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## A Systematic Literature Review Approach

Dennis Grenda

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SARJA – SER. E OSA – TOM. 129 | OECONOMICA | TURKU 2025

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## ABSTRACT

In an era defined by rapid technological advancement and pervasive digital transformation, the role of managerial competence has undergone significant evolution. The advent of digital technologies and the integration of Artificial Intelligence (AI) within organizational contexts have not only transformed operational processes but also altered the skill set required of managers. As organizations increasingly rely on digital tools and AI technologies for decision-making, fostering personalized customer interactions, and streamlining operations, understanding the competencies that managers need to thrive in this landscape has become paramount. This dissertation aims to systematically explore the managerial competencies essential to deal with the challenges of the digital age. Rather than focusing on a specific type of manager or industry, managerial competencies are explored generically.

The primary research question guiding this dissertation is: "What competencies do managers require to successfully navigate in the digital age?" Addressing this question involves investigating four research gaps identified in the existing literature. The first research gap pertains to terminological confusion surrounding the concept of competence, where interchangeable use of terms such as competence and competency creates ambiguity in defining what managerial competence actually entails. The second research gap highlights a lack of clarity regarding the underlying components of the concept of managerial competence, which are critical for developing comprehensive frameworks for managerial development. The third research gap concerns the under-explored relationship between digital competencies and traditional management competencies—scholars note a scant examination of the specific digital competencies required for effective management and the need for models that represent these skills. Finally, the fourth research gap addresses the inadequacy of understanding managerial competencies essential for successful AI implementation, which is frequently studied from an organizational perspective without delving into the individual competencies required from managers.

To address these research gaps, this dissertation employs a non-empirical research approach consisting of three systematic literature reviews. A non-empirical approach is suitable as it allows for a comprehensive synthesis of existing theoretical frameworks, terminological nuances, and conceptual gaps. The systematic literature review is particularly advantageous due to its structured methodology, which facilitates the rigorous identification, evaluation, and integration of relevant studies.

These studies are analyzed through qualitative content analysis and semantic decomposition. This approach enables a thorough exploration of the four identified research gaps while ensuring a coherent and replicable analysis that can inform future empirical research and managerial practices.

The findings of this dissertation are organized into three essays. In the first essay, the components of the concept of managerial competence are defined and clarified. The research reveals a lack of adequate definitions in nearly 36% of the reviewed articles, prompting the identification of seven key components of managerial competence: role, proficiency, disposition, capability, action, context, and effectiveness. This comprehensive understanding lays the groundwork for subsequent discussions around the necessary competencies in the digital era.

The second essay proposes a structured model of digital managerial competencies encompassing three dimensions: Technological knowledge, soft skills, and e-leadership skills. The research underscores that a manager's understanding of digital tools and leadership abilities significantly impact their effectiveness in virtual environments. The importance of both technological understanding and soft skills is accentuated, with evidence suggesting that the latter has become indispensable in contemporary work life, especially post-COVID-19 when remote work has proliferated.

Finally, the third essay delves into the distinction between traditional managerial competencies and those necessary for effective AI implementation. The analysis of 27 articles leads to the identification of 40 AI-related managerial competencies organized into nine competency dimensions. This inquiry reveals that while many competencies remain pertinent in the AI context, significant extensions and new competencies emerge, reflecting the evolving challenges managers face in integrating AI technologies into their workflows. Critical competencies identified include 'Integrating AI with Human Workers' and 'Being Curious to Learn about AI', emphasizing ongoing learning and adaptation as essential AI-related managerial competencies for effective leadership in the digital age.

This dissertation contributes to research as follows. Firstly, it clarifies the conceptual ambiguity surrounding the concept of managerial competence by formulating an original definition. Secondly, it enhances understanding of the concept of managerial competence by examining its underlying components, thus addressing foundational gaps in the management literature. Thirdly, it proposes a framework for digital managerial competencies for educators and organizational leaders to develop training and skill-building programs tailored to the needs of contemporary managers. Lastly, it identifies AI-related managerial competencies and shows how they differ from traditional managerial competencies.

In conclusion, this dissertation emphasizes the ever-increasing significance of managerial competencies in the digital age and presents a foundation upon which further research can build. As operating environments continue to evolve, equipping managers with the necessary competencies to adeptly navigate the challenges imposed by digital transformation and AI integration will be critical for organizational success.

KEYWORDS: Competence, Managerial Competence, Digital Managerial Competencies, AI-related Managerial Competencies, Digital Technologies, AI, Digital Age

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## TIIVISTELMÄ

Johtamiskyvykkyyksien rooli on muuttunut merkittävästi aikana, jota leimaavat nopea teknologinen kehitys ja digitaalinen murros. Digitalisaation ja tekoälyn (AI) soveltaminen työelämään eivät ainoastaan ole muuttaneet operatiivisia prosesseja. Ne ovat myös muokanneet johtajilta vaadittavia taitoja. Organisaatiot nojautuvat yhä enemmän digitaalisiin työkaluihin ja tekoälyteknologioihin päätöksenteossa, asiakaskohtaamisten räätälöinnissä ja toimintojen tehostamisessa, joten on tullut entistä tärkeämmäksi ymmärtää, millaisia kyvykkyyksiä johtajat tarvitsevat menestyäkseen tässä ympäristössä. Tämä väitöskirja pyrkii tarkastelemaan systemaattisesti minkälaisia johtamiskyvykkyyksiä vaaditaan digitalisoituvassa työelämässä. Tarkastelua ei ole rajattu tiettyyn johtajatyyppiin tai toimialaan; johtamiskyvykkyyksiä tarkastellaan yleisellä tasolla.

