A Multiple-Case Study on the Future of Roles and Competencies: Purchasing, Logistics, Marketing, and HRM

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ABSTRACT,
Industry 4.0, also known as the fourth revolution, is on the rise. The digitalization and automatization of manufacturing and related industries change the organization and ways of working within the value chain. As the revolution continues, it will thus have an impact on the future of employee roles and competencies of the value chain. This research aims to identify the differences in required competencies for future roles across four activities of that value chain; purchasing, logistics, marketing, and human resource management (HRM). Through a multiple-case study this research looks into the influence of technological developments on the future of roles and their competencies, five to ten years from now. The qualitative data was gathered through eight semi-structured interviews; two per value chain activity. Competencies such as up-to-date technological skills and analytical skills are becoming increasingly important across all value chain activities, along with various other competencies like flexibility. However, there are already differences in the technological progress of the four different disciplines: marketing is digitally advanced and HRM is especially competence-oriented, which is why these two disciplines are quite ahead of the purchasing and logistics discipline in terms of future-oriented roles and competencies, and better prepared for technological developments. Future roles that might arise in all four disciplines are a system manager, a data manager, or an innovation manager.

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1. INTRODUCTION: THE DEVELOPMENTS WITHIN INDUSTRY 4.0 AND THEIR CONSEQUENCES

When the computer was created, surely no one at that time or in subsequent years would have expected so many jobs to derive from and depend on computers, machines, and complementary technology like Artificial Intelligence (AI). Nowadays we live in a world where we can barely imagine living without such technologies. Moreover, we can say that these technologies shape our lives.

In the last ten years, many simple tasks and jobs have been automated and replaced by technology. The rapid automation and computerization of the manufacturing industry is sometimes referred to as the fourth Industrial Revolution, or Industry 4.0 (I4.0), and it covers a whole array of technologies; not only the internet and automation, but also AI, which all eventually reduce human involvement (Castelo-Branco, Cruz-Jesus, & Oliveira, 2019, p. 1). That automation resulted in many job losses of not only the manufacturing sector, but it also enabled new or adjusted job descriptions and opportunities. For instance, many factory workers were replaced by machines. However, new technologies require new experts and new specializations across all activities of the value chain, just like machines need mechanics and engineers. In addition, these new jobs require specific skills and competencies which might still be very vague for future jobs. These jobs will be referred to as roles in this paper. Based on the research of Mulder et al. (2005), this paper will refer to roles as the description of the content and structure of a profession (Mulder, Wesselink, & Bruijstens, 2005, p. 186).

This case study research will focus on the development of roles and their competencies across disciplines, and how technological developments will affect the development of the roles, resulting in the following research question: *"To what extent are there differences in the competencies needed for future roles within different disciplines of the value chain?"*.

In addition, to answer this research question it is plausible to look further into two sub-questions:

1) how do technological changes affect the future of roles and their competencies across disciplines; and

2) what are future roles and competencies across the disciplines?

In response to research by Delke et al. (2021) on the future of roles and competencies in purchasing, this paper aims to investigate whether there are also changes in roles and competencies for other activities along the value chain; purchasing, logistics, marketing, and human resource management (HRM). Furthermore, this case study research aims to identify the differences in required competencies for future roles in these disciplines. Based on the research by Delke et al. (2021), logistics, marketing, and HRM will be compared to the purchasing discipline eventually. Beforehand I would like to note that even though HRM is a support activity and thus coordinates the other three disciplines, it can still be very relevant to investigate alongside the three primary activities. One objective is to analyze current roles and their corresponding competencies across the four mentioned disciplines of the value chain, as well as future roles and competencies. Whereas the 'current' situation will thus be 2021, the 'future' situation will be five to ten years from now. A second research objective is to determine the contrasts between roles and competencies across the disciplines of the value chain. A final objective is to assess the influence of technological changes on the development of possible new roles; possible technological factors will be identified.

This research is of academic relevance to the research of Industry 4.0, which is concerned with technological developments and automation in manufacturing. This research develops the literature further, as it studies the development of competencies for future jobs. It is based on and can be a continuance of the research by Delke et al. (2021), who studied the future roles and competencies within the purchasing discipline, as well as that of Bals et al. (2019), who researched the current and future competencies within Purchasing and Supply Management. Further, through analyzing and comparing a set of disciplines I will determine whether there are significant differences in required competencies for the different disciplines. This can contribute to Project PERSIST, which aims to analyze the role of Purchasing and Supply Management in Industry 4.0 (University of Twente, sd). Also, this research goes more into depth on the different disciplines, whereas Pekkanen et al. (2020) analyzed the required key generic skills for supply chain management and operations management.

Finally, since this research investigates required competencies for future jobs, it can enable the participating firms to also focus on such competencies. The firms might be able to already think about how they intend to measure, assess, or implement both the jobs and competencies in the future. Moreover, not only the firms within the research could benefit, but many other firms as well since any firm will need such different disciplines to perform successfully. By keeping the competencies in mind, firms can focus on the recruitment of new human resources and adding value to their products or services.

2. THEORETICAL FRAMEWORK: CURRENT ROLES AND COMPETENCIES VS. THE FUTURE OF ROLES AND COMPETENCIES

In this paper, future roles refer to job descriptions that might arise five to ten years from now and that already exist (Mulder, Wesselink, & Bruijstens, 2005, p. 186); skills and competencies are interchangeably used for the abilities required for a certain job (Bals, Schulze, Kelly, & Stek, 2019, p. 2); Industry 4.0, also called the fourth Industrial Revolution, refers to the automatization and digitalization within the manufacturing sector (Castelo-Branco, Cruz-Jesus, & Oliveira, 2019, p. 1); the four discipline concepts will be defined in each of the subsections. These four disciplines have been chosen based on the value chain of Porter (1985) shown in Figure 1. He distinguishes between primary activities and support activities. Primary activities are the activities involved in the physical creation of the product, the sale, and the transport of the product; inbound logistics, operations, outbound logistics, marketing and sales, and service (Porter, 1985, pp. 36-38). Support activities support these activities by providing firmwide functions; firm infrastructure, HRM, technology development, and procurement (Porter, 1985, pp. 36-38). In this research, the primary activities are thus purchasing, logistics, and marketing, whereas the support activity is HRM.

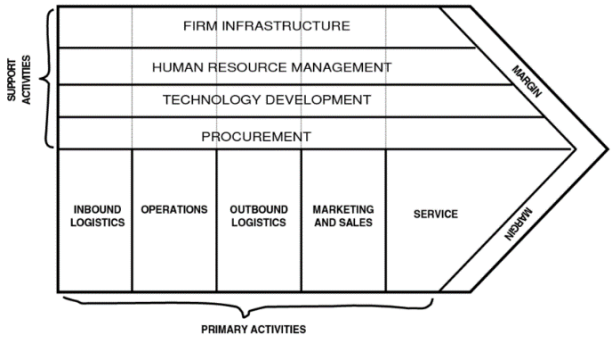

Figure 1. Porter's Value Chain

2.1 The purchasing discipline

According to Schiele (2019), purchasing is the function within an organization that forms an interface with the supply market to ensure that the organization is provided with the necessary goods and services of other organizations (Schiele, Chapter 4: Purchasing and Supply Management, 2019, pp. 47-48). Schiele (2019) distinguishes between at least six current purchasing roles based on responsibilities, and they require different sets of skills. The roles can be defined as operative procurement, purchaser for direct materials/serial purchaser, purchaser for indirect materials, public procurement, purchasing engineer, chief purchasing officer (CPO), and other specialization roles, depending on the size of the organization (Schiele, Chapter 4: Purchasing and Supply Management, 2019, pp. 64-66). Skills that are required for these jobs range from analytical skills and basic knowledge of purchasing processes to sustainability and stakeholder relationship management (Delke, Schiele, Stek, & Buchholz, 2021, p. 4).

Giunipero et al. (2005) proposed that changing environments required new sets of skills and that these skills required an entrepreneurial approach besides the purchasing and supply management skills (Giunipero, Denslow, & Eltantawy, 2005, p. 603). Their research showed that there would be a trend towards more use of team decision-making, and more flexibility in the optimization of the supply chain. Interpersonal communication would also require more flexibility and attention. (Giunipero, Denslow, & Eltantawy, 2005, p. 607). Flexible firm purchasing professionals of the future would have to be proactive; have the ability to plan strategically rather than operationally; be creative in such a way that they can find new ways to use traditional tools; implement risk management rather than risk avoidance; and they should manage relationships and communications closely rather than in a traditional 'arms-length' manner (Giunipero, Denslow, & Eltantawy, 2005, p. 608).

Bals et al. (2019) have looked into the future of purchasing competencies, and they found many competencies which they divided into technical skills, interpersonal skills, internal/external enterprise skills, and strategic business skills. Technical skills include automation, Big Data analytics, process optimization, Intellectual Property, e-procurement technology, and computer literacy; interpersonal skills include analytical skills, creativity, decision-making, teamwork, leadership, curiosity, passion, and resilience; internal/external enterprise skills encompass change management, communication skills, discipline-specific skills for all four disciplines, networking, and cultural awareness; finally, strategic business skills include risk management, strategic thinking, critical thinking, sustainability, and business and financial acumen (Bals, Schulze, Kelly, & Stek, 2019, p. 7)

In a Delphi study conducted by Delke et al. (2021) future purchasing competencies were also identified, based on the developments of Industry 4.0. Skills such as data analytics, strategic management skills, supply network management skills, E-procurement technology skills, robotic process automation (RPA) skills, digital contract management and legal skills, digital partnership management skills, digital negotiation, and digital leadership skills (Delke, Schiele, Stek, & Buchholz, 2021, pp. 7-9). Compared to the current purchasing skills, it is noticeable that future skills are more focused on digitalization and technology rather than relationship management.

Finally, Delke et al. (2021) also identified seven future purchasing jobs: the process automation manager, the data analyst, the chief happiness officer, the supplier onboard manager, the master data manager, the system innovation scout, and the legislation specialist (Delke, Schiele, Stek, & Buchholz, 2021, pp. 6-9).

