EXPANDING THE CONCEPT OF DIGITAL COMPETENCE

A Case Study on How Digital Competence is Portrayed in a Company Transforming to Digital Service Orientation

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Abstract

Digitalisation requires new ways for businesses to innovate in order to meet contemporary customer needs. Manufacturers are adopting digital service-based business models to enhance competitive advantage. To address these challenges companies have to identify, attract and develop digital competence. The purpose of this study is to discuss what kind of digital competence is discussed in the context of digital servitization. The following research question is answered: "*What are the digital competences a digitally servitized manufacturer requires for their employees?*". In order to inspect the digital competences, a case study was conducted at Volvo Cars Company during spring 2019. Job postings were used as the data source, collected with the method of web scraping. Nearly 700 job postings were analysed through means of directed content analysis, using the digital competence framework by Paschou et al. (2018) as the theoretical point of departure. The results show that a reframing of the framework is necessary to cover digital competence in the case study context, emphasising the multi-dimensionality of the concept. As an academic contribution, previous theory is extended by introducing a new framework, discovering new digital competences and explaining contextual elements. For practitioners, this study provides a practical tool for analysing the digital competence the organisation should recruit, nurture and develop further.

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1 Introduction

Digitalisation has shaped the objectives of contemporary businesses: adaption to digital markets and the exploitation of digital technologies have become essential priorities (Kane, Palmer, Phillips, Kiron, & Buckley, 2017). The expansion of digitalisation requires new ways to innovate in order to meet contemporary customer needs, raising the complexity of offerings especially in design and development (Dougherty & Dunne, 2011; Mocker, Weill, & Woerner, 2014; Porter & Heppelmann, 2014). To address this challenge, new kinds of competences are required. Digital strategies for navigating in the changing business environment differ from each other, but companies thriving in the digital economy can be characterised by commonalities, for example by investments on digital talent and leaders who excel in soft skills (Kane, Palmer, Phillips, Kiron, & Buckley, 2016; OECD 2016b). In other words, businesses have to consider the recruitment and development of digital talent when concurrently, the digital talent gap is increasing globally (Kane et al., 2016; Buvat et al., 2017; Volini et al., 2019). In fact, the main shortage is in soft skills such as customer centricity and passion for learning (Buvat et al., 2017 p. 4). Furthermore, studies show that employees are prone to switching their employer if their digital skills are not enhanced by the organisation or if the organisation is not keeping up with the digital transformation pace, making the increasing lack of digital talent even more challenging (Kane et al., 2016; Kane et al., 2017). In the end, organisations acknowledge the negative impact of digital talent shortage on digital transformation and competitive advantage (Buvat et al., 2017, p. 4).

Demirkan et al. (2015) state that the various implications of digitalisation have accelerated manufacturers' initiatives to utilise business models based on services in order to enhance their competitive advantage. Paschou, Rapaccini, Adrodegari, and Saccani (2018) reflect that this progress, referred to as *digital servitization*, is based on the convergence of manufacturing companies' digital and operational technologies and is manifested, for instance, by companies complementing their product range with services. Digital servitization is amplified also by the changes on the customer side: in the digital age, individuals interact differently with organisations before, during and after purchasing (Paschou, Adrodegari, Perona, & Saccani, 2017). After all, digital servitization comes down to the employee level: in order for manufacturers to keep the pace with digitalisation and digital servitization, attracting talent with a digital mindset and new digital competences is highly relevant (Paschou et al., 2018).

When discussing competence in relation to digitalisation, the term *digital competence* has been used (Shahlaei, Rangraz, & Stenmark, 2017). The concept has often been explained as the connection between an individual and a specific tool or software, albeit it also includes other dimensions (Shahlaei et al., 2017; Süße, Wilkens, Hohagen, & Artinger, 2018). Discussing competence in relation to digital transformations is highly relevant as digital competence might contribute "to the exploitation of the increasing amount of new opportunities generated by smart technologies" (Süße et al., 2018, p. 201). In addition, it should be noted that a gap exists in the literature examining specific stakeholders, such as individual employees, who are affected by digital transformation (Süße et al., 2018). Janssen

et al. (2013) state that the current body of research in digital competence is scattered and fails to provide a solid picture of the concept. A shared language and understanding is needed for employers and employees to comprehend the relevance and importance of digital competence in relation to their business and work (Janssen et al., 2013).

Therefore, the purpose of this study is to shed more light on what kind of digital competences are discussed in the context of a business transforming to digital service orientation. The following research question is aimed to be answered:

What are the digital competences a digitally servitized manufacturer requires of their employees?

To address this research question, previous research on digital servitization and digital competence was reviewed and a case study on a car manufacturer Volvo Cars Company (VCC) was executed. A directed content analysis of 688 job postings by VCC was conducted during April 2019. Ultimately, the digital competence framework by Paschou et al. (2018) is extended by introducing new competences based on the results.

2 Related Literature

In this section, previous research on digital competence and digital servitization is introduced. Firstly, the effect of digitalisation on manufacturers, and eventually to employees, is explained. In the latter part, previous work regarding digital competence is being explored.

2.1 Digital Servitization and The Effects on Employees

Servitization refers to the process of manufacturers complementing their products with services, in order to build up their competitive advantage and to nurture the relationship with their customer base (Vandermerwe & Rada, 1988; Demirkan et al., 2015). Digitalisation has accelerated companies' initiatives to take on with these service-based business models (Demirkan et al., 2015). Digital servitization is highlighted by manufacturers connecting their product-service couplings with digital systems which enable, for example, enhanced possibilities for customisation, independence, and connectivity with other products (Lerch & Gotsch, 2015; Porter & Heppelmann, 2014). While the old, product-concentrated logic is based on standardization, a service-dominant logic relies on individualised customer-integrated solutions (Süße et al., 2018). Customer-centricity is elaborated by Olivia and Kallenberg (2003) stating that instead of a transaction-based interactions, a relationship should be built with the customers. The change from transaction-based business models into relationship-based business models is manifested in value co-creation together with customers creating value with providers in a joint sphere (Lenka, Parida, & Wincent, 2017). Lastly, the digital product-system couplings can deliver data for the manufacturer that can be utilised for product improvements and in developing innovations and new solutions (Lerch & Gotsch, 2015). Lerch and Gotsch (2015) continue explaining that this requires manufacturers to revise their perception of innovation and innovation management.

Customer-centricity and data-centricity are connected to digitalisation capabilities that manufacturers pursuing servitization should utilise, in order to co-create value with their customers (Lenka et al., 2017). These capabilities are divided into *intelligence*, *connect* and *analytical abilities*. First, Lenka et al. (2017 p. 95-96) discuss intelligence capability referring to the ability to collect and to provide new ways of collecting, data without a major human input, by connecting hardware with smart components. Connect capability, on the other hand, highlights the proficiency of building connections between wireless networks and digitized products which is considered as important in facilitating the value co-creation. Analytical capability refers to the skills of transforming the acquired data into valuable insights for the manufacturer pursuing digital transformation. This entails the ability to find and build solutions, for example, algorithms, that create predictions of strategic value from the

extensive amount of data. These could be for example simulations of new products that can be utilised in meeting the customer needs and customer requirements. The digitalization capabilities are supported by *value co-creation mechanisms*. Perceptive mechanisms enable manufacturers to "identify, asses, and address specific customer needs" (Lenka et al., 2017 p. 97). By the help of the data, these mechanisms can enrich the value creation process with customers. Responsive mechanisms, on the other hand, refer to a manufacturer's ability to act on the customer's changing needs. However, through data-based predictions, businesses can become proactive in responding to these needs (Lenka et al., 2017).

The importance of employees and the ability to adapt in the new environment is of relevance too, the external forces, such as digitalisation and servitization, have a continuous impact on organisational systems (Grant & Parker, 2009). This has led to the acknowledgment of *relational* and *proactive perspectives* and the importance they play for the survival of businesses in this technology-driven era (Grant & Parker, 2009). On one hand, organisations are understood as systems in which independent actors are loosely or tightly coupled to each other, depending on the required and optional collaboration and communication in their daily work. This interdependency is commonly referred to as the relational perspective where roles and relationships are interwoven into the larger social systems (Katz & Kahn, 1966, referenced to by Grant & Parker, 2009 p. 8). On the other hand, uncertainty rises with the lack of prediction due to external influences such as competition, the emergence of new technologies and changing customer needs, as well as the work system outcomes (Wall, Cordery & Clegg, 2002). As uncertainty is more manageable in the presence of creativity and innovation, proactive perspectives on work design are of relevance to restructure and alter work nature and to ultimately influence and motivate proactive behavior among the employees (Grant & Parker, 2009; Frese & Fay, 2001). In regard to this, Martinez, Bastl, Kingston & Evans (2010) highlight the importance of relational capabilities, similar to Lenka et al. (2017), to sense and seize value for the customers while reducing risk and uncertainty.