Tätä väitöskirjaa ohjaa tutkimuskysymys: "Millaisia kyvykkyyksiä johtajat tarvitsevat menestyäkseen digiaikana?" Kysymykseen vastaaminen edellyttää neljän kirjallisuudessa tunnistetun keskeisen tutkimusaukon tarkastelua. Ensimmäinen liittyy terminologiseen epäselvyyteen käsitteen "kyvykkyys" ympärillä; englanninkielisissä tutkimuksissa käsitteiden ”competence” ja ”competency” vaihteleva käyttö aiheuttaa epäselvyyttä siitä, mitä johtamiskyvykkyys oikeastaan tarkoittaa. Toinen tutkimusaukko tarkastelee käsitteen ”johtamiskyvykkyys” osa-alueiden epäselvyyttä. Kolmas tutkimusaukko liittyy digitaalisten ja perinteisten johtamiskyvykkyyksien välisen suhteen vähäiseen tutkimukseen – tutkijat ovat kiinnittäneet huomiota siihen, että tarvitaan lisää malleja, jotka kuvaavat johtamisen edellyttämiä digikyvykkyyksiä. Neljäs tutkimusaukko liittyy siihen, että ymmärryksemme johtajien tekoälyosaamisesta on puutteellista – asiaa on tarkasteltu organisaation näkökulmasta, sen sijaan yksittäisten johtajien kyvykkyyksiä ei ole juurikaan tutkittu.

Näihin tutkimusaukkoihin vastaamisessa käytetään ei-empiiristä tutkimusotetta, jonka myötä väitöskirja koostuu kolmesta systemaattisesta kirjallisuuskatsauksesta. Ei-empiirinen lähestymistapa mahdollistaa olemassa olevien teoreettisten viitekehysten, terminologisten nyanssien ja käsitteellisten aukkojen kattavan synteesin. Systemaattinen kirjallisuuskatsaus on metodologinen, jäsennelty ratkaisu, joka mahdollistaa aiempien tutkimusten tunnistamisen, arvioinnin ja integroinnin. Kirjallisuuskatsaukset analysoidaan laadullisen sisällönanalyysin ja semanttisen analyysin avulla. Tämä lähestymistapa mahdollistaa tutkimusaukkojen syvällisen

tarkastelun ja varmistaa samalla johdonmukaisen ja toistettavissa olevan analyysin, joka voi toimia perustana tuleville empiirisille tutkimuksille ja johtamiskäytännöille.

Väitöskirjan tulokset esitetään kolmessa esseessä. Ensimmäisessä esseessä määritellään ja selkeytetään johtamiskyvykkyyden käsitteen osatekijöitä. Essee osoittaa, että noin 36 %:ssa tarkastelluista tieteellisistä artikkeleista ei anneta selkeää johtamiskyvykkyyden määritelmää. Määritelmän selkeyttämiseksi tutkimuksessa tunnistettiin seitsemän keskeistä johtamiskyvykkyyden osatekijää: rooli, osaaminen, taipumus, valmius, toiminta, konteksti ja vaikuttavuus. Tämä kokonaisvaltainen ymmärrys luo perustan myöhemmälle keskustelulle digiajan vaatimista kyvykkyyksistä.

Toinen essee esittelee rakenteellisen mallin digitaalisista johtamiskyvykkyyksistä. jaotellen ne kolmeen ulottuvuuteen: teknologinen osaaminen, vuorovaikutustaidot ja e-johtajuustaidot. Tutkimus korostaa, että sekä digitaalisten työkalujen tuntemus että johtamistaidot vaikuttavat merkittävästi johtajan tehokkuuteen virtuaalisissa ympäristöissä. Teknologisen osaamisen ja vuorovaikutustaitojen merkitys työelämässä korostuu etenkin COVID-19-pandemian jälkeisellä hybridityön aikakaudella.

Kolmannessa esseessä tarkastellaan perinteisten johtamiskyvykkyyksien ja tekoälyyn liittyvien kyvykkyyksien eroja. 27 artikkelin analyysin perusteella tunnistettiin 40 tekoälyyn liittyvää johtamiskyvykkyyttä, jotka jaettiin yhdeksään kyvykkyysulottuvuuteen. Tutkimus osoittaa, että vaikka monet kyvykkyydet ovat edelleen relevantteja myös tekoälykontekstissa, myös uusia osa-alueita ja aiempien laajennuksia tarvitaan. Keskeisiä uusia kyvykkyyksiä ovat esimerkiksi "tekoälyn integrointi ihmistyöhön" ja "uteliaisuus oppia tekoälystä", jotka korostavat jatkuvan oppimisen ja sopeutumiskyvyn merkitystä digiajan johtamisessa.

Väitöskirja tuottaa neljä tieteellistä kontribuutiota. Ensinnäkin se selkeyttää käsitteellistä epäselvyyttä johtamiskyvykkyyden määrittelyssä esittämällä uuden määritelmän. Toiseksi se syventää ymmärrystä johtamiskyvykkyyden rakenteista tarkastelemalla sen osa-alueita. Kolmanneksi se esittää digitaalisten johtamiskyvykkyyksien viitekehyksen, jota työnantajat ja kouluttajat voivat hyödyntää koulutuksen ja osaamisen kehittämisohjelmissa. Lopuksi se tunnistaa tekoälyyn liittyviä johtamiskyvykkyyksiä ja osoittaa kuinka nämä eroavat perinteisistä johtamiskyvykkyyksistä.

Yhteenvetona väitöskirja korostaa johtamiskyvykkyyksien kasvavaa merkitystä digitaalisella aikakaudella, tarjoten pohjan, jolle jatkotutkimusta voidaan rakentaa. Johtajien varustaminen tarvittavilla kyvykkyyksillä on olennaista, jotta he voivat hallita digimurroksen ja tekoälyn tuomat haasteet ja edistää organisaation menestystä jatkuvasti muuttuvassa toimintaympäristössä.

AVAINSANAT: Kyvykkyys, johtamiskyvykkyys, digitaaliset johtamis- kyvykkyydet, tekoälyyn liittyvät johtamiskyvykkyydet, digitaaliset teknologiat, tekoäly, digiaika

# Acknowledgements

*"Exploration is really the essence of the human spirit, and to pause, to falter, to turn our back on the quest for knowledge, is to perish"*

Frank Borman (astronaut and commander of Apollo 8)

Exploring is an essential part of human nature, driving innovation, expanding our knowledge, and helping us better understand the universe and ourselves. Exploration fuels curiosity, resilience, and progress, ensuring that humanity continues to grow and adapt in an ever-changing world.