2.2 The logistics discipline

Logistics can be defined as the overall process of acquiring, storing, and transporting resources (Cousins, Lamming, Lawson, & Squire, 2008, p. 7). Monczka et al. (2016) build upon Porter's (1985) value chain; they also distinguish between inbound and outbound logistics, where inbound logistics encompasses the income and storing of goods and raw materials from suppliers to a business, and outbound logistics can be further divided into transportation management and distribution management (Monczka, Handfield, Giunipero, & Patterson, 2016, p. 17). Transportation management involves the selection and management of external carriers; shipping companies, trucking companies, airlines, or railroads. Distribution management entails the packaging, storing, and handling of the materials at storage. McKinnon et al. (2017) identify four groups of current logistics personnel, namely operative logistics staff, also called blue-collar staff; administrative logistics staff such as the traffic planners; logistics supervisors like traffic controllers or the warehouse shift leaders; and the logistics managers (McKinnon, Flöthmann, Hoberg, & Busch, 2017, p. 15). They also found that leadership and communication skills are essential for leaders and managers, yet within logistics, this is often a lacked skill (McKinnon, Flöthmann, Hoberg, & Busch, 2017, p. 18). Finally, the researchers argue that technological expertise, along with data analysis, is a must, but becoming increasingly important in logistics because of the expanding freights and trade volumes, as well as the emergence of Industry 4.0 (McKinnon, Flöthmann, Hoberg, & Busch, 2017, p. 18).

Many advanced technologies are related to Machine Learning and AI, such as data mining, machine vision, computational statistics, and other algorithms, which are eventually able to substitute for human workers. (Frey & Osborne, 2013, p. 258). Frey and Osborne (2013) found that non-routine cognitive tasks such as computer programming, and non-routine manual jobs like janitors are highly computerisable because there is big data available. This computerization and robotization imply that many low-wage manual jobs can diminish over time, as well as a large number of other knowledge jobs (Frey & Osborne, 2013, pp. 259-261). However, some tasks will remain difficult to automatize; since machines and algorithms are still experiencing difficulties with perception and manipulation, it will be hard to automatize such jobs. In addition, it remains difficult to specify the psychological processes that underlie human creativity, and current algorithms are not yet able to comprehend or imitate such processes. Finally, while robots, machines, and algorithms can copy human intelligence and emotions to some extent, they do not yet possess the grand 'common sense' that humans possess (Frey & Osborne, 2013, p. 262). Thus, occupations that require social intelligence are also very unlikely to be automated.

Similar to the purchasing discipline are the potential required future skills, which McKinnon et al. (2017) also identified; Big Data Analytics and Robotic Process Automation (PRA) skills both emphasize the usage of digital systems. On the one hand, by implementing technologies such as intelligent warehousing and movement tracking the efficiency will increase, but some jobs might become obsolete. On the other hand, new jobs can be created to focus on higher-value work and innovation, or to keep the automation up-to-date and working (Forfás, 2013, pp. 26-40, 106-117).

Future jobs in logistics could be similar to those found in a Delphi study by Delke et al. (2021); process automation, system innovation, and data analytics are increasingly important within both disciplines, as well as in Industry 4.0 (Tipping & Kauschke, 2016, p. 7). Moreover, due to globalization customers expect faster shipments, more flexibility, and more transparency, all at a lower price.

2.3 The marketing discipline

The marketing discipline can be defined as the achievement of corporate goals through meeting and exceeding customer needs better than the competition does, as well as the promotion, selling, and distribution of products through campaigns and programs. (Fahy & Jobber, 2015, p. 39). The Marketing Book (2008) distinguishes between relationship marketing; business-to-business marketing; direct, data, and digital marketing; international marketing; e-marketing; green marketing; marketing for non-profit organizations; pricing; brand building; sales management; retailing; and marketing in emerging economies (Baker & Hart, 2008, pp. 33-41, 125-127, 283-288, 299, 306-315, 372-378, 465, 472-498, 502-506, 562-564, 586-590, 602-619). For all such specializations, we commonly find managers, directors, consultants, strategists, and various specialists, but there are also Chief Executive Officers (CEOs), Chief Operating Officers (COOs), and Chief Marketing Officers (CMOs). Along with these different current jobs, there are also current skills; areas such as social media marketing, marketing research, email marketing, and digital marketing require advanced data analytics skills, whereas all areas require sufficient communication skills and creativity (Manai & Holmlund, 2014, pp. 751-752).

Benson et al. (2014) find that the usage of internet-based technologies, ICT, and social media skills are becoming increasingly important (Benson, Morgan, & Filippaios, 2014, p. 520). Similarly, a study by Di Gregorio, Maggioni, Mauri, and Mazzucchelli (2019) investigated future skillsets required for marketing jobs as digitalization related to Industry 4.0 increases. The study distinguished five skill categories, namely basic soft skills, analytical skills, digital and technical skills, core marketing skills, and customer insight skills. Basic soft skills such as taking initiative, teamwork, and interpersonal skills are becoming increasingly important, followed by digital and technical skills such as the knowledge of social media and e-commerce. Thirdly, core marketing skills like planning and time management, as well as creative thinking and precision should be taken into consideration. In fourth place are the analytical skills related to data orientation, problem-solving, critical thinking, and data analysis. Finally, the customer insight skills like the knowledge of a company, its customers, and its research methods appear to be of less importance (Di Gregorio, Maggioni, Mauri, & Mazzucchelli, 2019, p. 255).

The same study showed the top three most promising marketing jobs of the future across five countries; Italy, France, Germany, Spain, and the UK. In all five countries, the digital marketing manager is at the top; in Italy, Germany, and the UK the social media manager comes second, whereas the sales manager and E-commerce manager come second in France and Spain respectively; the third job ranges from Big Data analyst to marketing communication manager (Di Gregorio, Maggioni, Mauri, & Mazzucchelli, 2019, p. 254). Finally, this research also identifies the digital marketing manager, social media manager, e-commerce manager, and Big Data analyst as the key positions of the future of the Marketing discipline.

Cognizant, Centre for Future of Work and Future of Workplace, analyzed 21 Marketing jobs of the future, as can be seen in Figure 4 in appendix 2. They also found that skills such as communication and networking are very important, alongside negotiation skills, consumer engagement, and knowledge of the organization are becoming increasingly important (Pring, Davis, & Boland, 2019, pp. 6-47). Finally, there is less emphasis on data analytics. Such skills are similar to the skills found in the Delphi study by Delke et al. (2021), and again the jobs are based on responsibilities and tasks that need to be fulfilled.

2.4 The human resource management (HRM) discipline

HRM can be defined as recruiting, selecting, training, developing, assessing, and motivating employees, as well as maintaining relationships with them, ensuring their health and safety, and making sure that they are treated accordingly (Lepak & Gowan, 2010, p. 8). There are three interrelated Human Resource (HR) activities: work design and workforce planning, managing employee competencies, and managing employee attitudes and behaviors (Lepak & Gowan, 2010, pp. 8-14).

The SHRM (2018) has researched current competencies, and they created an HR Competency model with nine key competencies; HR technical expertise and practice, relationship management, consultancy, leadership and navigation, communication, global and cultural effectiveness, critical evaluation, ethical practice, and business understanding (SHRM, 2016). These key competencies match with the findings of Ulrich et al. (2013), who found six domains that define the required skills and knowledge for HR (Ulrich, Younger, Brockbank, & Ulrich, 2013, p. 462). Ulrich et al. (2013) visualized three spheres of influence: a context sphere helps define an organization's strategic position; an organizational sphere where capability, leading change, innovation, and technology initiatives are frequently used to increase effectiveness and efficiency; in the individual sphere relationships and trust are built to achieve results (Ulrich, Younger, Brockbank, & Ulrich, 2013, p. 464).

Both Ulrich et al. (2013) and the Society for Human Resource Management (SHRM) distinguish between HR generalist jobs and HR specialist jobs. Generalist jobs have a broad spectrum of responsibilities, and roles include the chief HR officer or the people services manager. HR specialist jobs are divided into five common areas; 'workforce planning and employment', which includes roles such as chief talent manager, recruiter, and staffing specialist; 'HR development', which includes roles like an organizational development specialist, employee development specialist, and trainers; 'total rewards', which encompasses roles such as a compensation manager, or benefits analyst; 'employee and labor relations' includes roles such as the employee advocate, and the performance management specialist; finally, the 'risk management area' concerns roles like the safety officer and the risk management specialist (SHRM, 2018). Ulrich et al. (2013) found a drop in HR generalists and an increase in HR specialists (Ulrich, Younger, Brockbank, & Ulrich, 2013, p. 459); from 1987 to 2012 activities such as organizational development and research, HR planning, strategy, and recruitment have become increasingly important roles in HR with an increase of at least 7% each over the years, whereas the generalist has decreased from 61% in 1987 to 40% in 2012 (Ulrich, Younger, Brockbank, & Ulrich, 2013, p. 460). Remarkably, the percentage of women within the HR discipline has increased from 30 percent to 62 percent in the past fifteen years, whereas the percentage of men has decreased from 70 percent to 38 percent (Ulrich, Younger, Brockbank, & Ulrich, 2013, p. 459).

Similar to the findings of Ulrich et al. (2013) Dhanpat et al. (2020) identified several competencies within HR to take advantage of the developments around Industry 4.0 (Dhanpat, Buthelezi, Joe, Maphela, & Shongwe, 2020, p. 4). HR professionals should focus more on a strategic approach in which four competencies are increasingly important; people enablement, creative innovator, change agent, and the strategic partner (Dhanpat, Buthelezi, Joe, Maphela, & Shongwe, 2020, p. 6).