2.2 Digital Competence

Competence has been discussed previously through various concepts, categorised by Bassellier, Reich, and Benbasat (2001) into *skill, personality trait,* and *knowledge-based* definitions. The skill-based definitions assume that employee's skills and the job requirement should match, signaling that competence is a match between an employee and the assignment (Bassellier et al., 2001; Davern, 1996). Inspecting competence as a personality trait implies that the definition should also include personal and behavioral traits, such as generic knowledge, motives, and feelings (Bassellier et al., 2001; Kanungo & Misra, 1992). Knowledge-based viewpoint breaks the connection between a task and a competence and views competence as a transfer of knowledge between various tasks (Brown, 1993, referenced to by Bassellier et al., 2001). Following this definition, competence is not a routine but readiness to navigate in complex and ever-changing environments (Keen, 1991, referenced to by Bassellier et al., 2001). Delamare Le Deist and Winterton (2005) address the complexity created by the multiple definitions of competence and state that in order to align education

with the needs of the labour market and to promote the mobility of the workforce, creation of common vocabulary around competence is essential. Therefore, they suggest discussing competence from a multi-dimensional, holistic perspective combining the skills, knowledge, and behaviour required. Delamare Le Deist and Winterton (2005) divide competence into *functional competence* (skills), *cognitive competence* (knowledge), *social competence* (behaviour) and *meta-competence* (an intermediary between the other competences). This concept argues for the integrity of competence, meaning that detaching the four dimensions is difficult (Delamare Le Deist & Winterton, 2005).

Digital competence has also been discussed through various terms ranging from digital literacy to e-skills and IT competence: the multitude of names, frameworks, and definitions embrace the importance of the concept (Vieru, 2015; Ferrari, 2012; Ala-Mutka, 2011). Despite the fact that digital competence has gained its ground as the main definition for the proficiencies individuals are required to have in the knowledge society, it has been criticised of how it often excludes the societal and organisational perspectives and narrows down only as the relationship between a human and a device (Ilomäki, Kantosalo, & Lakkala, 2011; Shahlaei et al., 2017). In other words, it is argued that the skill-based definition of digital competence is not sufficient enough: technology-related skills and knowledge are the basis of digital competence and its development, but they do not explain the whole concept (Ala-Mutka, 2011; Calvani, Cartelli, Fini, & Ranieri, 2008; Ferrari, 2012; Janssen et al., 2013). Additionally, in order to succeed in the digital environment other abilities such as soft skills are needed which entail, for example, leadership, communication, collaboration and teamwork skills (OECD, 2016a; OECD, 2016b). Demirkan et al. (2015) state that in addition to mastering a certain competence, it is highly relevant to be able to cooperate cross-functionally and to co-create value with other employees. Lerch and Gotsch (2017) discuss that the digitalisation increases the complexity and therefore enhanced problem-solving skills are required. Following these discussions, digital competence is in this paper seen as a holistic concept, entailing of multiple dimensions, for example functional, social and cognitive (DeLamare Le Deist & Winterton, 2005; Ferrari, 2012; Calvani et al., 2008). In addition, it should be also highlighted that digital competence is dependent on the organisational context and therefore, a universal model of digital competence does not exist (Vieru, 2015)

The multi-dimensionality of digital competence has been discussed through various frameworks. Ferrari (2012) state that in addition to technical skills and knowledge, attitudes (such as e.g. critical, flexible, and reflective attitudes) are relevant for the definition of digital competence. Built upon previous frameworks from the societal and pedagogical perspectives, the authors present a framework that entails seven competence areas. In addition to knowledge, skills, and attitudes, the framework includes *collaboration, communication, creation of content and knowledge, ethics and responsibility, evaluation and problem-solving and technical operation*. In addition to Ferrari (2012), Calvani et al. (2008) also consider digital competence as a multi-dimensional concept. Their definition of digital competence entails *technological*, *cognitive* and *ethical dimensions*, taking into account also the integration of these aspects. Integration refers to the fact that individuals should understand the possibilities technologies bring in sharing knowledge with others and in collaborating in the creation of new knowledge. In other words, Calvani et al. (2008) connect digital

competence to the abilities of problem-solving, information gathering and collaboration, in addition to knowledge creation.

Süße et al. (2018) discuss digital competence from the perspective of digital servitization. In their framework, the authors divide digital competence required in product-service systems (PSS) into three main categories: *technical handling*, *critical evaluation,* and *problem-oriented usage*. Complementing the other PSS-related competences, Süße et al.'s (2017) framework emphasise the exploitation and exploration of information in order to solve problems individually and in teams. Servitization also demands new ties to be established with suppliers and customers in order to create value. In some cases, it means that operations are decentralised, requiring a cross-functional work environment. This means not only that the organisational arrangement is undergoing a change, but the skillset for these environments are different (Baines & Lightfoot, 2014). Baines and Lightfoot (2014 p. 19) found that skills needed in a service-oriented business typically aim to facilitate and sustain customer relationships. Examples of these skills that are important in a service-oriented business are flexibility, relationship-building, service-centricity, and technical adeptness.

3 Theoretical Framework

Paschou et al. (2018) present a framework of digital competences which are required for companies pursuing digital servitization. The authors formulated this framework by conducting a literature review on previous research on the topic, further inspecting it by interviewing managers and validating the results in a round table discussion with industry experts. In this paper, the framework by Paschou et al. (2018) is used as a starting point for the discussion of how digital competence is portrayed in a company transforming to digital service orientation. This framework was chosen as it combines the research on digital competence with digital servitization, as well as being suitable for the case study context. In the previous research, multiple frameworks on digital competence exist but for example, in contrast to Süße et al.'s (2018), created also in the context of digital servitization, the chosen framework presents a more holistic and multi-dimensional picture on digital competence, taking into account also the behavioural side of competence. Being a current body of work, continuing the discussion from the framework by Paschou et al. (2018) could be seen as more relevant than utilising an older framework from another discipline. The framework by Paschou et al. (2018) is assorted into four groups: 1) *Data Analysis & Management*, 2) *Digital Content Creation*, 3) *Soft Skills* and 4) *Innovation Appetite*. These categories are divided into various subcategories as presented in table 1.

Table 1.
A framework for digital servitization competences (Paschou et al., 2018).

Data Analysis & Management	Digital Content Creation	Soft Skills	Innovation Appetite
Find, Collect, Elaborate & Analyse Data	Creation of Digital Content in Technical & Commercial Form	Communication in Customer's and Stakeholder's Language	Knowledge of Impacts And Risks of New Technology, and of Adoption Approaches
Manage Data Security (Cybersecurity) & Protect Digital Assets	Problem-solving, Creativity, Logical Thinking, Design New Solutions	Teamwork Attitude	Management of Projects For The Introduction of New/Digital Technologies
		Leadership	
	Design & Development of Software & Hardware	Results Orientation, Time & Stress Management	

The first category, Data Analysis & Management, covers two sub-categories: a) *Find, Collect, Elaborate & Analyse Data* and b) *Manage Data Security (Cybersecurity) & Protect Digital Assets*. The first sub-category refers to the individual's abilities to use, evaluate and navigate with data, in order to process it into something actionable for the organisation. This includes

also that individuals can utilise methods like simulation modeling and machine learning application. The latter sub-category implies that cybersecurity is taken into consideration within work practices, as well as protecting the data sets and other technological elements. The second category, Digital Content Creation is divided into three sub-categories: a) *Creation of Digital Content in Technical & Commercial Form*, b) *Problem-solving, Creativity, Logical Thinking, Design New Solutions* and c) *Design and Development of Software & Hardware*. The first sub-category suggests that individuals should possess the skills in order to create commercial and technical content, for instance audio, text, and video, to communicate individual and company-related thoughts. The second sub-category, on the other hand, refers to the capability to solve problems that are not thoroughly defined, for instance through creativity and problem-solving skills. The last sub-category refers to code writing and programming related capabilities that enable actions like data analysis and development.