I myself am an explorer. I like to learn new things. I like to travel and explore countries and their cultures. This love for exploration and learning naturally led me to seek opportunities beyond my home country. Having already completed my Master's degree in the UK, I was eager to broaden my horizons further and immerse myself in new cultures and academic environments. Finland, with its renowned education system and innovative research community, seemed like the perfect place to continue my academic journey.

My fascination with Finland also has a personal and nostalgic dimension. As a child, I vividly remember watching ski jumping competitions with my grandpa, cheering for legendary athletes like Janne Ahonen and Matti Hautamäki. Their remarkable successes and the Finnish prowess in winter sports left a lasting impression on me. Finland's rich sporting history and its reputation for resilience and excellence resonated deeply with my own values of perseverance and curiosity.

Combining my passion for exploration, cultural appreciation, and academic growth, pursuing a PhD in Finland felt like a natural next step. It offered a unique environment where I could delve into my research interests while also experiencing the beautiful landscapes and vibrant culture that reminded me of those cherished childhood memories. This journey was not just about advancing my academic career but also about embracing a new chapter of discovery and connection with a country that has inspired me since I was young.

In my thesis, I chose to incorporate the word 'explore' in the title, as it embodies the very spirit that has guided me throughout this journey. My thesis is a testament

to that spirit of exploration—an ongoing quest for understanding, discovery, and connection.

I am an explorer at heart, and my journey through this doctoral research has been marked by the support, inspiration, and encouragement of many wonderful people. I am deeply grateful to all who have contributed to this chapter of my life.

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I also want to acknowledge the people I met in Turku, during my travels across Finland and abroad. I am grateful to Yasith Hirimburegama, who started this doctoral adventure with me. Our mutual support in the beginning proved to be a strong foundation. Johannes Kuusisto, thank you for the insightful conversations during lunch and for providing delightful distractions from work amidst your lively phone talks in Robert's Coffee. To Joonas, Peter, Luca, Hajar, and Dumindu—your companionship was a source of comfort and encouragement. A special thank you to Mr Mahroof, my hairdresser, for always making me look my best. A special thanks also to Mr Lippiainen for lending me 'polkupyörä', which made my commute to the university much easier. To Mr Degerth, his daughters, and colleagues—thank you for providing nutritious, affordable breakfast that kept me energized.

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To everyone mentioned and to all those I have had the pleasure to meet along this journey, thank you for your support, your curiosity, and your companionship. This exploration would not have been possible without you.

26th April 2025
*Dennis Grenda*

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## Tables



## Figures

# List of Essays

This dissertation is based on the following essays:

Essay 1 Grenda, D. & Palmunen, L. M. (2025). Constructing Clarity in Managerial Competence: Seven Primitives for Future Research. *Management Review Quarterly*, 1-37. https://doi.org/10.1007/s11301-025-00501-z

An earlier version of this paper has been submitted to the *International Journal of Management Reviews* in 2023

Essay 2 Grenda, D. Technological Knowledge, Soft Skills and E-Leadership Skills – three Pillars for the digitally competent Manager. (Under review in *Journal of Business Economics)*.

An earlier version of this paper has been presented at the *37th British Academy of Management (BAM) Conference* (September, 2023; University of Sussex Business School, Sussex, UK)

Essay 3 Grenda, D. Unveiling the Impact of Artificial Intelligence on Managerial Competencies: A Systematic Literature Review. (Under review in *International Journal of Management Reviews*).

An earlier version of this paper has been presented at the *24th European Academy of Management (EURAM) Conference* (June, 2024; University of Bath, Bath, UK)

# 1 Introduction

*"I thought it was all about technology. I thought if we hired a couple thousand technology people, if we upgraded our software, things like that, that was it. I was wrong. Product managers have to be different; salespeople have to be different; on-site support has to be different. We've had to drill and change a lot about the company. And I just think it's infecting everything we do. It's infecting our own IT. It's infecting our own manufacturing plants. It's infected everything we're doing, I think in a positive way."*

(Jeff Immelt, CEO of General Electrics, in 2015)

## 1.1 Problem Statement

We are now in the digital age, where the integration of digital technologies has become a vital aspect of nearly every industry. Digital transformation has revolutionized the way businesses operate, interact with customers, and make decisions (Caruso, 2018; Ilanković et al., 2020). Artificial Intelligence (AI) plays a significant role in this transformation, enabling organizations to automate tasks, provide personalized customer experiences, and analyze large amounts of data for strategic insights (Krakowski, Luger, & Raisch, 2022).

In this fast-paced digital environment, managerial competencies are more crucial than ever before (Müller et al., 2024). The ability to adapt to rapidly changing technologies and market trends is essential for staying competitive in today's digital landscape (Scuotto et al., 2021). In this regard, managerial competencies are a crucial factor for achieving business success, also in the digital age (Zahoor et al., 2023). However, the rise of digital technologies has changed the roles of managers and also their competencies. By using data analytic tools, managers can now identify trends and patterns in customer behaviour, allowing them to make more targeted and effective marketing decisions (Oliveira, Kakabadse, & Khan, 2022). Likewise, virtual collaboration platforms like Slack, Microsoft teams, and Zoom enable managers to communicate and share information with their teams instantly, irrespective of their physical location (Wang et al., 2021).

Besides these advantages of digital technologies, they can also bring challenges to managers and their competence. For example, managers may become overly reliant on digital technologies for decision-making and problem-solving, leading to a lack of critical thinking and strategic thinking skills (Kanungo et al., 2022). Furthermore, managers may feel overwhelmed by the amount of data and information available through digital technologies, leading to decision paralysis or the inability to prioritize tasks effectively (Marsh, Vallejos, & Spence, 2022). With the rise of email, instant messaging, and other digital communication tools, managers may also lose the ability to effectively communicate in person, impacting their relationships with employees and stakeholders. The COVID-19 pandemic has seen many examples in which digital technologies can create barriers between managers and their employees, making it harder to build trust, provide feedback, and foster a sense of teamwork and collaboration (Amankwah-Amoah et al., 2021).