During the COVID-19 pandemic Cognizant, the Centre for Future of Work and Future of Workplace, has looked into potential HR jobs ten years from now; it has visualized over 60

new HR jobs, along with required skills and a detailed set of responsibilities for each job (Brown, Meister, Styr, & Pring, 2020). All jobs revolve around five core themes that are mainly driven by AI, algorithms, and automation: individual and organizational resilience, organizational trust and safety, creativity and innovation, data literacy, and human-machine partnerships (Brown, Meister, Styr, & Pring, 2020, pp. 22-23). An understanding of the business and technologies involved, digital skills, critical thinking, forward-thinking, taking initiative, and communication skills are all becoming very important in the upcoming five to ten years, and are all similar to the skills that were found for the purchasing discipline, by Delke et al. (2021), as well as the findings of Ulrich et al (2013).

3. METHODOLOGY: A QUALITATIVE EXPLORATIVE MULTIPLE-CASE STUDY

3.1 Selection: Conducting an inductive multiple-case study

In this research, we try to better understand Industry 4.0 and its components. There is relatively little information on the future of roles and competencies, especially when comparing the sectors. According to Yin (2015), this allows for a case study (Yin, 2015). Moreover, Yin also argues that for questions involving 'how', 'why', and 'to what extent' a multiple-case study is the best option (Yin, 2015). Thus, this research can be defined as qualitative research; it is exploratory and allows for case studies, which can provide a lot of information (Snape & Spencer, 2003, pp. 2-4). Semi-structured interviews with open-ended questions provide the most insight into companies. The qualitative research will be inductive since the research allows for the development of explanations or theories and patterns (Rennie, 2006, p. 61). All companies selected for this research are located across the province of Overijssel in the Netherlands, and all but two firms have various locations across the Netherlands or Europe.

3.2 Sampling: Purposeful sampling

The population of this sample would encompass firms and jobs susceptible to automation and obsoletion, specifically within the four disciplines Purchasing, Logistics, HRM, and Marketing. The sample for the interviews will be a maximum of eight companies; two for each discipline. By conducting more than one interview per discipline the reliability and validity can be increased, and stratified purposeful sampling allows for the interviewing of subgroups of particular interest, as well as comparisons (Patton, 1990, p. 182). Even though purposeful sampling may decrease reliability because the sample can be chosen by researchers themselves, purposeful sampling does allow for more information-rich cases that are better related to the research (Maxwell, 2009, p. 23).

3.3 Measurement: The concept of the semi-structured interview

The interview will be a semi-structured interview, which means that there will be a list of topics used as a guideline, or a set of prepared questions. Interviewees' information will remain confidential at all times, and ethical approval by the UT is necessary. Furthermore, the interviews should have a maximum limit of 30 minutes, and the questions should be clear and objective to avoid confusion and unusable answers. The interviews should also avoid two-in-one questions, and by using multiple questions to assess one construct it will be easier and more reliable to make more specific conclusions and comparisons in the end (van Thiel, 2014, p. 95). The interview manual can be found in appendix 3. The questions can be asked accordingly, depending on the answers of the interviewees. Finally, the interview will be standardized; standardizing case studies or interviews increases reliability because it allows for replication (van Thiel, 2014, p. 100). If the results of the firms within the research are similar, they also increase in representativeness, and thus it is more likely that they can be generalized (Maxwell, 2009, p. 33).

The questions are based on both the objectives and previous literature to not only identify current roles and corresponding competencies but also to identify technological developments and how they influence the future of roles and competencies. The focus of the questions is on what activities the disciplines perform, what competencies they require for current roles, what they could require for future roles, and whether the disciplines themselves are already aware of possible future new jobs. In addition, questions about technological changes are asked; specifically, which technological developments, how they influence current activities, and how they might hinder or help future activities.

3.4 Data collection and analysis: Conducting and interpreting the semi-structured interviews

The data is gathered through interviews, as well as websites and publications by the firms. Permission to record the interviews is asked beforehand by the interviewer. If allowed, transcription has been conducted.

To avoid validity threats or keep them to a minimum respondent validation, 'rich' data, triangulation, and comparison can be used. Respondent validation can be defined as the systematical solicitation of feedback of the respondents themselves, and they should be taken into account along with the respondents' interview answers; 'rich' data will be collected during the interview, meaning that the interview should provide detailed information that varies enough to provide a complete picture of the research; triangulation is the use of different respondents, settings, individuals, or using a variety of methods, and it reduces the risk of systematic bias; comparison, already embedded in the research question, allows one to find potential irregularities, and to increase reliability (Maxwell, 2009, pp. 30-32).

Finally, through a narrative analysis of the interviews and websites, the answers of the interviewees are ascribed to the disciplines to draw conclusions, based on the steps from Ruona (2005). The interviews are first transcribed and anonymized. Secondly, familiarization is required to engage in the data. By relistening, rereading, taking notes, and actively engaging with the data it becomes easier to analyze the data. Next, the data can be coded, or simplified, which results in Cross-Table 1, and Tables 2 and 3. Finally, it becomes possible to interpret the data (Ruona, 2005) by organizing and comparing the coded data, as can be read in the results.

4. RESULTS: THE FUTURE OF THE VALUE CHAIN

4.1 The future of purchasing

For the purchasing discipline, two family businesses were interviewed and their responses were very similar. Firm 1 is slightly bigger than firm 2, which allows for more personnel and creating departments. Yet, in the future, both firms expect to grow, as can be seen in Table 1. Finally, firms accredit their

strong and short lines of communication to being a family business.

Both firms currently have approximately four to six purchasers, and one mostly upholds supplier relationships; thus they can be considered the supplier relationship manager or the supply chain manager. Both firms also have employees for inventory control. Firm 1 mentions that bigger firms most likely also have roles such as the procurement manager and categorized purchasers, whereas firm 2 also mentions that these firms are indeed much more specialized.

Along with the current roles, both firms stress the importance of analytical skills, strategic thinking, and a pro-active attitude. In addition, firm 2 mentions that they emphasize stress-resistance and flexibility, which can be because employees have more responsibilities since they fulfill multiple roles. In contrast, firm 1 did not explicitly mention either of the two skills but instead addresses teamwork. However, these differences can be accredited to the firms' size and one's number of responsibilities within the firm. These required skills are allocated based on what tasks need to be fulfilled per role; a purchaser needs to be able to negotiate and communicate very well, but they also need a basic knowledge of the firm's industry, for instance.

Both firms struggle with the same technological developments. First of all, they have to deal with the growth of systems, portals, and programs with which they have to work, as well as personalizing everything so that it fits their needs. In addition, the firms find it difficult to handle the digitalization of files and stock; firm 1 mentions that the arrival of new technologies and not yet optimized systems often causes double work, and thus it costs unnecessary time and money. Thirdly, there is an increased usage of Electronic Data Interchanges (EDIs), but due to the many different suppliers requiring different ways of communication and systems, it is very difficult to optimize EDIs throughout an entire firm. Despite these big challenges, both firms are very much open to such changes.

With regards to the changes of purchasing roles in the upcoming five to ten years, the firms unanimously agree that digitalization and automatization will not yet replace roles, but rather support them. Activities such as ordering and order picking might be automated or digitalized, but they will still require human involvement. New roles that will arise can be a system manager, data manager, or automation manager to deal with the growth of systems, programs, and portals; and a digital contractor and e-procurement manager to deal with digital ordering, buying, and selling, as well as digitalizing and ordering documents and files as digitalization and automation increases. Finally, firm 2 also mentions an innovation team or innovation manager to search for continuous improvements for the firm's processes.

As these roles evolve, the competencies will also change. Both firms agree that strategic thinking and a pro-active attitude remain important, they strongly emphasize the growing importance of analytical skills, (big) data analytics, and up-to-date technological skills due to Industry 4.0. Further, an innovative and creative mindset will be of relevance in creating a competitive advantage. Firm 1 mentions that both teamwork and communication will become very important to uphold customer service and contact as digitalization and automatization continue. Finally, firm 2 also mentions the continuous importance of flexibility.

Table 1. Interview results with competencies based on Bals et al. (2019)

	Value chain activity							
	Purchasing		***Logistics***		***Marketing***		***HRM***	
Interviewed firm	1	2	3	4	5	6	7	8
Company size	*Medium*	*Small*	*Large*	*Small*	*Medium*	*Small*	*Large*	*Medium*
Role division								
Very specialized	(X)		X (X)		(X)		X (X)	
Small departments	X	(X)			X	X (X)		X
One person fulfills multiple roles		X		X (X)				(X)
Competencies								
Stress-resistance		X	X (X)	X				
Flexibility		X (X)	X (X)	X (X)	(X)	X (X)	X (X)	X (X)
Pro-active attitude (curiosity, passion)	X (X)	X (X)		(X)	X (X)	X (X)	X (X)	X (X)
Teamwork / working in teams	X (X)		X	X (X)	X	(X)	X (X)	(X)
(Big) data analytics	(X)	(X)	(X)	(X)	X (X)	X (X)		X
Analytical skills	X	X	X	X		X (X)		
Communication skills	(X)		X		X (X)	X (X)	X (X)	X (X)
Decision-making skills			X		X		X	X
Innovative and creative mindset	(X)	(X)			(X)	(X)	(X)	(X)
Up-to-date technological skills	(X)	(X)	X	(X)	(X)	(X)	(X)	(X)
Strategic thinking skills	X (X)	X (X)	X (X)	X (X)	X	X (X)		
Main technological developments								
Growth of systems, portals, programs	X	X	X	X	X	X	X	X
Increasing usage of EDIs	X	X	X			X		
Digitalisation of files and stock	X	X		X	X			X
Focus on R&D and innovation			X		X	X	X	X
Future roles								
System manager	(X)	(X)	(X)	(X)			(X)	(X)
Data manager	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)
Talent manager			(X)	(X)	(X)	(X)	(X)	(X)
Automation expert or manager	(X)	(X)	(X)	(X)				
Privacy manager or expert			(X)		(X)		(X)	(X)
E-procurement manager or expert	(X)	(X)					(X)	
Innovation manager or team		(X)	(X)		(X)	(X)	(X)	
X = current, (X) = future								

4.2 The future of logistics

For the logistics discipline, one small firm and one large firm were interviewed, which result in some clear contrasts. For one, firm 3 is a big firm with over 15.000 employees. Every worker is assigned a specific task, and there are supervisors, team leaders, and site managers. Firm 4 is small and has approximately ten employees. Here, all warehouse employees can load and unload vehicles, take orders, run the warehouse, they can pack and check goods, and they can even work in the office; administration, order processing, billing, and contracting. Thus, in a larger firm tasks are much more specified whereas in a small firm one takes on multiple roles.