The two latter categories concentrate on social and innovation related competences. The third category, Soft Skills, is divided into four sub-categories: 1) *Communication in Customer's and Stakeholder's Language*, 2) *Teamwork Attitude*, 3) *Leadership*, and 4) *Results Orientation, Time & Stress Management*. The first sub-category highlights the importance of communication skills, especially the ability to speak the same language with various stakeholders, which are required for example for the sake of cooperation and smooth operation of the whole organisation. Being the basis for the following competences, the lack of communication is stated to reduce innovation. This heavily connected to the competence of Teamwork attitude which discusses the collaboration between individuals. Third sub-category, Leadership, is manifested in the ability to inspire people to innovate and is characterised by, for example, empathy and being able to motivate and convince people. Lastly, self-management related abilities are stated to be an important competence, for example in order to learn new things more efficiently. The fourth category dwells deeper into innovational capabilities, highlighting the knowledge on innovations, especially the impact and risks of them. Ultimately, managerial competences related to innovations were mentioned, especially the capabilities to run these projects and to overcome challenges regarding them. In relation to technical and organisational changes, being able to overcome resistance is a key ability for service-oriented businesses investing in innovation (Paschou et al., 2018).

4 Method

This study is based on secondary data in the form of job postings. The method of web scraping was utilised to collect job postings located on VCC's internal human resource management system and to clean the data from noise. The data was eventually analysed manually by the means of a directed content analysis.

4.1 Case Setting

The Swedish car manufacturer Volvo Cars Company, nowadays owned by the Chinese company Zhejiang Geely Holding, is an example of an organisation that has utilised servitization in order to operate in the new digital domain. They invest highly in safety, connectivity, electrification, and autonomous driving to enhance car owner experience (Volvo Cars, 2019a). In addition to maintaining the core business of manufacturing, VCC strongly focus on customer relations and the development of products and services. The following quote from their website mirrors their ambition to be viewed as a service provider rather than a mere product developer. They refer to this as "*Car-as-a-service*" business (Volvo Cars Annual Report, 2018 p. 14). In fact, a collaborative approach is preferred to help evolve their business model and embrace the digital transformation (Volvo Cars Annual Report, 2018). They not only exploit digital technologies but also embrace the exploration of new opportunities in order to improve their business (Kane et al., 2017):

"Volvo Cars aims to become a global and diversified mobility service provider. This means new models of car ownership and access, and new attractive services whenever and wherever customers want it. We want to come closer to our customers, so we're aiming for more than five million direct consumer relationships by the middle of the next decade, creating new sources of recurring revenue." (Volvo Cars, 2019b)

With this background in mind, VCC is considered a relevant study subject as they are not only widely known, but also actively work to continuously servitize their company and innovate new products and services.

4.2 Data Collection

Job postings were chosen for this study as they are the primary recruitment approach and thus can be said to reflect the required competences for the various positions offered by

companies. Knowing VCC is a large company and by inspecting the job postings on their external web site, the data amount was also expected to provide us with adequate information to extract valuable insights. The data collection was conducted by the means of web scraping which is a common method for gathering text data from the web (Debortoli, Müller, Junglas, & vom Brocke, 2016). As gathering a viable amount of job postings manually from the web would be a long process, web scraping was considered as the only applicable option (Mitchell, 2015). In practice, web scrapers retrieve HTML data from web pages, gather targeted information, structure it and store it in a readable text file. In this study, Selenium (SeleniumHQ, n.d.), a web browser automation was utilised. Originally, this web browser automation is meant for script testing, but when matched with a webdriver for Chrome (ChromeDriver, n.d.), the programming language Python (Python, 2019) and pip, a package installer for Python (pip 19.0.3, 2019), it can transform into a web scraping tool. The data for this study was collected from VCC's internal human resource system which is not publicly open. Legality and access are two common concerns related to web scraping (Boeing & Waddell, 2017; Johnson, Sieber, Magnien, & Ariwi, 2012), but such issues were not affecting this study as it was conducted in collaboration with VCC who performed the scraping for us. Further, a non-disclosure agreement was signed with regards to the data.

In order to display the gathered data in a structured manner, the collected data includes labelings that can be seen in the brackets below. In our case, we chose the following elements as vital to extract and save in the format of JavaScript object notation (JSON): *job title, country of hire, desired start date, business unit/area, job description text, and job post link*. The data collection began and was completed March 22, 2019, ending in a total amount of 2,482 postings. An observation of the data shows that the job descriptions provide information which includes the main responsibilities, the required qualifications pointing to educational and work experience including a minimum level of skills and competences. The descriptions also include a standard presentation about Volvo Cars Company, the business unit and in some cases, information about the team. Lastly, all descriptions naturally contain application details, such as contact information. In the scraped data, the status of the job is also presented. The status shows *"Approved for Internal Recruiting", "Filled - External Candidate", "Filled - Internal Candidate", "Cancelled"* and *"Closed"*. However, the date and reason for cancellation and closing are not revealed in the job postings, leaving us with limited understanding of what the meaning of these statuses actually are, for example, whether they were ever posted publicly or not. Hence, the job status was decided to be overlooked altogether and to instead use all the gathered data, no matter the status.

4.3 Pre-Processing of the Data

Before the initiation of the actual analysis, a pre-processing was necessary to prepare the actual data and avoid incorrect results by identifying potential data quality problems and cleaning out noise (Debortoli et al., 2016). An initial manual scan of the data revealed that more than a thousand postings out of 2,482 were missing a job description. It was also noticed that some postings were written in other languages than English. Observing the data further,

HTML elements were found in the description text corpus which obstructed the manual reading process. It was also discovered that some of the job postings were actually thesis work or Ph.D. positions, thus irrelevant for the purposes of this study. To facilitate the upcoming analysis, it was natural to first remove all this *'noise'* from the data (Debortoli et al., 2016). New scripts in Python were written for this purpose. Although the scripts proved efficient, they left behind a few traces of HTML elements which could not be removed due to increased complexity in the removal process and were thus left alone. Ultimately, the final clean data, comprised of all business units, resulted in a total of 1,208 job postings. The table below displays the top ten business areas with the highest amount of job postings.

Table 2.

The amount of job postings per business unit.

Business unit	Amount
Product & Quality	385
Research & Development	303
Group IT	84
Finance	77
Manufacturing & Logistics	69
Human Resources	38
Marketing Sales & Customer Services	41
Strategy, Brand & Retail	40
Purchasing & Manufacturing	37
Design	18

4.4 Analysis

In this paper, a total of 688 job postings were analysed in order to inspect the competences. As analysing the full amount of the web-scraped job postings would have been extensive, only the two largest business units were taken into concentration: the area of Product and Quality (P&Q) and the area of Research and Development (R&D). Technically speaking, no big difference between these two business areas exist, as R&D is only a part of the broader term of P&Q which not only involves research and development but other activities as well such as for example quality assurance of outgoing products and in some cases, purchasing. Eventually, the analysis was conducted by the means of directed content analysis which is a qualitative approach where the aim is to *"validate or extend conceptually a theoretical framework or theory"* (Hsieh & Shannon, 2005, p. 1281). For this paper, it means that Paschou et al.'s (2018) framework and its key categories are used as predetermined codes in order to validate or extend the existing framework. This approach comes with a strong bias as

the theory has a strong emphasis and thus can limit the researcher from finding alternative solutions to the theory (Hsieh & Shannon, 2005). To alleviate these limitations, other perspectives based on the related work are introduced.

The coding was done in Nvivo 12 Pro, a program used for coding qualitative data (Bazeley & Jackson, 2013). As proposed by Debortoli et al. (2016), to find the words in their correct context and understand their meaning, the recommendation is to collect more than one word. In cases where words or phrases in the data represented skills, qualifications or experiences, they were coded i.e. categorized into a suitable competence based on Paschou et al.'s (2018) framework. For instance, "*Work in close collaboration with your team*" would be categorized as "*Teamwork attitude*" in the framework. Alongside this, notes were taken as support during the coding process. The business areas were coded individually due to time restrictions and later discussed together. No inter-coder agreement was signed and the coding was based on mutual trust (Saldaña, 2013). Sharing thoughts and ideas about the data and the findings are considered beneficial as it may spur new dimensions in the findings (Heath, Hindmarsh, & Luff, 2010; Burant, Gray, Ndaw, McKinney-Keys, & Allen, 2007). This entire approach allowed us to find patterns in the job postings and eventually develop new competence areas that were not covered by the framework.

