2,3	1,0	2,7	**2,3**
Controller	15	3,1	2,3	2,0	2,0	**2,4**
Head of accountancy	9	3,9	1,0	3,0	2,0	**2,5**
Accountant	20	3,7	3,3	2,0	2,3	**2,8**
Financial employee	3	3,2	3,0	3,0	3,0	**3,1**
Financial employee	15	3,3	2,0	1,3	2,0	**2,2**
Financial antenna	5	4,0	1,0	1,0	1,0	**1,8**
Credit employee	20	3,9	3,0	1,0	1,0	**2,2**
Financial coordinator	23	3,7	3,3	3,7	3,0	**3,4**
Financial employee	8	3,9	3,0	1,0	1,0	**2,2**
Financial employee	1	3,0	2,0	1,0	1,0	**1,8**
Total results	**11,7**	**3,5**	**2,5**	**2,1**	**2,0**	**2,5**

Enclosure 3.1: Digital technologies

Table 36: Overview of digital technologies

Digital technologies

Scientific articles	
Author	*Specific technologies*
Vaidya, Ambad & Bhosle (2018)	Big data and analytics, Robotics, Simulation, System integration, Internet of Things, Cyber security, Cloud, additive manufacturing, Augmented reality
Xu, Xu & Li (2018)	Cyber-physical Systems, cloud computing, Enterprise Architecture, SOA, Industrial Integration, Business Process Management, IoT, Industrial Information Integration
Kamble, Gunasekaran & Gawankar (2018)	Cloud, Big data, IoT, Cyber security, Augmented reality, Robotic systems, 3D printing
Dai & Vasarhelyi (2016)	Cyber-physical system, Internet of Things, Sensors, Internet of Services
Articles	
McKinsey (2018)	Traditional web technologies, cloud based services, mobile technologies, big data, Internet of Things, Design thinking, Artificial Intelligence, Robotics, Advanced neural machine learning, augmented reality, additive manufacturing
PwC (2016)	Cloud computing, IoT, Augmented reality, 3D printing, Big Data, Analytics, Advanced human-machine interaction, smart sensors, mobile devices
Deloitte (2015)	Biotech, Nanotech, Neurotech, ICT and mobility technology, sensoring, 3D printing, Artificial Intelligence, Robotics, Drones
ACCA (2013)	Mobility, cloud , social collaboration , digital service delivery , big data, payment systems, cyber security, robotics, augmented and virtual reality, artificial intelligence.

Enclosure 4.1: Job advertisements

The job advertisements of the organisations can be found in the original state in the separate attachment.

Enclosure 4.2: Job advertisements managing finance roles

Company A

Table 37: Results job advertisements managing finance roles company A

Managing finance roles

Job title	Date	Profile	Job description	Digital focus
Business process owner (BPO)	2011	5y experience, Project skills, best practices, SAP implementations, consultancy experience, management skills	State of the art processes accounting, liaison between departments, best practices, in cooperation with IT, training, authority matrix	Office, ERP configuration for Financial Services, continuous improvement of business and IT processes, dashboarding
Accounting process manager	2011	10y experience, accounting best practices, project skills, process documentation, order to cash, purchase to pay, authorisation, self-invoicing, management, coach, relationships,	Shared Service Centre, synergies of scale,	Automation transactional accounting, liaison with IT, fast closing, development, SAP a must
Controller	2016	Master, 3-5y experience, analytical, proactive, team player, communication, business interest,	Support divisional controller, business line reporting, planning, expertise centre, purchasing, business partner, working capital	MS Office, SAP, SAP BW, IT systems and tools is an advantage
Controller	2017	Master economics, 3-5y experience, Diverse controlling, analytical, proactive, communication skills	Management control systems, forecasting, budgeting, planning, investment analysis	Office must, SAP is an advantage

Company B

Table 38: Results job advertisements managing finance roles company B

Managing finance role

Job title	Date	Profile	Job description	Digital focus
Business controller	2017	Master, reasoning capabilities, communication and organisational skills, proactive, interpersonal skills,	Trusted business partner, shared service centre, business decisions, improve processes, reporting, KPI's, advising, point of contact, optimize, improve,	Business process automation adapt to new systems,

			standardize and/or automate existing workflows	
Business controller	2019	Master, proactive, pragmatic solutions, critical thinker, business requirements, flexible, quick learner	Business information and control, support business decisions, reporting, Shared Service Centre support, optimize processes,	Systems optimisation, quick systems adoption