Both firms agree that any warehouse employee must be stress-resistant and flexible because of the time pressure for activities such as loading, unloading, and delivering on time. Furthermore, analytics and strategic skills are also a must. Finally, for supervisors, team leaders, and site managers it is important that they are motivating, convincing, innovative, pro-active, and they should be confident in their decision-making. Similar to purchasing, the required skills for logistics roles are allocated based on the tasks that need to be completed for both every day and specific projects or orders.

Within logistics, there are many technological developments that either speed up or slow down processes. Firm 3 mentions the growing complexity of systems, portals, and programs, and implementing them correctly. These include inventory control systems, ordering systems, and new programs that optimize activities such as picking and packing. However, firm 4 finds it challenging to keep up with their competition and all such changes since they do not have the same financial resources as businesses like firm 3.

Similar to the purchasing discipline, automatization and digitalization will be supportive and make roles easier, rather than replace roles. Secondly, the number of support activity workers will decrease, the number of workers in IT, programming, and machine maintenance will increase. Finally, there will be much more emphasis on sustainability and decreasing a firm's ecological footprint; less use of paper and printing, and increased usage of digital sources and EDIs. All in all, the evolution of roles in the upcoming five to ten years is very diverse. New roles that might arise are all related to the aforementioned technological developments. A system manager would be beneficial to monitor systems, platforms, and programs within a firm and to keep them up-to-date. He or she could work together with an innovation team to identify new or significantly important technologies that the firm could use to its advantage. A (technological) teaming manager could be implemented to make sure that an employee is at the right place in a company, to relocate employees in the case of automatization or digitalization, and to ensure that all employees can adapt to new technologies in a way that works for them. The (technological) teaming manager could work together with a talent manager to ensure personal development. To guarantee that automatization is implemented correctly and works accordingly a Robotic Process Automation (RPA) manager or a ramp-up manager could be assigned, and a data maintenance officer could be ascribed to correctly analyze and assess available data, as also mentioned by Delke et al (2021) in their research on purchasing roles.

In the future, communication skills, stress resistance, and flexibility will remain important competencies. Next, both firms emphasize the increasing need for up-to-date technological skills, specifically due to the development of systems such as EDIs and Building Management Systems (BMSs). Furthermore, an innovative and creative mindset will become very important, along with a pro-active approach, because the independence of employees will increase.

4.3 The future of marketing

For the marketing discipline, a medium-sized and a small firm were interviewed. Currently, they both work with small departments and only the medium-sized firm expects to grow to very specialized departments and roles, whereas the small firm thinks they will keep their divisions as they are.

Marketing is already a very specialized discipline. This is because it is all about achieving a competitive advantage, which requires creativity and innovativeness, as well as detailed research. Roles range from a product marketing expert, brand manager, and public relations manager to a Search Engine Optimization (SEO) expert and a social media expert. However, both firms explain that marketing is also a very broad discipline in which there are plenty of roles, partly due to the specialization; marketing can range from product marketing to social media and email marketing, but it also encompasses marketing research.

Along with these roles come required skills such as data analytics and analytical skills, which are needed to analyze the market's reaction to marketing strategies; communication skills, which are required since marketing is all about communicating with others; and teamwork, since one marketing strategy involves many different marketing aspects. Firm 5 also mentions the importance of a pro-active attitude and sufficient decision-making skills, whereas firm 6 also considers flexibility and strategic thinking skills as important.

Marketing is advanced, but still deals with many technological developments. Firm 5 mentions that there are plenty of systems and programs, but it is difficult for a firm to find technologies that fit with a firm's way of working and its current technologies. This was also mentioned in both the purchasing and logistics disciplines. Next, firm 6 also mentions the growth of EDI usage and the diversity of technologies to choose from. One final challenge is creating brand awareness and distinguishing oneself in a fast-developing, digitalizing environment.

Both firms 5 and 6 agree that automatization and digitalization will not replace any marketing roles yet, but rather simplify roles and tasks. For instance, firm 6 mentions that for interior designers, and real estate agents VR glasses can become a very useful tool in showing what blueprints will look like. In addition, through the usage of Search Engine Optimization (SEO) or Content Management Systems (CMSs) like WordPress it becomes much easier to assess advertisement campaigns and other marketing tools. In the upcoming ten years a heatmap expert, campaign expert, and corporate visual identity expert could arise. Secondly, a potential (technological) teaming manager could be implemented, or a data manager, which has been mentioned in all other disciplines already. A talent manager could be implemented to work together with the (technological) teaming manager in ensuring that everyone is at the right place in a company. Finally, firm 5 also mentions the potential for a privacy manager or expert because of the growing digitalization and automatization and the increasing amount of digital data.

As the emphasis on technology increases, more up-to-date technological knowledge will be required. Whereas marketing used to be about advertising and creating sales, it is now also about analyzing reactions, trends, patterns, and outcomes, as well as using all possibilities to reach the public. Thus, besides the up-to-date technological skills, there are plenty of other important skills; a creative and innovative mindset, communication skills, and (big) data analytics are also becoming increasingly important in the upcoming five to ten years to deal with, for instance, systems for Customer Relationship Management (CRM). Teamwork is also emphasized to achieve a competitive advantage. Finally, the focus on talent management and adaptability increases, because one needs to keep up with their competition, or maintain a competitive advantage.

4.4 The future of human resource management (HRM)

For the HRM discipline, a medium and a large firm were interviewed. The firms' main departments are based on inflow, throughflow, and outflow of personnel, along with total rewards and salary. In addition to these, firm 7 also has a learning and development department, and a department that focuses on projects such as a new so-called success factor system. In fact, firm 7 already has an innovation team, unlike the purchasing and logistics disciplines. Overall, this structure can be retraced to Ulrich's (1996) matrix of HR roles; administrative roles, employee involvement roles, strategic roles, and research and development roles (Ulrich D. , 1996, pp. 24-35).

Specific HRM roles range from recruiters, employee relation managers, and development managers to payrolling specialists and policy specialists.

Current competencies that both firms agreed on are flexibility, a pro-active attitude, communication skills, and decision-making skills. These are all required because rather than focus on administration and personnel management, HRM is now about employee engagement and strengthening a business' culture. Further, firm 7 also mentions the importance of teamwork, whereas firm 8 addresses (big) data analytics.

HRM has already had to deal with plenty of technological developments. For one, many files and documents are transferred through email, online portals, and platforms such as Microsoft Teams. However, there are many more developments coming. Firm 7 mentions the growth of AI, which can be of use in many different ways; AI enables quick search for potential job candidates and its assistance provides a much quicker pre-screening of such candidates, for instance. Additionally, the use of EDIs has increased tremendously. A third technological development is the growing complexity of existing platforms, systems, and portals; HR managers now have to look beyond the basic knowledge required for a function; a much broader (technological) knowledge is required to function well enough.

Both firms agree that support activities such as the mailroom or the receptionist, as well as administrative tasks, can be digitalized and automated. IT and the juridical department will see new roles; due to digitalization (digital) data protection and privacy will become more important. Especially privacy will become more important in the upcoming ten years; the more digitalization and automatization, the more a firm needs to comply with the European General Data Protection Regulation (GDPR). Thus, roles such as data analysts or data facilitators, privacy managers, and digital managers are highly likely within the next five years. For both firms, the importance of human contact between colleagues and clients becomes increasingly important. A new role such as a human network manager is very likely. Firm 7 explicitly mentions the importance of talent management as a future role. Finally, a technological teaming manager role can be created to ensure that all personnel can work with the firm's technologies and to ensure that everyone can adapt adequately to changes.

In the future competencies will change as roles change. However, current HR competencies that will remain important include soft skills like flexibility, communication skills, and teamwork, but also other skills such as strategic insight and a pro-active attitude. Both firms agree that in the future it will be very important that one is technologically up-to-date, and they should be open to change; a change management team is advised if firms are planning to implement changes. There will also be more emphasis on an innovative and creative mindset to distinguish oneself from others. Finally, talent management will become more important, partly to encourage self-development, whereas one's diploma or resume will become less important.

5. A CROSS-COMPARISON ANALYSIS

5.1 Current roles across the disciplines

Across all four disciplines, there are both similarities and clear differences. For one, marketing is already much more ahead of the other three discipline with regards to roles that have adapted or new roles that have arisen due to technological developments; SEO experts, digital marketeers, social media marketeers, email marketeers, e-commerce experts, and many more already exist, while 'traditional' roles such as customer service representatives are being replaced by so-called chatbots that are based on AI. Within purchasing and logistics the roles are still mostly traditional; purchasers, procurement employees, material experts, blue-collar staff, traffic planners, and traffic controllers, for instance. Similarly, even though HRM does already focus on R&D and innovation and even though they are using technologies such as AI and machine learning, most people still work as recruiters, trainers, or payroll and policy employees. However, this can be explained; during the Covid-19 pandemic, social media usage has increased by 13,2%, which means that there are 490 million active social media users (Chaffey, 2021). In addition, some of the most-used platforms are Facebook, Instagram, Youtube, and TikTok (Chaffey, 2021). Thus, it is very beneficial for marketeers to take advantage of such platforms as much as they can. Further, HRM can recruit employees via a platform like LinkedIn, but both purchasing and logistics have little to do with social media. This explains why marketing and HRM are ahead of the purchasing and logistics disciplines in terms of future roles and competencies, and their anticipation for technological developments.