5 Results

In this section, the results are presented using the digital competence framework by Paschou et al. (2018) as the point of departure. Background information of the job postings and competences are presented in order to explain the context around the data. The competences eventually exhibited following the same logic as in Paschou et al.'s (2018) framework. In the end, new competences found are introduced.

5.1 Background Information

In the job postings, the starting date for the new position was mentioned, instead of the date when the job posting was published. Therefore, it can be stated that the data consists of job postings that promoted positions starting in April-June 2017, ending with positions starting in April-June 2019. The statistics in table 3 state that job postings connected to the business area of Product and Quality were spread throughout the three years, while Research and Development had its majority between 2017 and 2018. The business area of R&D has more job postings with positions starting already in the second quarter of 2017 while the amount is decreasing drastically in 2018, while the job postings for P&Q are more evenly distributed since the last quarter of 2017 until the first quarter of 2019. The reasons behind these fluctuations cannot be explained based on the job postings.

Table 3.

The starting dates of the job positions promoted in the VCC job postings.

Year/month	R&D	P&Q
2017	**257**	**80**
Apr-Jun	42	0
Jul-Sep	113	1
Oct-Dec	102	79
2018	**46**	**267**
Jan-Mar	26	90
Apr-Jun	11	69

Jul-Sep	6	65
Oct-Dec	3	43
2019	**0**	**38**
Jan-Mar	0	34
Apr-Jun	0	4
Total	**303**	**385**

Job positions promoted in the data can be divided roughly into four categories: *managerial, leader, development and design,* and *commercial*. Managerial positions include titles such as product managers, team managers, business managers, principal engineers, product owners, as well as hardware and software responsible. Leader positions include both team leaders, group managers, project leaders, and scrum masters. Commercial positions include titles such as buyers and purchasing administrators which are mainly found within the business area of Product and Quality. Development and design include both engineering and programming jobs involving a broad range of architecture design, analytics, and testing. These positions found in the data are located in Sweden (684), Denmark (3) and The United States (1). The majority of positions located in Sweden can be explained by the fact that Volvo is a Swedish company, having its headquarters in Sweden.

In addition to the competences, the job postings are characterised by two overarching themes: cross-functionality and agility. Cross-functionality is emphasised in relation to VCC as a company and its work environment but also connecting to the competences. Cross-functionality is essentially based on the fact that collaboration between different external and internal stakeholders is important and this can be handled through different actions, for example through collaboration, networking or negotiation. Leadership and management are also distinguished by the cross-functionality. VCC is also portrayed as an agile organisation, typically through sentences such as "*At Volvo Cars, we have an Agile Organization [...]*". In some of the job postings, the agile transformation taking place at VCC is elaborated further. It explains how the company is transforming its departments, creating agile teams where cooperation is a key element for customer value. The SAFe framework is thus used to scale the number of teams to handle suppliers and sync with other departments. Agility is also mentioned in relation to the job postings, for example in relation to hardware and software development, teamwork and leadership. Aside of these overarching themes, it is noted that hard technical skills oftentimes involve having experience and knowledge about Volvo systems and tools as well as automotive experience and understanding, both business-wise and in relation to the development of hardware and software.

To get an overview of the most frequent words in the two business areas, a query has been made through Nvivo 12 Pro. The top 60 results are found in the table below. It is relevant to emphasize that the job postings consist of more than merely the description of skills, requirements and what the job entails, as previously covered in section 4.2. The postings also contain basic Volvo descriptions, business area descriptions, information about the application process, and titles connected to the data collection script (as mentioned in section 4.2). Thus,

the results in the table below are based on the entirety of job posting content. As the table below shows, the words marked with an asterisk, e.g. *"product", "quality", "people"* and *"volvo"* can all be found in the Volvo and business area descriptions. Along the same lines, also words such as "*external*, "*recruiting*" and "*contact*" are marked with an asterisk due to their generic nature, pointing to the fact that they are related to the application process. The words without an asterisk such as "software", "responsible" and "knowledge" are, on the other hand, more directly connected to digital competence. However, most words, with or without an asterisk, e.g. *"external", "people",* and *"contact"*, also occur in relation to the required competences. For instance, the mentioned examples connect to management, design and development of software and hardware, and to communication.

Table 4.

The 60 most frequent words in the job postings.

Word Frequency Count					
people*	3662	vehicle	1282	safety	1003
development*	3557	software	1274	working	991
volvo*	3542	responsible	1262	passion*	990
car*	3282	world*	1253	knowledge	973
job*	2880	generation*	1219	questions*	967
experience*	2853	next*	1219	business	951
recruiting	2846	technology*	1212	process	940
cars*	2734	quality*	1205	part*	937
external*	2511	research*	1201	join*	931
team	2435	systems	1195	want*	924
work	2010	engineering	1190	electrical	918
group	1868	drive*	1188	position*	916
system	1867	make	1168	global	896
create*	1839	please*	1157	together*	892
design*	1725	skills	1157	application*	881
future*	1708	ability	1151	engineer	879

product*	1436	customer	1115	status	870
environment*	1417	support	1098	regarding*	847
contact*	1406	test	1092	driving*	833
area*	1301	new	1086	innovative*	833

5.2 Competences

In this part, the competences found from the data are introduced. The competences are presented under the same logic as in Paschou et al.'s (2018) framework and they are therefore divided into four different categories: "*Data analysis & management*", "*Digital content creation*", "*Soft skills*" and "*Innovation appetite*". In the end, new competences found from the data in contrast to the original framework are introduced.

5.2.1 Data Analysis & Management

In this part, competences related to data analysis and data security are presented through observations made in the gathered data.

5.2.1.1 Find, Collect, Elaborate & Analyse Data

Data-related competence can be inspected from the job postings: for example, in the business area of Research and Development, this is consistently being described with the terms "*data-driven*" and "*strong analytical capability*". Apart from having analytical skills, the knowledge and the usage of analytical tools and methodologies are commonly mentioned in both business areas: this entails systems and methods used in development processes, covering areas such as testing, quality assurance, verification, and validation. In the framework by Paschou et al. (2018 p. 384), this is discussed as having the skills to use advanced methods, for example, simulation modeling:

"Experience in analysis of multivariate probabilistic models, Experience in machine learning methodology for classification, Experience of development in Sympathy Six sigma [sic!] methodology (DFSS), Comprehensive overview of data storage and data analysis framework". (R&D)

In the data, the competences and skills related to finding and gathering data are rarely mentioned. In contrast, elaboration and analysis of data are heavily emphasised in the same terms with Paschou et al. (2018) who suggest that the individuals working with data should be able to process data into something actionable. This can be inspected in the job postings, as the data analysis is often connected with a specified outcome, for example to the improvements of hardware and software or to obtain customer satisfaction to fulfill customer requirements:

"To leverage data and other sources to generate actionable insights to improve business outcomes at scale, make Volvo a better place to work and improve management practices". *(P&Q)*

"As Senior CAE Engineer you will be responsible for planning and performing virtual simulations, including analysis of results, recommendation of design changes and reporting". *(R&D)*

In the business area of Product and Quality, additional descriptive explanations of data-related competence appear. The analysis of data often points to tasks related to the pursuit of competitive advantage and customer satisfaction. This usually entails research skills for the execution of benchmarking and analysis of customer feedback:

"Conduct and lead user research activities, Identify user business value and innovation opportunities".

"Monitor and analyse competitors and customer feedback".

5.2.1.2 Manage Data Security (Cybersecurity) & Protect Digital Assets

Competence related to data security management and the protection of digital assets is not emphasised in the job postings. In total, only a few job postings associate directly with Paschou et al.'s (2018) framework and the majority of these findings can also be connected to having knowledge of the impacts and risks of new technologies, as security and protection act as a part of the larger picture. Following these remarks, data security is discussed in relation to the end products and from the customer-perspective, rather than as the ability to protect one's own, or company's work-related hardware and software. It should be also taken into account that safety is one of the most important values at Volvo Cars Company, explaining its frequency in the data.

"You will need to consider non-functional requirements such as performance, scalability, availability and security when producing designs and software". *(R&D)*

"Different technical solutions are to be evaluated and development of new test methods are needed to secure that the vehicles meet our high safety standards". *(P&Q)*

5.2.2 Digital Content Creation

This section dives deeper into the competences related to digital content creation explaining how the data relates or differs from Paschou et al.'s (2018) suggestion.