In order to handle digital technologies efficiently and realizing the development potential of digital transformation, scholars have increased awareness about the necessity of digital competence (Audrin, Audrin, & Salamin; 2024). Digital competence goes beyond the ability to use digital tools and software. It includes a comprehensive range of knowledge and skills that enable managers to navigate the complexities of digital technologies, lead teams in implementing new tools and strategies, and make data-driven decisions (Imran et al., 2020; Adie et al., 2022).

However, the 2023 Global Leadership Development study revealed a significant portion of managers lack the necessary skills to lead their teams effectively in a digital environment (2023 Global Leadership Development Study), and also The Survey of Business Uncertainty found that many managers struggle to adapt to remote work and digital communication tools, leading to decreased productivity and team cohesion (Bloom et al., 2023).

Numerous efforts have been made to enhance comprehension, delineation, and eventual assessment of digital competencies. These endeavours have predominantly originated from governmental bodies (such as the EU), focusing on either citizens (Vuorikari, Kluzer, & Punie, 2022), teachers (Ghomi & Redecker, 2019), or students (Romero-Tena et al., 2020). What is missing so far are studies of managers and their competencies in the digital age. In management research, various studies point to the micro-level as significant source of the creation and dynamics of specific activities and processes in organizations (e.g., Felin, Foss, & Ployhart, 2015; Scuotto et al., 2020). However, the majority of studies of digital competence and AI adopt a macro-perspective by investigating the capabilities of the overall organization (Scuotto et al., 2021). The relevant competencies and activities of managers to use digital technologies and support successful implementation of AI are still unclear to academics and industry professionals (Davenport & Ronanki, 2018; Desouza, Dawson, & Chenok, 2020, Müller et al., 2024). Zahoor et al. (2023) even conclude

that the extant literature largely ignores the role of managerial competencies in digital transformation. Thus, in light of the current state of the literature, this dissertation aims to fill a critical research gap by shedding light on the competencies that managers require to successfully navigate in the digital age.

## 1.2 Background of the Dissertation

Given the setting and the background of this work, the main objective of this dissertation is to explore the competencies that managers require to successfully navigate in the digital age. The literature on managerial competencies is diverse and often fragmented, with studies focusing on several types of managers or industries (see section 2.2.3). By exploring managerial competencies in general, I aim to contribute to a generic understanding of what makes managers successful in the digital age. This section shows how the digital age has impacted managerial work (section 1.2.1) and what types of managerial competencies have emerged (section 1.2.2).

### 1.2.1 The Digital Age and Managerial Work

The digital age denotes a historical period marked by the extensive use and incorporation of digital technologies across numerous aspects of society, including communication, commerce, entertainment, and more (Urbach, Drews, & Ross, 2017; Goodwin, 2018; Hassard & Morris, 2022). According to Goodwin (2018), there are three distinct phases: pre-digital phase, mid-digital phase, and post-digital phase. Each phase has impacted managerial work, which is shown in Table 1.

**Table 1.** The Digital Age and the Impact on Managerial Work.

| Digital Age / Managers | Pre-Digital Phase | (Mid-)Digital Phase | Post-Digital Phase |
|---|---|---|---|
| **Workplace** | office | office | office + domicile |
| **Personal Contacts** | high | high | low |
| **Use of Technologies** | low | moderate | high |
| **Key Technologies** | Typewriters, Pagers, Overhead, Analog Phones, Dictaphones, Calculators, Fax machines | Personal Computers, Laptops, Emails, Mobile Phones, Internet, Early Social Media | Smartphones, Cloud Computing Artificial Intelligence, IoT-Devices, Communication Tools, Blockchain |
| **Competencies** | traditional managerial competencies | traditional and digital managerial competencies | traditional and AI-related managerial competencies |

The pre-digital phase refers to the time before the widespread use of digital technologies. Managers were mainly working from their office, and relied heavily on in-person meetings to communicate with their teams, clients, and other stakeholders. As technical devices had just one function, the use of technologies was low. Key technologies that managers used for doing their jobs included for example overhead projectors, analog phones, and dictaphones. Managers had to rely on their own knowledge and experience to make informed decisions, as real-time data and analytics were not readily available. Towards the end of the phase, tangible items became more and more digital, leading to the mid-digital phase.

This phase marks the transition towards digital technologies becoming more prevalent in everyday life. The emergence of personal computers, the internet, and mobile phones transformed the way people communicate and access information. Managers were still working from the office and mainly had personal contact with teams, clients, and other stakeholders, but started to include more technologies in their daily work, such as emails and social media. In order to make use of these digital technologies, managers need a new type of competencies: digital managerial competencies.

In the post-digital phase, digital technologies are fully integrated into society, becoming essential tools for communication, work, and leisure. Managers are not only working from the office, but also from home and have less personal contact with their employees. The emergence of advanced social media, cloud computing, and smart devices further transformed how managers interact and access information. AI is increasingly integrated into various applications, from virtual assistants like ChatGPT to autonomous vehicles and predictive analytics systems. Its advancements and applications contribute to shaping the future of the digital age. In

this phase, managers not only require traditional competencies, but also AI-related managerial competencies.

Goodwin (2018) stated that we would be in the mid-digital phase and considered the post-digital phase as future scenario. However, digital technologies have become commonplace and are deeply embedded in our daily-lives, school, and work (Jandrić et al., 2018), implying that we already have progressed beyond the mid-digital phase and are in the post-digital phase.

### 1.2.2 Concepts discussed in this Dissertation

Given the setting and the background of this work, the main objective of this dissertation is to explore the competencies that managers require to successfully navigate in the digital world. Apart from analysing the concept of managerial competence in the light of construct clarity, the dissertation sheds light on two types of managerial competencies that are important in the digital age: (1) managerial competencies to make use of digital technologies, also called digital managerial competencies; (2) managerial competencies to implement AI in organizations, called AI-related managerial competencies.