5.2 Currently important competencies

Table 2 shows the competencies that were identified during the interviews. All four disciplines consider flexibility, a pro-active attitude, and teamwork important competencies both now and in the future. These three competencies, along with communication skills, allow a firm to work more efficiently in the long run. Remarkably, communication skills are important for both marketing and HRM, but it is barely mentioned for purchasing and logistics. Marketing is all about communication, as the goal is to deliver the firm's message to the public; HRM works with human resources, which requires communication about many things; yet, purchasing and logistics also involve a lot of communication towards suppliers and clients, but the lack of emphasis on communication skills here can be because the interviewees considered other competencies more important before thinking of communication itself. Similarly, strategic thinking skills are considered very important in purchasing, logistics, and marketing, but they are not at all mentioned for HRM. This can be accredited to the fact that the first three disciplines are primary activities that are actively involved in the product or service, whereas HRM as supportive activity is a rather overarching discipline that supports the entire firm, and thus the other three disciplines, in situations related to employees.

5.3 Technological influences

Whereas purchasing and logistics firms are facing the increasing usage of EDIs, marketing and HRM firms have to deal with an increase in research and development (R&D) and innovation. In other words, purchasing and logistics are much more production-oriented, which means that they are more involved with business-to-business (B2B) relationships, whereas marketing and HRM are rather 'service' oriented, facing more business-to-consumer (B2C) relationships and the increasing usage of social media and the Internet of Things. The research of

Table 2. Competencies from the interviews, based on Bals et al. (2019)

Current competencies			
Purchasing	**Logistics**	**Marketing**	**HRM**
Stress-resistance	*Stress-resistance**	*Flexibility*	*Flexibility**
Flexibility	*Flexibility**	*Pro-active attitude**	*Pro-active attitude**
*Pro-active attitude**	*Teamwork**	*Teamwork*	*Teamwork*
Teamwork	*Analytical skills**	*(Big) Data analytics**	*(Big) Data analytics*
*Analytical skills**	*Communication skills*	*Analytical skills*	*Communication skills**
*Strategic thinking skills**	*Decision-making skills*	*Communication skills**	*Decision-making skills**
	Up-to-date technological skills	*Decision-making skills*	
	*Strategic thinking skills**	*Strategic thinking skills**	
Future competencies			
Purchasing	**Logistics**	**Marketing**	**HRM**
Flexibility	*Stress-resistance*	*Flexibility**	*Flexibility**
*Pro-active attitude**	*Flexibility**	*Pro-active attitude**	*Pro-active attitude**
Teamwork	*Pro-active attitude*	*Teamwork*	*Teamwork**
*(Big) Data analytics**	*Teamwork*	*(Big) Data analytics**	*Communication skills**
Communication skills	*(Big) Data analytics**	*Analytical skills*	*Innovative/creative mindset**
*Innovative/creative mindset**	*Up-to-date technological skills*	*Communication skills**	*Up-to-date technological skills**
*Up-to-date technological skills**	*Strategic thinking skills**	*Innovative/creative mindset**	
*Strategic thinking skills**		*Up-to-date technological skills**	
		Strategic thinking skills	

* = mentioned by both firms

Castelo-Branco et al. (2019) and others argue that Industry 4.0 is driven by new production possibilities and technologies; however, the production aspect is not discussed in this paper, because it can be ascribed to the primary activity 'operations' in Porter's value chain (Porter, 1985, pp. 36-38).

All disciplines deal with the growth of systems, portals, programs, yet purchasing, logistics, and marketing all struggle with finding the right technologies, implementing them, and personalizing them according to the firm's needs. Due to the extreme growth of such systems, platforms, and programs it can be difficult for firms to find the right one, which is why they might be struggling. Next, technologies such as AI and machine learning are greatly influencing the way disciplines work and how they change; for instance, every discipline is somewhat struggling with the digitalization of files and stock, and finding their way in what works best for them. Whereas the purchasing and logistics disciplines are mostly trying to digitalize their stock as efficiently as possible, marketing and HRM are dealing with the digitalization of files such as payrolls, policies, and contracts. Again, these changes can be accredited to purchasing and logistics being automation-focused, while marketing and HRM are rather service-oriented.

The model in Figure 2 can be created to determine the consequences of such technological developments; on the one hand, technological development such as AI can support roles and take over tasks to save time, which simplifies a role and enables a person to specialize. Eventually, this can lead to new roles; for instance, rather than general digital marketing experts, there are now also SEO experts and social media experts. On the other hand, technological developments can also replace so many tasks that it leads to a merge of roles or a complete loss of roles. Finally, radical technological innovations can lead to new roles at any given time in the future.

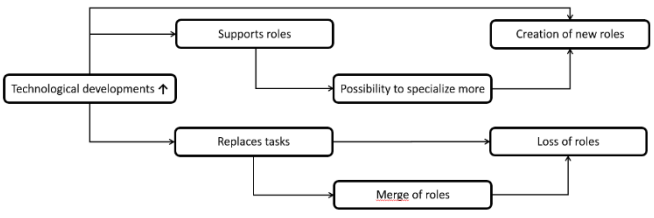

Figure 2. Possible consequences of technological developments

5.4 Competencies of the future

Another observation from this research is that HRM is competency-focused, and through R&D departments it analyzes future potential competencies and how to adapt to changing situations. Moreover, the HRM firms that were interviewed mentioned the worry about how some lower-educated and some older employees might experience difficulties in adapting to the digitalization and automatization of Industry 4.0 because it is getting too complex. In addition, all firms except for firm 5 explicitly stress the importance of flexibility and adaptability in the future, and most also strongly emphasizes the future potential of a talent manager and change management to bridge the potential gap; all firms except for the purchasing discipline firms.

As already mentioned, current skills such as flexibility, a pro-active attitude, and teamwork remain important skills in the future across all four disciplines. In addition to these, up-to-date technological skills are also stressed across all disciplines, due to the various technological developments; the increasing usage of systems, portals, programs, and EDIs, as well as the digitalization and automatization that includes AI, blockchain technology, and machine learning. Moreover, whereas analytical skills are currently very important skills within purchasing, logistics, and marketing, in the future the emphasis will be on (Big) Data analytics, due to the increasing digitalization of data. Further, strategic thinking skills will remain very important within purchasing and logistics to keep the processes optimized and profitable. Finally, the innovative and creative mindset is mentioned by all disciplines except for logistics, even though one firm mentioned it as a currently required skill. Moreover, firm 3 explicitly mentions their emphasis on innovation, automatization, and robotization on their website. The skill is necessary to create competitive advantages and to keep up with the competition, especially with fast-changing activities such as marketing.

Overall, the future of professionals in every part of the value chain is changing. It is no longer enough to be a so-called silo professional; only discipline-related skills are no longer enough. Moreover, besides a deep understanding of a discipline or activity itself, one also needs to possess a variety of other competencies, for instance from other disciplines, to be able to work in a field with enough ease and confidence. This can be referred to as the T-shaped professional (Schiele, Bos-Nehles, Delke, Stegmaier, & Torn, 2021, p. 8)

Table 3. Future roles based on the interviews

Purchasing	Logistics	Marketing	HRM
*System manager**	*System manager**	*Data manager**	*System manager**
*Data manager**	*Data manager**	*Talent manager**	*Data manager**
*Automation manager** *(RPA) manager*	*Talent manager**	*Privacy manager*	*Talent manager**
*E-procurement manager**	*Automation manager** *(RPA) manager*	*Innovation manager**	*Privacy manager**
Innovation manager	*Privacy manager*	*Corporate visual identity expert*	*E-procurement*
Digital contractor	*Innovation manager*	*Campaign expert*	*Innovation manager*
	Ramp-up manager	*Heatmap expert*	*Human network manager*
	(technological) teaming manager	*(technological) teaming manager*	*(technological) teaming manager*

* = mentioned by both firms

5.5 The future of roles

Table 3 displays potential future roles for all four disciplines. First and foremost, both the purchasing and logistics firms mentioned that technological developments in the upcoming five to ten years will mostly be to support roles and tasks. In contrast, within marketing and HRM it was mentioned that digitalization and automatization are already taking over a lot of tasks through programs, AI, and machine learning. To keep up with such changes the disciplines all participate in relevant courses, and when new technologies are introduced all eight firms benefit from R&D and ICT departments or externs that assist where needed.

Even though AI or machine learning is not new, they have only been implemented intensively in the last few years. Within purchasing it can eventually help recognize potential suppliers or buyers, and identify supply chain issues, but it can also perform day-to-day tasks such as invoice processing and data processing. If you combine AI and RPA for both purchasing and logistics back-office operations such as repetitive data-related tasks, picking, and packing can be automated; eventually, human error probabilities will decrease. For marketing, machine learning and AI can be used to recognize data flow and leads to optimize targeting and campaigning on various platforms; or they can create content as well as read content in an SEO optimized way. All of these optimizations eventually replace tasks and roles, such as the SEO expert or content marketeer, but they also assist other roles like a lead generator. Finally, for HRM AI can increase employee productivity overall: in talent acquisition processes it can do candidate screenings; it can optimize HR management by managing payrolls, analyzing policies and successes, or investigate corporate compliances; and finally, it can analyze data such as employee performance. Such optimizations can lead to simplification of roles such as the accountant or the recruiter.

Overall, all eight firms think that an innovation manager and a data manager will be relevant roles in the future. This can be accredited to the automatization and digitalization of Industry 4.0; an innovation manager will investigate innovations and their potential to a firm to constantly optimize processes, add value to products or services, and work as efficiently as possible. This is will be necessary because due to globalization consumer demands are rising; everything must be faster and cheaper, so firms must keep up. Also, there will be more digital data and it needs to be managed to be able to use it efficiently and effectively, which the data manager will then do. Due to the increase of digital data logistics, marketing, and HRM all agree that a privacy manager will also arise to make sure that a firm complies with regulations related to digital data usage and storage. Furthermore, purchasing, logistics, and HRM also think that all systems, programs, and portals are getting so complex that it is too complicated for everyone to understand, so one person or a team of system experts would be beneficial. Finally, logistics, marketing, and HRM believe that a (technological) teaming manager will be necessary to make sure that everyone within a firm can keep up with the technological changes and innovations.