5.2.2.1 Creation of Digital Content in Technical & Commercial Form

Creation of digital content in technical and commercial form is a competence that can be found from the job postings, with an emphasis on presentation and documentation skills. In contrary, the ability to express oneself and the company thoughts, introduced in the framework by Paschou et al. (2018), is not mentioned in relation to the specific software or the medium that should be used in creating this content, but in relation to what should be documented, for example from the development process. A majority of the job postings are requesting skills of documenting technical solutions and summarising and writing reports:

"One of your responsibilities will be to design the system solution as well as writing and releasing requirements and documentation, supporting the development in these areas". *(P&Q)*

"Develop and document component hardware specifications". (P&Q)

In the job postings, competence regarding software is mentioned, but not in relation to the content creation itself. The competence of using a certain software is often mentioned in relation to administrative or planning skills, especially in the business are of Product and Quality. Also, knowledge about certain media was mentioned rarely in the job postings, for example, "*deep knowledge in photography and post production*".

"Good overall computer (MS Office) and administration skills are needed including good knowledge in excel and power point [sic!]". (R&D)

5.2.2.2 Design & Development of Software & Hardware

Partly due to the inspected business areas that are heavily connected to product development, the competence regarding software and hardware development, or product development in general, is frequently mentioned in the job postings. These competences are mentioned in relation to the whole lifecycle of hardware and software development, from designing to testing. In the description of the original framework, Paschou et al. (2018) emphasise the ability of writing codes. These notions can be found from the job postings, also connected to other positions than solely to software developers. In the inspected business areas, at least a basic knowledge of software development seems relevant:

"Experience of software architecture & design in complex embedded systems, preferably in the automotive business". (P&Q)

Other skills related to the design and development, vary from implementing, maintaining and managing within the area of testing, validation, verification, quality assurance, and handling requirements. Also, the connection to the automotive industry can be seen clearly, in the form of mechanical and electrical engineering work, aside from programming. Overall, it can be noted that employees not only need to have hard skills but generally having good product development knowledge, also specifically in relation to the automotive industry and Volvo. In addition to the original framework by Paschou et al. (2018), agility is mentioned frequently in the job postings in relation to software development through terms such as "*You have SW or electronic engineering development experience, and preferably in an agile environment (we love agile!)*". It can be seen also, that the competences related to design and development are often mentioned in relation to other competences, such as leadership, teamwork and project management:

"Practical and theoretical knowledge about the Volvo product development process and especially the electrical development process […]". (R&D)

"The responsibility of an integration tester is to test according to integration design verification method in all Volvo Projects and support the entire team". (P&Q)

5.2.2.3 Problem-Solving, Creativity, Logical Thinking, Design New Solutions

Problem-solving, creativity, logical thinking and design new solutions are mentioned together in Paschou et al.'s (2018) framework and each one of these dimensions could be exposed in the data as well. Especially problem-solving, creativity and logical thinking are intertwined in the data. Firstly, the problem-solving ability can be found frequently and rather often in relation to analytical skills as well as to creativity, for example through terms like "*creative problem solving approach*" and "*strong analytical and problem solving skills*". Creativity, on the other hand, is discussed for example in relation to solving problems and developing new solutions and is talked through terms such as "*creative*", including "*thinking outside the box*" or "*thinking differently*".

"Demonstrated capacity for logical analysis and problem resolution". (R&D)

Logical thinking, as shown in the quote above, is not elaborated that frequently in the job postings, but in cases that it is, it stands mostly in relation to analytical and problem-solving skills. In close relation to logical thinking, a holistic view and conceptual thinking are new dimensions not mentioned in Paschou et al.'s (2018) framework. Being aware of the big picture, while understanding the details is relevant for both analysis and problem-solving in relation to business and product improvement. This can be portrayed through the following sentence. Lastly, the ability to develop new solutions can be found in the data, for example through terms such as "*solution driven attitude*" and "*develop new solutions*".

"Your holistic view will play an important role to quickly grasp the big picture to meet the business demands." (P&Q)

5.2.3 Soft Skills

Competences related to soft skills were also highlighted in the framework. This section therefore presents the analysed data related to these skills.

5.2.3.1 Communication in Customer's & Stakeholder's Language

Communication skills are mentioned frequently in the job postings, through terms such as *"good communication ability"* and *"good communications skills"*. In the framework by Paschou et al. (2018), Communication in Customer's and Stakeholder's Language is seen as the competence that establishes to common ground, essential for the integration of processes that servitization transformation requires. This can be reflected in the job postings, as communication skills are required in order to communicate with various stakeholders, from colleagues in other departments to customers and suppliers. Therefore, cross-functionality is an important theme in relation to communication:

"Excellent communication skills are mandatory, in order to be able to present and collaborate with colleagues and other stakeholders". (R&D)

"Good communication skills are required in this cross-functional role and you will build and maintain an extensive network throughout the company". (R&D)

Communication skills mentioned in the job postings are also characterised by international skills. Being able to speak different languages and to operate in an international environment, is valued in the data. Communication is also mentioned often in relation to other competences, for example to teamwork, leadership, cooperation, networking, and management. Paschou et al. (2018) also discuss collaboration in relation to communication: this competence can be found frequently in the data. Collaborative and cooperative skills are mentioned often in relation to communication and teamwork and discussed through terms such as *"collaborative "* and *"cooperation skills"*.

"The everyday work is carried out in collaboration with various design departments as well as suppliers which is why good communications skills in a fast moving and international environment are a must". (P&Q)

5.2.3.2 Leadership

Leadership is elaborated in various ways in the job postings. In concurrence to the framework by Paschou et al. (2018), leadership skills are manifested in the ability to motivate and mobilise employees towards common objectives and new innovations. Leadership skills are sought for in regards of leader positions but also in lower-level positions: motivating and coaching others could be generalised to be everyone's responsibility and this is communicated for example through terms such as "*be involved and encourage others*". Cross-functionality can also be seen as an important determinator in relation to leadership skills as leading cross-functional teams was highly appreciated.

"[...] a goal-driven leader who maintains a productive work environment and confidently motivates and coaches teams to meet high performance standards". (P&Q)

More specifically, leadership skills can be connected, for example, to the ability to carry responsibility, build trust and to coach as seen in the quote above. Sometimes even mentoring is mentioned. Leadership is also mostly mentioned in relation to other competences, from communication to teamwork, technological knowledge, cooperation, and project management.

"In this role you also need a genuine interest in developing other people to get them to grow and take responsibility as well as interested in driving the change to take us into the future". (R&D)

"Experience of product development process and leadership, preferably in an agile development". (P&Q)

5.2.3.3 Teamwork Attitude

Teamwork attitude is strongly emphasised in the job postings of both business areas. The demand for this competence is portrayed, for instance, by using terms like *"team player"*, "*team player capabilities*" and "*team orientation*" and in general, a willingness to be part of a team and being an inclusive team member. As mentioned by Paschou et al. (2018), people are supposed to collaborate when aiming for common goals and in the job postings, this is heavily connected to teamwork.

"You are a team player who is willing to share information, knowledge and experience with people around you". (P&Q)

Teamwork attitude at VCC is also portrayed by being able to work cross-functionally with various teams, also with people coming from other cultures. This competence is also not applicable only internally, as teamwork attitude is required when working with suppliers and other external stakeholders. Teamwork attitude is also a competence that does not exist in the job postings in isolation: it is often mentioned in relation, for example, to cooperation, leadership, and communication.

"The work include a lot of co-operation with other members within the organisation and close collaboration with Zenuity and our supplier and it puts high demands of good teamwork". (R&D)

"Team player, transparent, good communication and networking skills". (P&Q)

"Ability to work in, and lead a large team". (P&Q)

5.2.3.4 Results Orientation, Time & Stress Management

Results orientation, time and stress management are also mentioned as competences in VCC job postings, both individually and in relation to each other. Results orientation is exemplified in multiple ways, from the drive for results to results-focused and as simplified, getting the job done. In other words, in a structured and organised way, being able to plan, execute and deliver in accordance with the goals and objectives is mentioned as an important quality. Results orientation is often mentioned in relation to time management: the employees are supposed to have the ability to deliver on time which requires the competency to manage time, both on the personal level but also possibly from the team and project perspective:

"Result driven and ability to prioritize to deliver on commitments with tight deadlines". (R&D)

Stress or stress management is not mentioned explicitly in the job postings, but this competence can be connected to the skills of multi-tasking, prioritisation, and self-management, which is explained, for example, by the ability to handle a lot of different issues at the same time and being able to prioritise among these issues. This ability is often connected to communication skills and results orientation.