Company C

Table 39: Results job advertisements managing finance roles company C

Managing finance roles

Job title	Date	Profile	Job description	Digital focus
Group reporting	2017	Bachelor or master business administration, 5+ years of experience, ethical, credible, time management, communication, control handling, reporting technical skills, organize, languages, decisive, prioritize, entrepreneurial,	Supervision closing, forecasting, budgeting, policies and procedures, solve issues, strategy alignment, review operational results, cash projections, internal controls, compliance, acquisition support	Process optimization, dashboarding, IT minded, computer skills, operation and functioning of programs
Senior administration officer	2018	Bachelor, communication, analytical, commercial flair, evaluate opportunities, time management, process thinking, languages	Contact point client contracts and project setup, project screening, matching value propositions, monitor contracts, client visits, price management, project management	Process optimisation, testing new IT implementations, IT training, follow IT innovations, keep up-to-date

Company D

Table 40: Results job advertisements managing finance roles company D

Managing finance role

Job title	Date	Profile	Job description	Digital focus
Finance & project officer	2018	Economics master, passion IT and finance, analytical, critical, problem solving, team player, languages,	Controller units, finance projects, change projects, support CFO	E-invoicing, ERP functionalities, finance software, tool implementation, advanced excel is obligated, ERP knowledge is advantage

Company E

None provided.

Company F

Table 41: Results job advertisements managing finance roles company F

Managing finance role

Job title	Date	Profile	Job description	Digital focus
Financial advisor	2017	Master, cooperation capabilities, mobility over different locations and outside, financial vision, customer focus, problem solving, contact capable, project management, coaching, leading	Financial policy, cash stream management, investment management, budgeting, reporting, contact point financial institutions and external audit	Transformation processes

Enclosure 4.3: Job advertisements supporting finance roles

Company A

Table 42: Results job advertisements supporting finance roles company A

Supporting finance roles

Job title	Date	Profile	Job description	Digital focus
Business analyst	2016	Master, 3-5y experience, controlling experience, proactive, organisational, communication, business interest,	Transformation, reporting, problem solving, resource optimization, process architecture,	MS Office, SAP, SAP BW, IT systems and tools is an advantage
Junior BPO	2017	Bachelor 5y experience, team player, project skills, interaction other departments, training, benchmarking, management skills, problem solving	Accounting best practices, Training programs, reduce redundant activities, process templates	Cooperation with IT to create processes, design, IT change, ERP configuration, business requirements for IT, Office, SAP must

Company B

Table 43: Results job advertisements supporting finance roles company B

Supporting finance role

Job title	Date	Profile	Job description	Digital focus
Junior business controller	2017	Bachelor, thinker, numerical skills, communication skills, proactive, dynamic, fast-paced	Ensure business, closing process optimization, link operational and financial information, lean working, diverse projects,	Improve financial systems and processes, finance tools, technical data analysis, data management, Excel, IT-minded,

Company C

Table 44: Results job advertisements supporting finance roles company C

Supporting roles

Job title	Date	Profile	Job description	Digital focus
Accountant assistant for accounts payable	2016	Bachelor accountancy, 1-2 year experience advantage, precise, teamwork,	Booking invoices and credit notes, process invoices, follow-up, supplier payments, monitoring, contact point suppliers reporting, support colleagues	Excel in MS office, MS Dynamics AX is an advantage
Business support administration assistant	2016	Broad experience, languages, autonomous work, critical, precise	Controlling, project registration, invoicing	Interaction with digital archive system
Project office administration	2017	Experience, languages, organisational, autonomous working, critical,	Register maintenance contracts, invoicing, complaint management, client contact	Axapta (AX) tool experience is helpful
Business analyst	2017	Bachelor or master business administration, 3+ years of experience, credible, confidential, time management, communication, reporting technical skills, languages, organized, decisive, team player, entrepreneurial, prioritize	Closing, reporting, forecasting, budgeting, analytical review, internal controls, business perspective, support acquisition, business consultant	Dashboarding, IT minded, computer skills in functioning programs, BO, SAP BPC

Company D

Table 45: Results job advertisements supporting finance roles company D

Supporting roles

Job title	Date	Profile	Job description	Digital focus
Administrative financial assistant	2017	Service and team focused, structured, communicative, Language Dutch & English,	Support CFO, agenda management, report composition,	Print management tool is a plus, MS Office

			finalize projects, input invoicing	
Junior management accountant	2017	Master economics, analytical, number cruncher, team player, communicative, languages	Financial research, internal and external reporting, interaction partners, support ad-hoc finance projects, budgeting	Strong knowledge of Excel

Company E

Table 46: Results job advertisements supporting finance roles company E

Supporting role

Job title	Date	Profile	Job description	Digital focus
Accounting assistant	2017	High school diploma, Social, rigorous, organised	Administration, external communications, invoicing	None

Company F

Table 47: Results job advertisements supporting finance roles company F

Supporting role

Job title	Date	Profile	Job description	Digital focus
Finance administration employee	2013	Bachelor, punctual, communication, proactive, team work, assertive	Purchasing, sales management, thesauri, budgeting, communication finance department	MS office, internet, Navision knowledge is advantage,