6. DISCUSSION

6.1 Theoretical implications

6.1.1 Purchasing: theoretical implications

For purchasing, both current and future skills are similar to the skills found by Giunipero et al. (2005), except for teamwork, analytical skills, and up-to-date technological skills. However, the latter two skills were found by both Bals et al. (2019) and Delke et al. (2021). Though, teamwork was mentioned by only one firm for both the current and future competencies; this can be a geographical observation due to the strong culture in firms from Twente.

All the roles identified in the interviews correspond with the roles that Delke et al. (2021) established in their research. Moreover, the system manager, data manager, talent manager, and innovation manager have all been mentioned for at least three disciplines, which indicates that there is interest in the roles.

6.1.2 Logistics: theoretical implications

McKinnon et al. (2019) argue that technological expertise, along with data analysis are currently required competencies within logistics. The interviews support this and even amplify this with skills such as stress resistance, flexibility, and teamwork. Firm 7's list of skills also fits with the future competencies that McKinnon et al. (2019) mention, which can be accredited to the fact that firm 7 is already a large, very developed firm that has plenty of resources available to anticipate the changes of the future; both speculate that leadership, communication, up-to-date technological skills, and data analysis will be very important in a few years.

Future roles in logistics are very similar to those identified by Delke et al. (2021) for the purchasing discipline; the system manager, data manager, automation manager or RPA manager, and the innovation manager can all be the same as in the purchasing discipline because both disciplines are production-oriented.

6.1.3 Marketing: theoretical implications

From the core-marketing skills to the skills identified in this research, almost everything is similar to the findings of Giunipero et al. (2019) and Cognizant (2019), except for the skills flexibility, a proactive attitude, and teamwork. These skills were found in the interviews, but not in the literature. However, the importance of these skills may have increased throughout the

Covid-19 pandemic due to the little in-person networking. Finally, Cognizant (2019) mentioned negotiation skills, which was not at all mentioned during the interviews; both interviewed firms did not specifically consider these as important skills in marketing, but rather in other disciplines.

Similarly, the future of roles in marketing analyzed in the interview is much the same as those mentioned by Giunipero et al (2019); specializations in social media, big data, and tasks such as heatmaps and branding or corporate visual identity. However, in the interviews, it was also mentioned that AI can assist in such roles by, for instance, content optimization. Giunipero et al. (2019) might not have mentioned this because AI is now more widely known and used than in 2019. Finally, roles such as the data manager, system manager, and innovation can be related to the research of Delke et al. (2021) in the purchasing discipline, where the fourth industrial revolution allegedly started; such roles are very much related to the automatization and digitalization that marketing is also dealing with.

6.1.4 HRM: theoretical implications

HRM is already very advanced. Besides basic HR knowledge, current and future skills include advanced communication skills, flexibility, a pro-active attitude, and teamwork. These are also mentioned by SHRM (2018) as well as Cognizant (2019). However, SHRM (2018) also mentions critical evaluation and ethical practice, which the interviewees might not have mentioned because they view it as normal and already incorporated in their firms. Cognizant (2019) also adds up-to-date technological skills to the already mentioned future skills, because of the growing complexity of technology.

Ulrich et al. (2013) and SHRM (2018) already distinguished between generalist roles and specialist roles, but within HRM specialist roles will only increase according to the interviewees; think of the privacy manager and human network manager. This is due to technologies such as AI being able to take over certain tasks; this is further elaborated based on Figure 2. Again, roles such as the system manager, data manager, and innovation manager can be retraced to Delke et al. (2021) and the purchasing discipline, where most of the research on Industry 4.0 originates from. Finally, firm 7 mentioned a change management team, while Dhanpat et al. (2020) suggested a change agent to successfully adapt to changes in a firm; this can be beneficial for upcoming technological developments of Industry 4.0

6.2 Managerial implications

The influence of technologies on the future of roles and competencies is increasing. Moreover, technologies such as AI, machine learning, and blockchain technologies along with systems and platforms like EDIs and BMSs are already widely used across the disciplines. When such technologies are applied more and getting more complex, it can be difficult to keep up. However, purchasing, logistics, and marketing could look at HRM and study how HRM tackled the struggles of competencies and technologies. All disciplines could opt for a team of change management experts, innovation experts, or technology experts to investigate what technologies would best fit a firm, how, and to what extent this changes the firm's dynamics. Finally, firms should take always take any opportunity to learn more about technologies, software, systems, and so on, but also on personal development, to avoid or mitigate such gaps in technology, because these technologies offer many benefits. By including roles in this research it becomes easier to assess to what extent a discipline, firm, or role needs to consider certain technological implementations. However, it should also be kept in mind that even though technologies can replace roles such as the receptionist, it also offers plenty of opportunities for new roles like a privacy manager, as illustrated in Figure 2.

While many roles are very discipline-related, increasingly more roles require a general set of competencies besides core competencies, and more roles are affected by technologies in some way. Due to technologies taking over many tasks and simplifying them, many new specializations can be created, as Ulrich et al. (2013), SHRM (2018), and Cognizant (2019) also concluded. By looking further into their research, management could be able to better visualize and anticipate the future of roles and competencies. Increasingly more specialist roles can be applied to all four disciplines, such as the data manager, system manager, innovation manager, and talent manager, also identified by Delke et al. (2021). Overall, it can be stated that the sets of future roles and competencies are not getting more complicated, but rather simplified and specialized to optimize performance; especially the number of T-shaped professionals and technology-related roles such as an RPA manager will rise. Finally, as Dhanpat et al. (2020) mention, it would be wise to implement a change management team for such situations.

6.3 Limitations and future research

There are a few limitations to this research. First of all, given the timeframe of this research, a limited number of firms were interviewed. To improve the quality of this research, future research could benefit from a larger sample of firms. Secondly, to increase reliability and representativeness one could also interview three different groups of firms per discipline; small firms, medium firms, and large firms. Thirdly, in this research, the size of the firms varies for every discipline; this can lead to misrepresentations. The more firms are included, the higher the reliability and representativeness. Fourth, the interviewees were not given any examples or answers to choose from. Had examples such as a list of competencies been provided, it could have enabled more standardized answers, which would have made it easier to compare the disciplines. Finally, only one method of data collection was used. To get access to more data a survey could have also been used besides the interview.

Further research could look at other activities along the value chain, such as operations. When including the primary activity 'operations' one could also further investigate to what extent Industry 4.0 is driven by new production possibilities and technologies since many researchers mention that Industry 4.0 is driven by new possibilities and developments in the production process. One can also investigate how to implement future roles or how to update current roles with the changes in skills. Third, since HRM is a support activity whereas the other three disciplines are primary activities, one could investigate whether the future-oriented HRM competencies and roles can be of use within the primary activities of the value chain. Finally, the firms interviewed for HRM mentioned a potentially growing gap between lower-educated people and higher-educated people, as well as older and younger people. This can be further investigated; if this is the case, it would be wise to anticipate and investigate how to avoid such a gap.