"I am looking for an open-minded, self-driven person that gets energy by delivery in time, solving problems, handling time plans and administrate". (R&D)

5.2.4 Innovation Appetite

These innovation driven competences involve, according to Paschou et al. (2018) an understanding of new technologies and their impacts. This section sheds a light on how these competences were portrayed in the job postings.

5.2.4.1 Knowledge of Impacts & Risks of New Technology & Adoption Approaches

This competence is not that self-explanatory to find from VCC's job postings. Knowledge of technology is highlighted frequently, but not specifically in relation to the impacts, costs, and risks or to any business-driven competence (Paschou et al., 2018). Technological knowledge was portrayed generally, on the other hand, for example by the lines of "*good practical and theoretical knowledge of certain technology areas*" or "*understanding of the technical impact of certain area*". This competence can be thus seen more about being technically up to date and remaining open-minded and susceptible for new knowledge, rephrased for example with words such as "*We expect you to be open to learning new technical areas, to have curiosity about ongoing digital and societal trends*". Instead of connecting technical knowledge to business purposes, it is rather connected to finding new solutions and the ability to share knowledge among the team:

"*I actively participate in technical discussions to stay updated in my technology domain good practical and theoretical knowledge of certain technology areas*". (R&D)

"*Transfer/Mediate needed knowledge within the team and cross-functional teams in order to support implementation and designs*". (P&Q)

5.2.4.2 Management of Projects for the Introduction of New or Digital Technologies

This is a competence that Paschou et al. (2018) relates to managing change and innovation, for example overcoming resistance to change. This competence is portrayed in the job postings frequently, especially in the business area of P&Q, through the ability of "*driving change*" or in more personal terms, "*willingness and openness to change*". This is elaborated further by emphasising the importance of the outcomes and implementations that change-drivenness embarks. This competency is on some occasions connected directly to change managerial activities, for example in "*removing roadblocks*". It should be noted that sometimes, extinguishing this competence from leadership and more general managerial actions is difficult. Further connections to other competences include the drive for solutions, communication, and teamwork.

"*Partner to remove roadblocks/barriers to support and empower owners and line organisation*". (R&D)

"*You should have documented experience from high-level leadership positions with proven ability to set strong direction and convey a persuasive future vision at all levels of Volvo Cars organization*". (R&D)

5.2.5 New Competences

Lastly, the gathered data also points to new competences not covered in the original framework. The new competences found in the data are "*Management Skills*", "*Networking Skills*", "*Negotiation Skills*", "*Customer Orientation*", "*Business & Strategic Orientation*", "*Proactiveness & Independence*", "*Continuous Learning & the Ability to Share Knowledge*".

5.2.5.1 Management Skills

In addition to the competence "Management of Projects for the Introduction of New or Digital Technologies", it can be seen in the job postings that more general managerial competence is also sought for. General management skills can be identified in the data through terms such as "*good administrative capacity*", "*decision-making ability*", "*knowledge of managing projects*", and "*project management skills*". The competence is also elaborated through tasks from planning to coordination, and also to entail the ability to take responsibility regarding time, resources and project-deliveries, while being able to operate cross-functionally with the team and other stakeholders. Data indicates that management skills are connected to various other competences and most frequently with leadership, communication, solution-orientation, and communication – as well as time and stress management:

"Leadership- and management skills". (P&Q)

"Well developed planning and coordination skills will help you to structure and organize your work, as well as your team's work". (R&D)

5.2.5.2 Networking Skills

Networking skills are frequently mentioned in job postings. Often mentioned in relation to communication and collaboration, the ability to build and also to maintain relationships and to a network is considered to be an important competence by VCC. The importance of networking skills is argued for example due to the cross-functionality of various job positions, meaning that work is carried out with colleagues from different departments or with external stakeholders.

"Since you have many interfaces within the company, you have good communication and networking skills". (R&D)

"Working as an analysis engineer within surface treatment means that you will establish and develop relationships with a variety of system areas, suppliers and other customers globally". (P&Q)

5.2.5.3 Negotiation Skills

Connecting to networking, negotiation skills are also highlighted in the job postings, mostly in the business area of Product and Quality. Mentioned as well in relation to communication, negotiation skills are connected to for example purchasing and other commercial activities.

"Good negotiation skills and ability to challenge with respect and find win-win solutions". (P&Q)

"You have leadership experience, work life experience from positions where negotiation and customer and/or supplier contact is a common task". (P&Q)

5.2.5.4 Customer Orientation

Customer orientation is referred to frequently in the job postings through terms such as *"customer focused"* and *"customer oriented"*. It is elaborated as having a genuine interest in customer demands and being able to put a focus on their needs and requirements. Therefore, a heavy connection to product development can be in the form of end results and customer satisfaction. In the end, customer orientation is also mentioned in relation to solution drivenness and communication.

"You are customer-focused person, who has the ability to recognize customers' needs and expectations". (R&D)

"You're energetic and is truly motivated by finding and creating new solutions, for you as well as the customer". (P&Q)

5.2.5.5 Business & Strategic Orientation

Business orientation elaborated for example by being able to identify and describe business needs and also mentioned frequently in relation to drivenness for performance. In relation to business orientation, the ability to think strategically surfaced in the job postings. A strategic mindset is elaborated as being able to design and develop new strategies, also connected to designing new solutions, leadership skills, and knowledge sharing.

"You have the ability to think strategically while having a hands-on approach to occurring issues". (P&Q)

"You are used to cooperate and communicate with different people in different roles, and you also have a flexible and business oriented mind set". (R&D)

5.2.5.6 Proactiveness & Independence

In contrast to teamwork and collaboration, proactiveness and independence are highlighted in the job postings. Proactiveness is connected to developing new solutions, providing improvements and pushing projects independently to the goals. Independence, on the other hand, is often shown through the term "*self-driven*" and it is often mentioned in relation to teamwork: an employee should be able to work in a team but also independently. Independence is also portrayed as the ability of taking initiatives on her or his own.

"As a leader and a team player we need a person with a positive attitude who likes to be proactive and has the courage to take the initiative instead of waiting for instructions". *(P&Q)*

"You enjoy working as part of a team, but you also have the ability to act independently with a holistic view". *(R&D)*

5.2.5.7 Continuous Learning & the Ability to Share Knowledge

Knowledge is not only emphasised in relation to the impacts of new technologies, as mentioned in Paschou et al.'s (2018) framework. In VCC's job postings, continuous learning and the ability to share knowledge are highly valued skills and they are mentioned a few times as being an important part of the organisational culture. In both business areas, this is exemplified by a willingness to learn new things and pursuit to stay updated on a specific field, as well as share that knowledge with colleagues. These competences are characterised by the frequently changing environment that requires adaptation.

"You are therefore willing to share knowledge and experience with your colleagues and at the same time take in account the existing heritage". *(R&D)*

"Interest in learning and share knowledge to others". *(P&Q)*

6 Discussion

In concurrence to the framework presented by Paschou et al. (2018), competences under the four main categories could be found in the results: "*Data Analysis & Management*", "*Digital Content Creation*", "*Soft Skills*", and "*Innovation Appetite*". However, in order to answer extensively to the research question, the descriptions of the competences mentioned in the framework are suggested to be extended and elaborated further. The titles of the digital competences are also renamed and re-categorised, in order to harmonise the vocabulary around competence. In addition, competences previously not highlighted in the framework were found in the data, bringing in a new dimension to the competences required for manufacturer pursuing for a digital service orientation. As a conclusion, a reframed digital competence framework is suggested, divided into three dimensions inspired by previous research: 1) *Functional Competence*, 2) *Soft Competence*, 3) *Innovational Competence*. Aside of the renamed and reframed competences, eight new competences have been identified and marked with an asterisk in table 5. In addition, the contextual factors of cross-functionality and agility are highlighted in the results, emphasising their effect on a customer-oriented and digitalised work environment.

Table 5.
A new suggested framework for digital competence within digitally servitized companies, categorised in the way they are presented in the discussion.