The term ‘managerial competence’ consists of the adjective ‘managerial’ and the noun ‘competence’, making it a specific part of the concept of competence. In the management literature, authors often use ‘competency’ and ‘competence’ as synonyms (Boam and Sparrow 1992; Brown 1993; Smith 1993). Others separate them, using competency when focusing on the individual’s characteristics (input/person-related approach), and competence when focusing on performance requirements (output/task-related approach) (e.g., Stuart & Lindsay, 1997; Armstrong, 1998). However, some authors use them in the opposite way (e.g., Hogan & Warrenfeltz, 2003; Vartiainen, 2020). In this dissertation, the term ‘competence’ is used in a holistic sense to denote a person's overall capacity. Competencies represent foundational elements of the overall capacity. They are specific attributes that enable a person to perform effectively in their professional role. If this individual is a manager, the term ‘managerial competencies’ is applicable. The specific managerial competencies are analysed in essays 2 and 3, whereas essay 1 examines the holistic concept of managerial competence.

The concept of competence in itself is not a novel phenomenon. Interest in the concept of competence can already be found in works of the early 20$^{th}$ century (e.g., Childs, 1910; Small, 1914; Dewey, 1916). While it was introduced as academic concept in the late 1950s (White, 1959), it gained prominence in the management literature during the 1970s and 1980s (McClelland, 1973; Boyatzis, 1982), as organizations began to focus more on individual and team-based skills and abilities

rather than just job roles and functions. The literature falls broadly into two research streams:

1. The first stream focuses on individual competence and take the person or individual as a starting point in order to discuss the concept of competence (e.g., Boyatzis, 1982; Albanese, 1989; Woodruffe, 1991). McClelland (1973) can be seen as the founder or pioneer of the 'competence' movement as we know it today. This US approach associates competence with superior performance and with psycho-social traits (Hayes, 1979). In European competence research, psycho-social characteristics do not feature and the emphasis is on performing to the standard required of employment rather than superior performance (Winterton, Delamare-Le Deist, & Stringfellow, 2006). These competence models typically include cognitive competence (knowledge), functional competence (skill) and social competence (behaviours). That approach aligns well with the KSA (knowledge, skills and attitudes) used extensively in training, although arguably it is behaviours rather than underpinning attitudes that should be emphasised.
2. The second stream deals primarily with organizational core competence and discusses the concept of competence from an organizational perspective (e.g., Prahalad & Hamel, 1990; Amit & Schoemaker, 1993; McGrath, MacMillan, & Venkatraman, 1995). It is primarily located in the area of strategic management. Competencies are described here as characteristics of organizations; human skills are considered resources. Prahalad & Hamel's (1990) article 'The Core Competence of the Corporation' was ground-breaking here, as it shifted the focus from the individual to the organizational level. Long-term organizational success is therefore based on an organization's ability to build core competencies and implement them profitably in products. Core competence is defined as the collective knowledge and skills embedded in the organization. They are the decisive factors for organizational competitiveness because they are central to creating customer benefits, gaining access to new markets and are difficult to imitate.

Besides, Vartiainen (2020) divides competencies into three levels:

1. **Micro-level:** This refers to the personal characteristics and learned abilities of an individual that enable effective job performance.
2. **Meso-level:** This level focuses on the collective characteristics and processes that enable a team to function effectively in a work environment.
3. **Macro-level:** This level pertains to the resources and capabilities that an entire organization must develop to achieve and sustain a competitive advantage.

By investigating managerial competence and the competencies of managers in the digital age, this dissertation contributes to the research stream on individual competence at the micro-level.

The concept of managerial competence is more than 50 years old, yet it has always been essential in ensuring the success and effectiveness of an organization (Burgoyne, 1989). A main reason why managerial competence is important is that it directly impacts the performance and productivity of a company (Boyatzis, 1982). Competent managers are able to set clear goals, allocate resources effectively, and make informed decisions that drive the organization towards success. They are able to identify and address problems before they escalate, and implement strategies that enhance efficiency and effectiveness.

Traditionally, managerial competence includes a variety of competencies, including decision-making, problem-solving, leadership, communication, and strategic thinking (e.g., Spencer & Spencer, 1993). Digital transformation and the advent of new digital technologies has revolutionized the way managerial work is conducted and the competencies required to succeed in these roles. Two types of managerial competencies have emerged: digital managerial competencies and AI-related managerial competencies.

Digital managerial competencies derive from the concept of digital competencies, with digital competence as overarching concept. For example, Iordache, Mariën, and Baelden (2017) stated that digital competencies enable people to use new technologies to receive up-to-date information, and to exchange and develop knowledge with others. Furthermore, Guitert, Romeu, and Colas (2020) emphasize that digitally competent people would have better opportunities in finding jobs, while job seekers without knowing how to search for jobs online or filling out online applications would risk to stay unemployed. Schwarzmüller et al. (2018) pointed out that digital technologies have changed existing job profiles to the extent that nowadays almost every job requires 'basic computer knowledge'. Quick decision-making, higher information density, greater insecurity, and enhanced availability have increased the complexity of employees and managers' work. Especially the COVID-19 pandemic forced managers to increasingly use virtual collaboration tools in order to communicate with their employees and manage from distance. This requires "a new set of managerial abilities and a different potential of thinking and acting" (Gerasimenko & Razumova, 2020, p. 116), which makes digital competencies the centre of interest.

Whereas digital managerial competencies relate to a broad range of digital technologies, AI-related managerial competence refers to technologies that utilize artificial intelligence techniques and algorithms. In this dissertation, AI-related managerial competencies include the knowledge and skills of managers in order to use and implement AI in their organizations successfully. The integration of AI

within organizations continues to be challenging (Dwivedi et al., 2021), which impacts the potential long-term competitive advantage that it is supposed to offer (Griva et al., 2021). The majority of these challenges stem from AI's disruptive potential (Harney & Collings, 2021). Indeed, integrating human and machine intelligence necessitates a review of organizations' decision-making practices (Herrmann & Pfeiffer, 2022), organizational learning (Balasubramanian, Ye, & Xu, 2022), and managerial issues. The adoption of AI alters potential sources of competitive advantage, requiring managers to acquire new skills to stay relevant in an AI-driven competitive landscape (Krakowski, Luger, & Raisch, 2022). The impact of AI on organizations (Griva et al., 2021) may lead to changes in managerial responsibilities and the skills needed, along with the emergence of new qualifications (Vrontis et al., 2023).