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APPENDIX 1: PLANNING

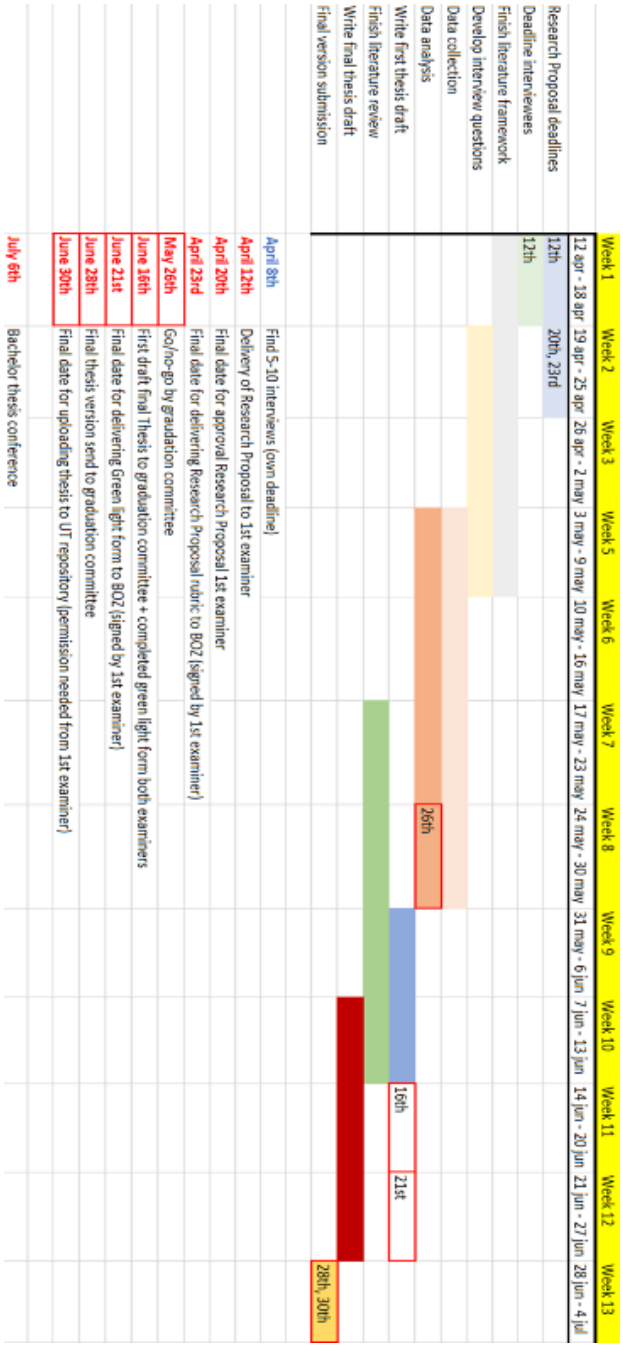

Figure 3. Planning for the thesis

APPENDIX 2: FIGURES

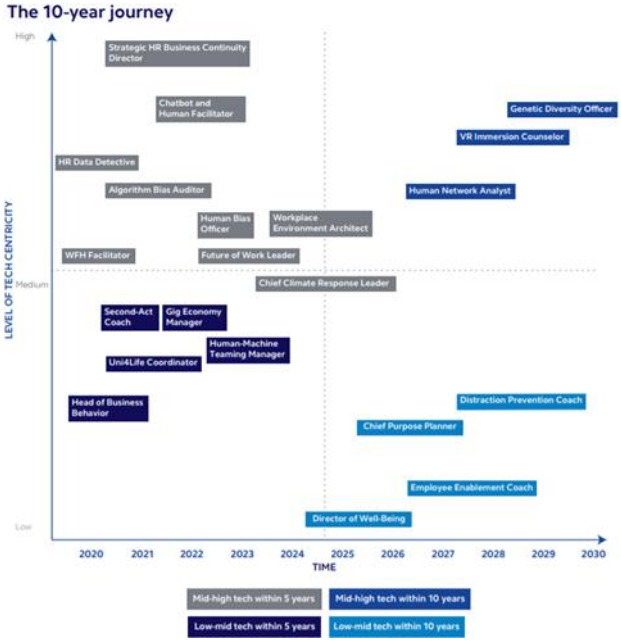

Figure 4. HR jobs of the future according to Cognizant

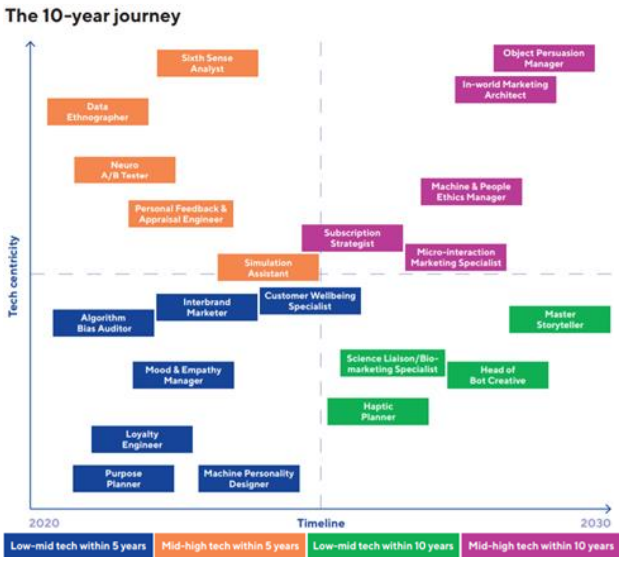

Figure 5. Marketing jobs of the future according to Cognizant

APPENDIX 3: INTERVIEW

Part 1: introduction

- Can the interview be recorded?
- Introduce myself and my research purpose
- Explain the procedure of the interview
  - Confidentiality
  - Leave at any time
  - Not mandatory to answer the questions
- Any questions before starting?
- Ask the interviewee to introduce him/herself
  - How long have you been working here?
  - What are your responsibilities?

Part 2: the rich information

Q1: Does the firm have job descriptions or roles within different departments and functions? Could you name a few examples?
Q1a: What are the most important job descriptions (roles)?
Q1b: How are the responsibilities appointed to the job descriptions (roles)?
Q1c: What does the (hierarchical) structure of the functions look like?

Q2: Do you allocate specific skills/competencies for each job description? *Clearly explain competencies; the abilities required for a certain job (e.g. communication skills, leadership, planning, creative thinking)*
Q2a: How do you define and update the skills needed for each job description (role)?
Q2b: What are the most important competencies per job description (roles)?

Q3: What are the most important technological developments in the environment of the firm within the discipline?
Q3a: Why are these most important?
Q3b: Which of these are the most challenging ones?
Q3c: Why are these challenging?

Q4: How does the firm deal with these technological changes? (how do they anticipate?)

Q5: Do the technological changes in any way affect the future of any roles within the discipline?
Q5a: How so / why not?
Q5b: Can this be considered positive or negative?
Q5c: Why so?

Q6: To what extent is the firm focused on future developments in technology, automation, and digitalization? *Ask for examples of innovations, actions, etc.*

Q7: Are there any competencies that were very important 5-10 years ago that are now obsolete or replaced?
Q7a: If yes, which ones?
Q7b: Why do you think that is?
Q7c: If no, why are they not obsolete/replaced (yet)?

Q8: Are there any competencies that are becoming increasingly important within the discipline?
Q8a: If yes, which ones?
Q8b: Why do you think that is?
Q8c: If not, why do you think that no competencies are becoming more important?

Q9: What are the most important competencies that you look for within the discipline as a firm?
Q9a: If possible, specify for certain roles

Q10: Which jobs do you think will become obsolete in 5-10 years?
Q10a: Why do you think that?
Q10b: How might they be replaced?

Q11: Which jobs do you think will be created in 5-10 years, rather than replace jobs?

Part 3: the closing

- Summarize the main points of the interview
- Does the interviewee have any more questions?
- Does the interviewee have any interesting topics left to discuss?
- Thank you for helping me.
- Would he/she like a copy of my final thesis?

Figure 6. Image sent along with the Email (English)

Figure 7. Image sent along with the Email (Dutch)

APPENDIX 4: LITERATURE REVIEW

Author	Source type	Year	Title; main topics	Part of paper	Review
M.J. Baker *S. Hart*	Book; collection of Elsevier articles	2008	The Marketing Book → types of marketing	Theoretical framework; marketing.	M.J. Baker has also written a book on marketing strategy and management, which has been cited over 1000 times. Both Baker and Hart are renowned professors related to Marketing and Business, and thus I consider this book reliable. It is fairly recent but still relevant.
L. Bals, *H. Schulze,* *S. Kelly,* *K. Stek.*	Elsevier article	2019	Purchasing and supply management (PSM) competencies: Current and Future requirements → terms and definitions: competencies and skills	Research question. Theoretical framework; purchasing.	These are well-known people within the PSM; authors and professors. They can be considered valid and reliable sources. The article is also very recent and it related very much so to this research.
V. Benson, *S. Morgan,* *F. Filippaios.*	Elsevier article	2014	Social career management: Social media and employability skills gap → potential future marketing skills	Theoretical framework; marketing.	The authors are all recognized professors. The article can be related to future marketing skills, hence the article is relevant and also considerably recent. Furthermore, the sources of the article are all most important within the technology and computer area.
R. Brown, *J. Meister,* *C. Styr,* *B. Pring.*	PDF from website	2020, May	21 HR Jobs of the Future → matrix of 21 future HR jobs; timeline and tech-centricity → underlying themes	Theoretical framework; human resource management	Cognizant is an American technology company for consultancy, information technology, and outsourcing services. It also looks at the future of many industries due to COVID-19; even without the pandemic. The pandemic can be considered an environmental change, along with the digitalization and automatization that followed. This source can be considered relevant for this paper. Moreover, this research was conducted very recently.
I. Castelo-Branco, *F. Cruz-Jesus,* *T. Oliveira.*	Elsevier article	2019	Assessing Industry 4.0 readiness in manufacturing: Evidence for the European Union → Industry 4.0 → Industry 4.0 technologies	Situation and complication. Research question.	This article is only used for the definition of Industry 4.0. The three authors are familiar with technological developments and economics, and they can be considered relevant and valid sources. It is also very recent.
D. Chaffey	Website (Smart Insights)	2021	Global social media research summary 2021 → Social media usage → Popular social media platforms	A cross-comparison analysis: competencies of the future	Smart insights is an educational platform for marketing that teaches digital marketing practices and provides constant marketing insights. The website is up to date and supported by other websites, so this makes for a reliable and recent source. In addition, the information is very relevant to the digital skills and social media usage explained in the cross-comparison. In addition, Dave Chaffey has written five (successful) books on Digital Marketing, so this also increases the reliability and representativeness of this source.

P. Cousins, *R. Lamming,* *B. Lawson,* *B. Squire.*	Course material; book	2008	Strategic Supply Management: Principles, Theories and Practice → definition of logistics	Theoretical framework; logistics.	The book is not extremely recent, but it was still used as course material in year 1 module 3 (Cohort 2018). It encompasses many different aspects of Supply Management and it includes the definition of logistics used in this paper. There are no strong opinions nor biases included; the book objectively covers the subjects.
V. Delke *H. Schiele* *W. Buchholz*	Article	2021	Specifying roles in purchasing and supply management in the era of Industry 4.0: a Delphi study → future roles	Theoretical framework; purchasing.	The authors have published numerous works within the Purchasing and Supply Management area; they can be considered reliable sources. The article is very recent and very relevant to the research done in this paper. Moreover, the research in this paper is somewhat based on this source.
V. Delke *H. Schiele* *W. Buchholz* *K. Stek*	Article	2021	Defining Industry 4.0 skills in purchasing and supply management. → current skills → future skills	Theoretical framework; purchasing.	The authors have published numerous works within the Purchasing and Supply Management area; they can be considered reliable sources. The article is very recent and very relevant to the research done in this paper. Moreover, the research in this paper is somewhat based on this source.
N. Dhanpat *Z.P. Buthelezi* *M.R. Joe* *T.V. Maphela* *N. Shongwe*	Article	2020	Industry 4.0: The role of human resource professionals → focus on the future → future competencies → the role of HR	Theoretical framework; human resource management	All are either professors or closely related to change and Industry 4.0; it is difficult to find a proper translation of the information on the Asian authors. The article has been cited enough times for me to consider it reliable enough to use. The article is very recent, and also relevant since it discusses the impacts of Industry 4.0.
A. Di Gregorio, *I. Maggioni,* *C. Mauri,* *A. Mazzuchelli.*	Elsevier article	2019	Employable skills for future marketing professionals → digitalization → skillsets → future job positions → customer-centred skills	Theoretical framework; marketing.	The authors are mostly professors very much focused on the future of work and economics, as well as technological developments. This can be considered reliable and valid. The article is also very recent, which increases its reliability as well as its credibility.
J. Fahy, *D. Jobber.*	Course material; book	2015	Foundations of Marketing → definition of marketing	Theoretical framework; marketing.	This book discusses the many aspects of marketing, including its definition and how to create value for a product or service. The book is barely six years old and as course material, it can be considered objective.
Forfás	PDF from website	2013	Future Skills Requirements of the manufacturing Sector to 2020 → current level of skills demand → future demand for skills → developments	Theoretical framework; logistics.	Forfás was the national policy advisory board for enterprise, trade, science, technology, and innovation of Ireland before its functions were transferred to the Department of Enterprise, Trade and Employment, Enterprise Ireland, and Industrial Development Authority and the Health and Safety Authority. Its subjects are still relevant and recent, so this is a valid source. Finally, there are no clear biases; only scenarios. It is not a scientific article, but I consider this reliable enough to use as a citation.