Functional Competence	Soft Competence	Innovation Competence
Data Management & Analysis	Communication and Cooperation Skills	Problem-solving, Creativity, Holistic View & Designing New Solutions
Design and Development of Software & Hardware	Teamwork Attitude	
	Networking Skills*	Continuous Learning & Ability to Share Knowledge*
Documentation & Content Creation Skills	Negotiation Skills*	Change Drivenness*
Management*	Proactiveness & Independence*	
Business & Strategic Orientation*	Results Orientation & Self-Management	
	Customer Orientation*	
	Leadership	

Digital competence can be reflected through the results as a multi-dimensional concept which entails behavioural, cognitive and functional dimensions (Delamare Le Deist & Winterton, 2005). This multi-dimensionality is supported also by the fact that, based on the data, digital competence can be examined through the various definitions of competence explained by Bassellier et al. (2001). Firstly, digital competence can be defined as having certain skills, for example, technical skills related to software and hardware development. Secondly, the behavioural definition is strongly emphasised through the various soft, interpersonal and social skills. Lastly, competence can be considered as knowledge, since knowledge itself, along with continuous learning and the ability to share knowledge, are seen as important values. The results also argue for the combination and sharing of digital competence between the two business areas, as the individual competences are tightly coupled and as no matter the position, various competences from different dimensions are required (Delamare Le Deist & Winterton, 2005). Driving this forward, seem to be cross-functional and agile values and methodologies as these elements are heavily mentioned.

The effect of digital servitization on the employee and on digital competence can be discussed based on the results. In concurrence with previous research (Lenka et al., 2017; Olivia & Kallenberg, 2003; Lerch & Gotsch, 2015), customer centricity and the importance of data can be noted as key elements in the job postings of VCC. Customer-centricity can be elaborated for instance through the competences of communication and cooperation, as well as customer orientation, aiming to create or co-create value for the business while understanding customer requirements and needs (Lenka et al., 2017). The importance of data, on the other hand, can be elaborated as the high concentration of data-related competence, connecting to the analytical digitalisation capability (Lenka et al., 2017). In addition to these key elements, a dynamic way of working is introduced in the results, mainly presented through an agile transformation that requires cross-functional cooperation, flexibility and open-mindedness in relation to product development and customer co-creation. Since VCC is an agile organisation, the agile element points to a more cross-functional and global way of working. It requires more flexibility in the form of being mobile and open to travel or adapt, and to being passionate about agile methodologies when it comes to design and development specific products and services. Flexibility and relationship-building are necessary for a service-centric business (Baines & Lightfoot, 2014) and is nevertheless compatible with the customer focus highlighted in the results.

6.1 Functional Competence

In relation to Delamare Le Deist and Winterton (2005), functional competence refers to the skills that are relevant for a certain job position, as well as to the skill-based definition of competence (Bassellier et al., 2001). Based on the results, functional competency entail skills, technical and operational expertise, varying from data analysis to documentation and management – often enhanced by the expertise of using certain tools and software. Functional competency is defined by its industry context (Vieru, 2015) as skills and knowledge related to

automotive industry are highlighted in the results. The significance of functional competency was promoted also by the word frequency of job postings (table 5), with the high frequency of words such as "*engineering*", "*software*", "*test*", "*electrical*", "*development*", "*create*", and "*design*". Ultimately, six competences were categorised under as functional, from which *Management* and *Business and Strategic Orientation* are newly added based on the results.

The competency previously named *Find, Collect, Elaborate & Analyse Data*, is renamed as *Data Management & Analysis*, to align with the findings. The analytical ability proved to be in line with Paschou et al.'s framework (2018), however, the importance of data handling and analysis is emphasised in the job postings, as data collection is rarely mentioned. Thus, in a digitally servitised company, the results suggest that elaboration and analysis of data is processed into something actionable, either into direct product improvements or future innovations (Paschou et al., 2018; Lenka et al., 2017; Süße et al., 2017). The next competence, *Design & Development of Software & Hardware* could be discussed in the new framework in relation to Paschou et al. (2018). However, aside of software development, skills related to hardware and other product development were emphasised heavily compared to the descriptions of Paschou et al. (2018). It also pointed to having an agile experience and knowledge in order to sufficiently fulfill job tasks and conform to the agile team environment. The experience of working in an agile environment was highlighted frequently in relation to product development, connecting to the proactive perspectives on work design (Grant & Parker, 2009). The industry context was also prominent in relation to this competence, as hard skills such as mechanical and electrical engineering were often mentioned, aside of programming. Furthermore, this competence can be seen as the focal point of the functional competence in general as the production of products and services connects to all the other functional competences and reflects the innovative capability of this operation. It can be argued that having some level product development knowledge and project work experience is necessary in relation to being proficient in other competencies. Within this competence of design and development, safety is mentioned, pointing mainly to the concern of the driver. This is also reflected in the word frequency as "*customer*" and "*safety*". Data security on the other hand, was less emphasised. Despite this, its position and relevance in the framework can be still argued for. Based on the fact that VCC aspire to meet their goal of zero deaths and injuries in traffic by 2020 (Volvo Cars, 2019c), data security can very well be an inbuilt fundamental principle for the production of offerings, instead of a separate competence. For this reason, we suggest that the initial competence of *Manage Data Security (Cybersecurity) & Protect Digital Assets* becomes an inbuilt part of software and hardware development.

Instead of *Creation of Digital Content in Technical and Commercial Form*, a new title of *Documentation and Content Creation Skills* is proposed. This better illustrates the competence that was sought for in the collected data, revolving around the employees' ability to report, document, summarise, and present the status of their work, instead of the technological capability of using certain software or having the expertise of using a certain media, in order to create the content. This connects back to agility and proactiveness: an employee is supposed to take control over one's own work and to collaborate and communicate cross-functionally in order to follow-up on requirements and results (Grant & Parker, 2009). As a new functional competence, *Management* is introduced. In the framework by Paschou et al. (2018), management is discussed only in relation to innovation and to self-management. Based on the results, managerial abilities, such as planning and coordinating are prominent,

yet again in a cross-functional matter. *Business and Strategic Orientation* is also a new competence, referring to the ability to think strategically and being able to identify business needs. This relates not least to establishing connections with suppliers (Süße et al., 2018). These newly found competences appear to streamline processes, methods and tasks, and, according to Süße et al. (2018) aim in the long run to align business goals with customer needs.

6.2 Soft Competence

Another category associated with digitally servitised manufacturers is the one of soft competences (Paschou et al., 2018). The findings of this study highlight seven competencies that make up a combination of soft skills and attitudes. In relation to Paschou et al. (2018) and the previous studies (e.g. Ferrari, 2012; Calvani et al., 2008; OECD, 2016a; OECD, 2016b; Demirkan et al., 2015), the importance of soft skills is emphasised in the results. Based on the results, a soft competence is characterised by the notion of cross-functionality, highlighting the relational and proactive aspects of work: an employee is supposed to work in tight collaboration with various stakeholders, both locally and internationally, and in changing environments. In particular, they can be discussed in relation to behavioural definition of competence (Delamare Le Deist & Winterton, 2005; Bassellier et al., 2001), involving behaviours, feelings, and attitudes. Moreover, alongside functional competences, they help motivate employees to perform and innovate by influencing proactive behaviour (Grant & Parker, 2009; Frese & Fay, 2001).

In contrast to the framework by Paschou et al. (2018), the title of *Communication in Customer's & Stakeholder's Language* is changed to *Communication & Cooperative skills*. This change has been made in order to emphasise the integrity of communication and collaboration which are essential assets in establishing a common ground for a digitally servitized business and building the relationship with customers (Paschou et al., 2018; Baines & Lightfoot, 2014; Ferrari et al. 2012). Further, the competence of *Teamwork Attitude* is manifested as the ability for an employee to work cross-functionally with internal and external stakeholders. This can be reflected also through the frequency of words in the job postings such as "*team*", "*work*", "*group*", and "*together*". In concurrence to previous research, *Networking Skills* are added as a new competence to the framework showing that establishing connections internally and externally is highly important (Süße et al., 2017; Baines & Lightfoot, 2014). In close connection, *Negotiation Skills* are also introduced as a new competence, discussed especially in relation to finding new solutions (Paschou et al., 2018) and influencing stakeholders. All in all, these interpersonal skills can be argued to promote innovation in servitized companies, connecting to the previous research (Vandermerwe & Rada, 1988; Oliva & Kallenberg, 2003; Demirkan et al., 2015).