## 1.3 Research Gaps and Research Questions

The main research question directing this dissertation is:

*What competencies do managers require to successfully navigate in the digital age?*

By answering this research question, the dissertation explores four distinct research gaps in the competence literature. The first research gap relates to the terminological confusion of the concept of competence (Winterton, Delamare-Le Deist, & Stringfellow, 2006). This confusion is expressed in the interchangeably use of the terms a) competence and competency, and b) competence and skills and capabilities. In the management literature, for example, the terms ‘management competence’ (Bücker & Poutsma, 2010), ‘management competencies’ (Carson & Gilmore, 2000), ‘managerial competence’ (Avkiran, 1999), ‘managerial competency’ (Bernardin et al., 2016), or ‘managerial competencies’ (Debrah & Ofori, 2005) can be found. Apart from managerial competence, authors also use the expressions ‘managerial skills’ (McKenna, 2004) or ‘dynamic managerial capability’ (Huynh, Wilden, & Gudergan, 2022). Due to the ambivalence of the concept of competence (e.g., Velde, 1997; Hoffmann, 1999; Stoof et al., 2002), a refined understanding of the precise meaning of managerial competence is essential.

The second research gap is that researchers who study managerial competence are primarily concerned in finding out what competencies managers require, without considering the underlying components of managerial competence. So far, only the components of competence, such as knowledge, skills, attitudes etc. have been identified and visualized as an iceberg (Bergenhenegouwen, 1996; Garavan & McGuire, 2001; Kennedy & Dresser, 2005), with skills, knowledge, and behaviours

lying above the waterline, and abilities, capabilities, and attitudes below. However, these components may be different from the concept of managerial competence. By ignoring the underlying components of the concept of managerial competence, researchers may be overlooking potential areas for improvement and development in managers. Hence, the first conceptual publication, essay 1, that supports this thesis explores the existing literature on managerial competence to find definitions that can be decomposed into primitives that mark the overarching features of all definitions. Thus, the first sub-research question concerns the conceptual components of managerial competence:

*SQ1: What are the conceptual components of the concept of managerial competence?*

The third research gap addresses the missing relation of digital competence and digital competencies in the management literature. In recent years, several authors (e.g., Murawski & Bick, 2017; Oberländer, Beinicke, & Bipp, 2020; Audrin, Audrin, & Salamin, 2024) noticed that research on digital competence in the management literature, or, in the context of work in general, is scarce. Digital competence is a concept that is mostly studied in an educational setting, and research on necessary digital competencies either focus on students (Calvani et al., 2008; Cartelli, 2010; Li & Ranieri, 2010; Hatlevik, Ottestad, & Throndsen, 2015) or teachers (Krumsvik, 2008; Pettersson, 2017; Reisoğlu, & Çebi, 2020; Romero-Tena et al., 2020). That means we neither know what are the required digital competencies of managers nor how a model capturing digital competencies for managers may look like. For example, Murawski and Bick (2017) wanted to investigate digital competencies for workers. They conducted a literature review on digital competence before manually searching a range of IS, HR, and scientific learning journals, but no articles discussed digital competence in the workplace. Similarly, Oberländer, Beinicke, and Bipp (2020) found only a few papers in their literature review on digital competencies for the workplace. In this thesis it is argued that the concept of e-leadership is useful for bridging the gap between digital competence and management studies. So far, e-leadership skills have not been considered in frameworks of digital competence, though researchers have argued that in order to succeed in a virtual work environment, today's managers must adopt new leadership skills (Liu et al., 2018; Contreras, Baykal, & Abid, 2020). Besides technological knowledge and soft skills, e-leadership skills are an essential component of digital competencies. Essay 2 addresses this research gap and argues that for managerial occupations, a model of digital competencies should consist of technological knowledge, soft skills, and e-leadership skills. It addresses the following sub-research question:

*SQ2: How can a model of digital competencies be conceptualised for managers?*

The fourth research gap concerns the lack of managerial competencies for successful AI implementation. In the literature, competencies and skills related to AI are commonly named "AI capabilities", but researchers using this term usually adopt a macro-perspective by investigating the capabilities of the overall organization (e.g., Scuotto et al., 2021). In general, Pereira et al. (2023) found out there is very little research on AI and how it affects the workplace. Some preliminary studies have been conducted on AI and its impact on business models (Burström et al., 2021), organizational decision-making (Jarrahi, 2018), and strategies for businesses to build AI trust (Gkinko, & Elbanna, 2023). Similarly, Makarius et al. (2021) note that much of the literature on AI in management focuses on practical applications across various organizational functions, including assembly lines, customer interactions, human resources, job tasks, and strategic decision-making. When it comes to competencies and AI, a large stream of research studies how customers perceive the competence and warmth of human service workers in comparison to robotic service workers (Kim, Schmitt, & Thalmann, 2019; Lei, Shen, & Ye, 2021; Frank & Otterbring, 2023). However, the skills and underlying practices that businesses need to fully utilize AI are still unclear to academics and industry professionals (Davenport & Ronanki, 2018; Desouza, Dawson, & Chenok, 2020). While data competencies and analytics capabilities are frequently emphasized (Sjödin et al., 2021), the relevant competencies and activities of managers to support successful implementation of AI are not well understood. Essay 3 addresses this issue by identifying the AI-related managerial competencies and illustrating to what extent these differ from the classic managerial competencies. It answers the following sub-research question:

*SQ3: Which managerial competencies are essential for making use of AI?*

Figure 1 on the next page summarises the insights from this section:

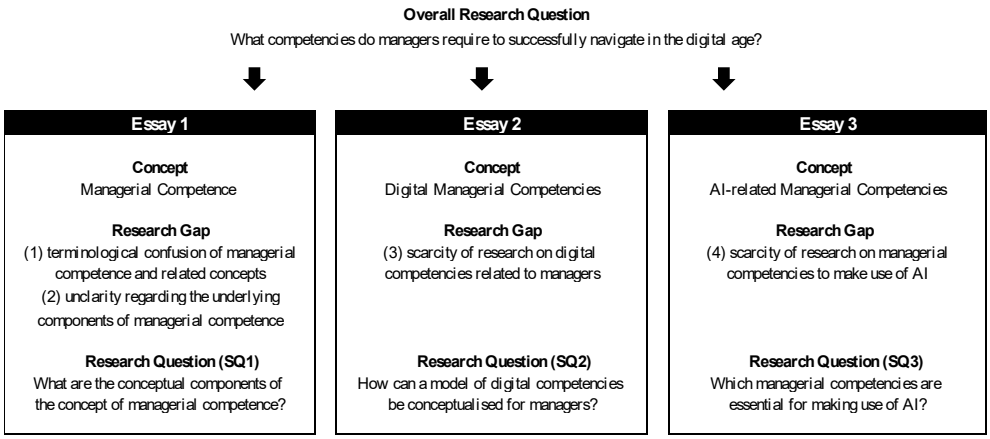


**Figure 1.** Overview of the concept, research gaps, and research questions addressed in each paper of the dissertation (developed by the author).

## 1.4 Research Approach

The research approach describes the researcher's viewpoint regarding ontological and epistemological approaches, methodologies, strategies, time horizon, and techniques to collect and analyse data. A widely recognized research model that researchers use for outlining their research approach is the research onion developed by Saunders, Lewis, and Thornhill in 2007 (Saunders, Lewis, and Thornhill, 2019). Figure 2 illustrates the research onion, in which the words representing my research approach in this dissertation are underlined:

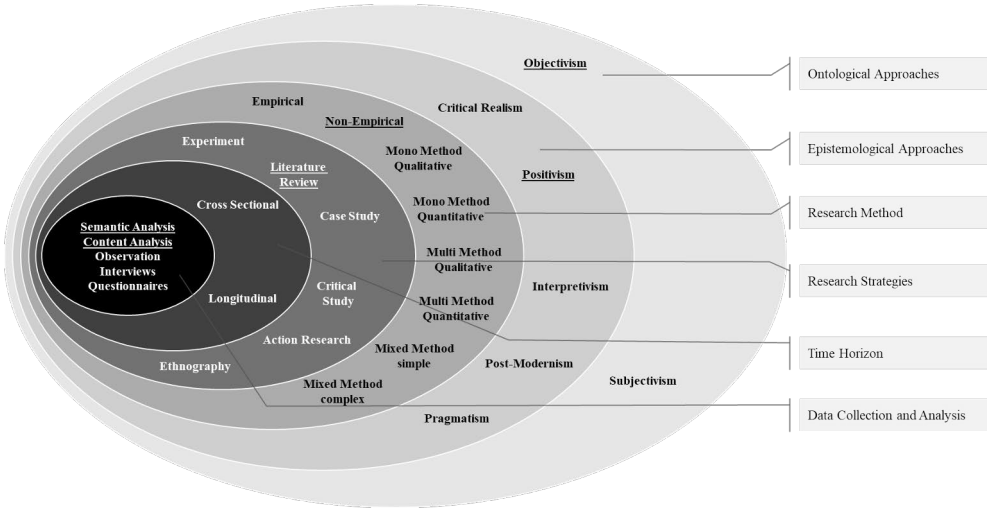


**Figure 2.** The research onion of this dissertation (adapted from Saunders, Lewis, and Thornhill, 2019).

In this dissertation, an objectivist ontology was chosen, asserting that managerial competencies exist independently of our perceptions or beliefs about them. This perspective allows for the identification and classification of these competencies as real entities that can be defined and explored systematically. By adopting an objective standpoint, this study can establish standard definitions and frameworks for managerial competencies, which is particularly valuable in the digital age, where rapid technological changes necessitate a shared understanding of what competencies are essential for effective management.

Besides an objectivist ontology, a positivist epistemology was considered most suitable for studying managerial competencies. A positivist epistemology emphasizes the idea that knowledge can be obtained through objective analysis and logical reasoning. In the context of this dissertation, positivism allows for the systematic examination of existing literature, theories, and frameworks related to managerial competencies in the digital age. Furthermore, it allows on deriving generalizable insights about managerial competencies that are applicable across contexts.

As regards methodological choice, this study employed a non-empirical approach based on a systematic literature review to gain a thorough understanding of the subject. Due to the evolving landscape shaped by digital transformation and the growing influence of AI, a thorough literature-based inquiry offers a deep insight into the theoretical frameworks and definitions related to managerial competencies.

Since no primary data was collected in this study, no information regarding the time horizon (cross-sectional or longitudinal) can be given.

The data gathered from the systematic literature review was analyzed using semantic decomposition and qualitative content analysis. Semantic decomposition was used to break down definitions of managerial competence into their fundamental elements to better understand their meaning and relationships (essay 1). Qualitative content analysis was used in essays 2 and 3 to analyze the data from the papers identified through the systematic literature review. This involved coding the data into categories and themes, which was essential to find digital managerial competencies (essay 2) and AI-related managerial competencies (essay 3).

## 1.5 Structure of the Dissertation

This dissertation is structured as a compilation thesis, comprising an introductory part and three essays. The introductory part consists of five chapters. In chapter 2, a detailed overview of the concepts of competence and digital competence, as well as on digital technologies is presented. In chapter 3, the ontological and epistemological choices, the research method and forms of data analysis are explained. Chapter 4 presents the main findings from the essays and summarizes their findings. Chapter 5 outlines the study's conclusions, highlighting both theoretical and managerial implications, as well as addressing limitations and suggesting directions for future research. Finally, the three essays follow the introductory part. Figure 3 illustrates the outline of this doctoral dissertation.