C.B. Frey, M.A. Osborne.	Elsevier article	2013	The future of employment: how susceptible are jobs to computerization? → technological change → wage inequality → skill demand → computerisation → task model	Theoretical framework; logistics.	The authors are well-respected professors with interests in economics, the future of work, and machine learning respectively. The article has been cited many times, making it a much more reliable source than other articles. The article is still relevant and relates very much so to Industry 4.0.
L.C. Giunipero, D. Denslow, R. Eltantawy.	Elsevier article	2005	Purchasing/supply chain management flexibility: moving to an entrepreneurial skill set → Changes in organizations → Future competencies/skills	Theoretical framework; purchasing.	Giunipero is a supply Chain Management professor who has written many papers on PSM. Denslow researches environmental science and technology and also researches the supply chain. Thus, these authors are very reliable and valid, and this paper is very relevant to the research since it relates to future competencies/skills, and the changes within organizations. The article is somewhat dated, but still very much relevant.
D. Lepak, M. Gowan.	Course material; book	2010	Human Resources Management: Managing Employees for Competitive Advantage → HRM definition → HRM activities and jobs	Theoretical framework; human resource management.	This book was used as course material in year 2 module 1 (Cohort 2018). It is about many aspects of HRM, including definitions, activities, and how to create competitive advantages. This source is considered reliable and relevant; a trustworthy source.
A. Manai, M. Holmlund.	Emerald Group article	2014	Self-marketing brand skills for future business students → current competencies for marketing jobs	Theoretical framework; marketing.	This paper is relevant for the marketing part because it describes current competencies for marketing jobs; thus this paper is considered relevant. It has not been cited many times, but that could also be because it was not cited properly by others; both authors are specialists in economics.
J.A. Maxwell.	SAGE article; book chapter	2009	Designing a Qualitative Study → research design; goas, conceptual framework, research questions, methods, validity, generalization	Research design.	This article provides a clear method for a research design, which is usable in this research. It was course material for the minor Public Management in year 3 module 1 (Cohort 2018). This research is objective and contains no opinions or biases; except for research bias explanations.
A. McKinnon, C. Flöthmann, K. Hoberg, C. Busch.	World Bank Group; research paper	2017	Logistics Competencies, Skills, and Training: A Global Overview → four levels of employment → skills shortages → enhancing logistics competencies	Theoretical framework; logistics.	The authors have great experience in the logistics sector and trade, so they are reliable, while their findings are relevant for this research. It is also very recent, which makes it more reliable than older sources.
R. Monczka, R. Handfield, L. Giunipero, J. Patterson.	Book	2016	Purchasing & Supply Chain Management → value chain; supply chain → inbound/outbound transportation → shipping/warehousing/distribution	Theoretical framework; purchasing.	This book discusses Purchasing and Supply Chain Management in detail. The writers have produced many articles on the subject, and the book is very relevant and recent. The sources they have drawn their information from are also very reliable and thorough.

			→ receiving/handling/storage		
M. Mulder, R. Wesselink, H. Bruijstens.	Article	2005	Job profile research for the purchasing profession → definition of roles →	Introduction. Theoretical framework.	All three authors are experts in the field of competencies, roles, and their development. This increases their reliability. The research is not the newest, but it has been a good base for other research, such as that of Delke et al. (2021). Furthermore, this paper can be considered relevant for my research because it looks at the future of the purchasing profession, which I am also doing.
M. Patton.	Article	1990	Purposeful Sampling → types of sampling → purposes of the types	Theoretical framework; purchasing, logistics.	The article is 31 years old, but sampling is still a very important part of the research on sampling. M. Patton is known for his qualitative research, which makes this article of him much more credible and reliable. The article talks about the different types of sampling, which I used in my research design. Finally, this objective article does not contain any strong biases or opinions, and neither do the sources of the article.
M. Porter	Book	1985	The Competitive Advantage: Creating and Sustaining Superior Performance → value chain → primary activities → support activities	Theoretical framework. Logistics	Michael Porter is a well-known author and researcher. He is also known for the creation of the Five Forces to analyse competition. This is thus a very reliable source. Furthermore, his basis of the value chain is of high relevance still, which makes this very relevant, although the original book is dated. I consider this a valid source.
B. Pring, E. Davis, V. Boland.	PDF from website	2019, April	21 Marketing Jobs of the Future → matrix of 21 future Marketing jobs; timeline and tech-centricity	Theoretical framework; marketing.	Cognizant is an American technology company for consultancy, information technology, and outsourcing services. It also looks at the future of many industries due to COVID-19; even without including the pandemic, this paper would be considered an environmental change. Thus, this source can be considered relevant for this paper. Moreover, this research was conducted very recently.
D. Rennie.	Elsevier article	2006	The Grounded Theory Method: Application of a Variant of its Procedure of Constant Comparative Analysis to Psychotherapy Research → inductive research	Research design.	The article has been cited frequently, and few parts are relevant for this research. The sources used are very much reliable, and even though the article is a little dated it is still applicable.
H. Schiele.	Book; chapter 4	2019	Chapter 4: Purchasing and Supply Management → purchasing definition → objectives → roles → Kraljic matric	Theoretical framework; purchasing.	Schiele is a professor at the University of Twente, who has looked into Industry 4.0 and the future of Purchasing through many of his works; he is a reliable and relevant source of information for this research. In addition, the book is very recent, which increases reliability.

H. Schiele *A. Bos-Nehles* *V. Delke* *P. Stegmaier* *R.J. Torn*	Article	2021	Interpreting the industry 4.0 future: technology, business, society and people → T-shaped professionals → silo shaped professionals → 5 pacemaker technologies	A Cross-comparison analysis: competencies of the future	The five authors have worked on various papers and projects related to Industry 4.0 and the future of roles and competencies for projects such as PERSIST at the University of Twente. Thus, this source is very reliable. The article was written very recently, which also increases reliability. Finally, the paper is relevant as it discusses future technologies related to Industry 4.0.
SHRM.	Website	2016	SHRM Competency Model → current and future competencies in HRM	Theoretical framework; human resource management.	SHRM is a professional HR membership in the US that promotes the HR profession; it might be slightly biased, but it provides relevant information. It researches many workplace issues and their implications. With technology as a workplace issue or environmental change, this research can be considered relevant for the paper.
SHRM.	Website	2018	Careers in Human Resource Management → current skills → current jobs within HR areas	Theoretical framework; human resource management.	SHRM is a professional HR membership in the US that promotes the HR profession; it might be slightly biased, but it provides relevant information. It provides insight on current HR skills, as well as potential current jobs. It is very relevant and recent.
D. Snape, *L. Spencer.*	SAGE article	2003	The Foundations of Qualitative Research → qualitative research definition, when to use	Research design.	Both authors have much experience in qualitative research, and even though the paper might be old, it is still relevant and frequently used nowadays. In addition, the paper is included in a book with papers of many other qualitative research writers.
A. Tipping, *P. Kauschke.*	PDF from website	2016	The future of the logistics industry → changes and developments in logistics → future scenarios	Theoretical framework; logistics.	PWC is one of the Big Four professional service firms, along with Deloitte, Ernst & Young, and KPMG. It is the second biggest firm of the four, and it stands out with its strong audit department. Because the firm focuses on diversity, inclusion, and improving social circumstances they do a lot of researches into both current situations and future situations. Because it is an 'outsider' for logistics it can be seen as an objective source. In addition, due to digitalization and automatization the future of jobs/roles is also very relevant.
D. Ulrich, *J. Younger,* *W. Brockbank,* *D. Ulrich.*	Elsevier article	2013	The State of the HR profession → HR skills and knowledge → generalists and specialists	Theoretical framework; human resource management.	Ulrich is also often called the "Father of modern HR", so this can be considered a valid source for HRM aspects, especially its required skills and competencies. Ulrich's works are still very relevant as well as recent, and contain little to no biases; neither do his sources. In addition, the other authors are also very reliable authors related to HR.
PERSIST.	Website		Purchasing Education Research Syndicate: Industry 4.0 Skills Transfer → Industry 4.0 → Project PERSIST	Academic relevance.	The University of Twente is a technical university that puts a lot of emphasis on the future. PERSIST is a relevant authority to refer to in the context of Industry 4.0.

			→ Project objectives		
S. Van Thiel.	Book	2014	Research Methods in Public Administration and Public Management, an Introduction → case study research → selection of cases → reliability and validity → interview types → interview manual	Research design.	S. van Thiel is a Professor of Public Management and has been researching for 25 years. For (case study) research the items discussed in this part of the book are very important and thus the author is considered valid and reliable. Since it was written in 2014 it is still considered relatively recent. Finally, there are no biases or opinions in the text.
R. Yin	Book	2015	Case Study Research: Design and Methods → when to use case study → designing case study	Research design.	Yin is a well-known scientist for his work on both case study design and qualitative research. This makes him a very reliable source, as well as very relevant. Even though research design information remains valuable for a long time, it is good that this book is still fairly recent.