Proactiveness and Independence, mentioned as a new competence to the framework, is recognised for example by Grant and Parker (2009) and is described as being self-driven and being able to take initiatives, break from procedures and find new solutions. Independence on

the other hand, was often mentioned in relation to teamwork: being able to work in a team but also independently with discipline and structure to complete one's own work. This competence relates to taking responsibility for one's own growth and for the progress of the company. It can be connected to what Paschou et al. (2018, p. 386) refer to as *'self-empowerment'*, meaning that an employee controls his/her own role and tasks, but the authors do not identify it as its own competence. Highly related to independence is the competence of *Results Orientation and Self-Management*, previously discussed as the competence of *Results Orientation, Time and Stress Management*. In this study it is elaborated as planning, executing, and delivering results in a structured and organised manner according to goals and requirements. Self-management as well as the ability to multitask and prioritise is explained by handling a lot of different issues at the same time and being able to prioritise among these issues. Managing time is thus automatically included here, relating to both personal and team or project level, and is overall in agreement with the descriptions of Paschou et al.'s (2018) framework. *Customer Orientation* is suggested as a new competence, emphasising the knowledge and understanding of customer needs and requirements and connecting to the importance of value co-creation (Lenka et al., 2017; Martinez et al., 2010). From a broader perspective, this competence tends to play a role in the production of products and services, not least in the product development process which often requires a customer focus in order to fulfill customer needs, as proposed by the results. Lastly, *Leadership* is a soft competence since, unlike management, it seems to concern a higher level of behavioural characteristics such as the ability to motivate and mobilise employees towards common objectives and new solutions by creating a trustful environment. To be added is also that leadership is not only relevant for higher-level positions; it is acknowledged also in lower-level positions while stated to be a common responsibility to support, coach and motivate each other. Once again, the ability to work and lead cross-functionally applied here as well.

6.3 Innovation Competence

Finally, we have the category of innovation, which is roughly based on the same concepts introduced by Paschou et al. (2018). The highly common words "*innovative*" and "*new*" apply here. Integrated with the soft competences, it can be stated that an entrepreneurial approach evolves. To address challenges in the servitised business, motivation, initiative taking, and creativity are needed. The role of knowledge is also emphasised, highlighting the importance of continuous learning in the ever-changing environment which implies that the knowledge-based definition of competence (Bassellier et al., 2001) can be applied. Altogether three competences are categorised under *Innovation Competence* category, from which *Change Drivenness* is a new one.

Problem-solving, Creativity, Holistic View and Designing New Solutions is enhanced with the notion of a holistic view, based on the results. In wide terms, this competence entails basic abilities needed to create, handle, and balance solutions. Problem-solving skills are stressed out (Süße et al., 2018; Calvani et al., 2008; Ferrari, 2012), also in heavy relation to the data analysis skills. This points to the ability of obtaining information, weighing alternatives, and

making decisions. Creativity on the other hand, connects to proactiveness and independence, responding to situations as they arise (Grant & Parket, 2009), as well as carrying out tasks individually and creatively to find new solutions to problems, elaborated also by Baines and Lightfoot (2014). Especially the holistic view as a new dimension is needed to solve problems, since it brings an understanding to the whole situation, reflecting the customer-centricity (Lenka et al., 2017). This can be understood as an expansion to the competence mentioned in the previous framework (Paschou et al., 2018).

Additionally, for a service-oriented business, it seems important to attain new knowledge about technology and staying up to date, but not specifically in relation to the impacts, costs and risks mentioned by Paschou et al. (2018). Remaining open-minded while looking for new opportunities and being susceptible for new knowledge is instead requested. As the competences are defined by the frequently changing environment that requires adaptation, a new competence of *Continuous Learning and the Ability of Sharing Knowledge* is suggested, highlighting the importance of continuously staying up to date with knowledge and being able to build a common knowledge (Süße et al., 2017) by exchanging ideas and know-how with colleagues. This can be argued to be important in order to handle uncertainty, as the understanding of new technologies and customer data is being developed continuously (Wall, Cordery & Clegg, 2002). It can further be argued, mainly based on the competences teamwork attitude and communication and cooperation, that they ultimately set the ground for information spreading and creating opportunities for innovation. The basis of this addition lies in the competence referred to as *Knowledge of Impacts & Risks of New Technology, & of Adoption Approaches* in the Paschou et al.'s (2018) framework, but in this suggestion, the emphasis is on learning and the continuity and sharing of it, instead of knowledge itself. In the results, *Change Drivenness* was mentioned frequently and therefore this name is preferred instead of *Management of Projects for the Introduction of New/Digital Technologies*. This correlates with Paschou et al. (2018), but heavily represents change management, with the focus on the ability to drive change and overcome resistance. It was discussed more on a personal level, as an employee's own openness towards change, yet mentioned still in close relation to managerial activities, which is a dimension worth acknowledging.

6.4 Limitations and Future Research

Utilising a deductive approach to content analysis can be stated to strengthen the trustworthiness and quality of the study. On the other hand, the chosen method can be seen as a limitation, due to chosen theory and the controversies raising up from researcher's interpretations. Reaching full objectivity in relation to collected data during the coding process is difficult as coding is based on author's subjective qualities (Saldaña, 2013), raising ethical questions. Also, the process of coding the data collaboratively can be seen as a benefit and a limitation as no inter-coder agreement was written between the two authors (Saldaña, 2013). Nevertheless, the discussion during and after the coding process can be seen as an improving quality to the data as the individually gathered data was compared and further categorised collaboratively. It can be stated also, that the deductive approach to content analysis, i.e. using a theory as a starting point for the analysis, limits the process of analysis.

This can be explained as the content in the theoretical framework by Paschou et al. (2018) is not clarified extensively, leaving room for interpretation and misunderstandings. Additionally, the chosen data format could be seen as a limiting factor in the study. The transferability was challenged by the fact that two slightly different job descriptions were stored in the internal HR system where the data was gathered from, depending on if the job applicant is a current employee at VCC or an external applicant. It was not clarified in the data, whether the job posting was meant for external or internal usage. In some cases, the content in the job postings was difficult to interpret due to the company-specific language, concerning for example some IT systems and working methods. It should be also taken into account that job postings from only two business areas were analysed. Analysing other business areas would most likely give other insights to the study topic. Worth noting is also that, ideally all the noise, including the introductory text about VCC and the application process ought to be removed to improve the quality of the word frequency and the analysis of these words (table 4). An attempt was made to find a solution for this, but due to the unstructured characteristics of job postings, extracting only relevant sections proved difficult. In the end, it should be stated that this research is based on one case study in a specific industry while analysing only certain business areas in the company and therefore the results cannot be generalised.

Future research could issue the limitations of this study by complementing the discussion with quantitative study methods, utilising for example text mining tools to analyse the data. The usage of quantitative methods could open up new avenues for understanding the digital servitization, for instance exemplifying the importance between the found digital servitization competences and perhaps adding new competences in the picture. This could also show the hierarchy between certain competences. Further, a longitudinal study covering job postings from various years could shed more light on how the perception of digital competence has changed in relation to digital servitization throughout the years. More job position specific research could further open up new perspectives on digital competence and to expand the knowledge on the connectivity of competence. In contrary to this study, job postings from different business areas could also be examined.

7 Conclusion

This study has discussed the concept of digital competence in the context of a business transforming into service orientation enhanced by digitalisation. A case study was conducted at Volvo Cars Company in order to answer the research question: *What are the digital competences a digitally servitized manufacturer requires of their employees?*. By utilising the digital competence framework by Paschou et al. (2018) as the point of departure, digital competences mentioned in VCC's job postings were examined and further analysed through the means of directed content analysis. In the end, elaborations on digital competence were made and a new framework was proposed, based on the digital competences found in VCC's job postings in combination with previous research. The new framework highlights the multi-dimensionality of digital competence by dividing it into three categories: functional, soft and innovational competences. Functional competence is characterised by skills and technical and operational abilities that are required in order to succeed in the job position. Soft competences are connected to behavioural and interpersonal skills and attitudes. Innovational competence refers to for example cognitive skills related to new innovations and product development. In the end, the digital competency framework is characterised by overarching elements of cross-functionality and agility. As an academic contribution, this paper attends to the discussion on the vocabulary around digital competence by extending the previous research on the topic. As a contribution to practitioners, this paper provides a practical set of competences that can be utilised in identifying digital competences already existing in the business and that should be developed, or used to recruit new digital talent.

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