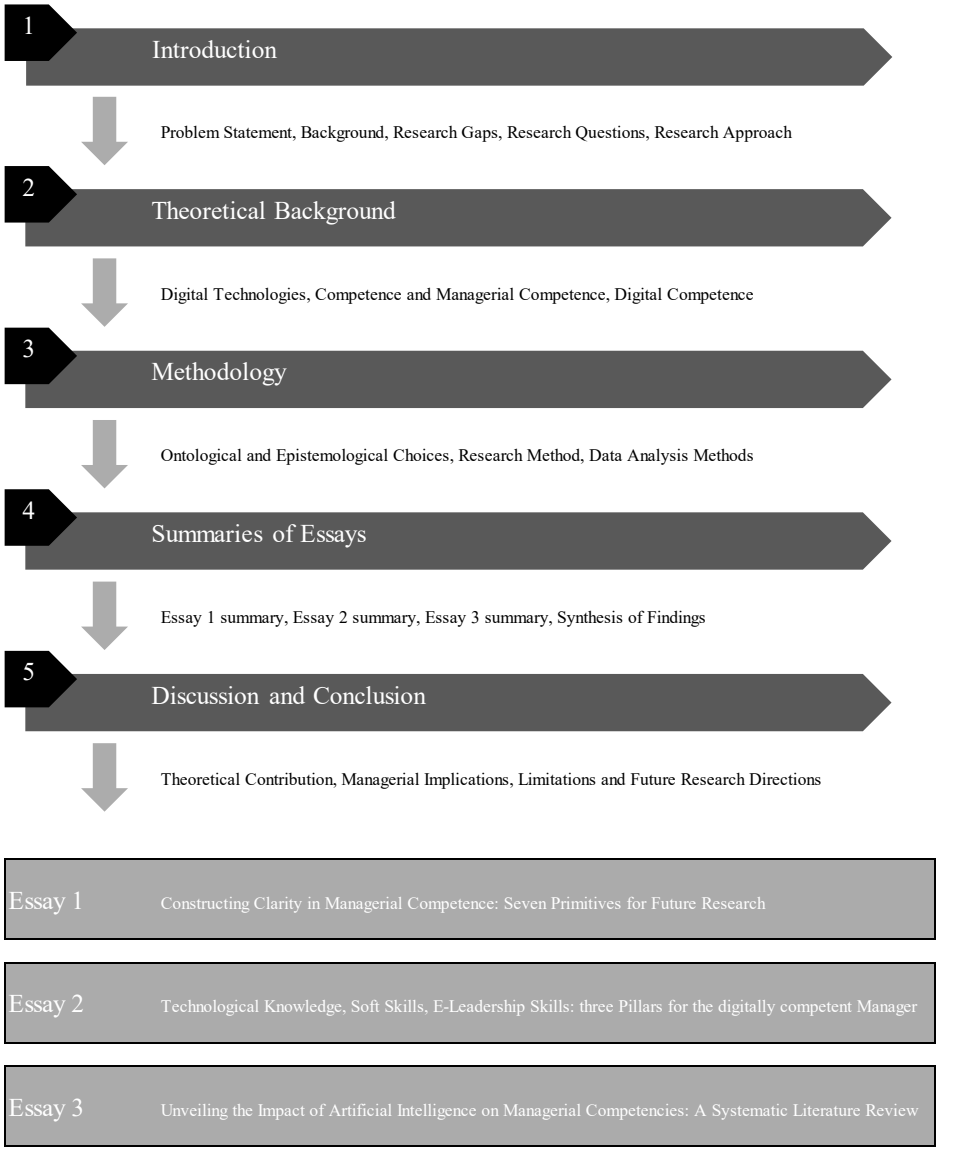


**Figure 3.** The outline of the Dissertation (developed by the author).

# 2 Theoretical Classification and Foundation

This chapter aims to provide an overview of the foundational concepts and theories related to competencies and digital technology. It starts by defining key concepts, such as digitization, digitalization, and digital transformation to highlight their relevance and connectedness (section 2.1.1). This exploration sets the stage for examining research approaches to the study of technology in organizations, including positivist, social constructivist, sociomaterialistic, and predictive perspectives (section 2.1.2). Subsequently, the chapter unpacks the components of artificial intelligence, focusing on algorithms, machine learning, and deep learning (section 2.1.3).

Building on these foundational concepts, the chapter transitions to an examination of the concept of competence, tracing its genesis and early definitions (section 2.2.1) before discussing its significance as an academic construct. This includes an analysis of the interplay between the concept of competence, motivation, intelligence, and performance (section 2.2.2) and the implications of the concept of competence in management contexts (section 2.2.3).

Finally, the chapter ends with a detailed exploration of the concept of digital competence, addressing its origins (section 2.3.1) and the critical distinctions between digital skills and digital literacy (section 2.3.2). It also synthesizes various definitions of digital competence, highlighting common elements that underpin this concept (section 2.3.3).

By synthesizing these elements, this chapter lays the groundwork for understanding how digital and AI-related competencies can be developed and applied in managerial contexts.

## 2.1 The Concept of Digital Technology and AI

Digital technology encompasses a broad spectrum of tools and systems that enable the creation, storage, processing, and transmission of data. From personal devices like smartphones and laptops to complex networks that facilitate global communication, digital technology has become integral to nearly every aspect of modern society. Artificial intelligence, a subset of digital technology, represents a significant leap forward in our ability to replicate and enhance cognitive functions through machines. By leveraging algorithms, machine learning, and data analytics, AI systems can execute tasks that have traditionally demanded human intelligence, including understanding natural language, identifying patterns, and making decisions. Understanding these technologies enable managers to gather and analyze vast amounts of data in real-time, make informed decisions, automate processes, and streamline operations. For example, cloud computing allows for greater flexibility and scalability, big data analytics provides valuable insights for strategic decision-making, IoT connects devices and systems for better monitoring and control, and AI automates routine tasks and optimizes operations.

This section sets the stage for a deeper exploration of the concepts, applications, and impacts of digital technology and AI, highlighting their role as catalysts for change in the digital age.

### 2.1.1 Exploring Key Terms in the Digital Age

When talking about the digital age, terms like ‘digitization’, ‘digitalization’, and ‘digital transformation’ abound. These terms are often used interchangeably, leading to confusion and misunderstanding (Frenzel et al., 2021). The confusion between these terms often arises due to their overlapping nature and the rapid evolution of technology. As digital technologies continue to advance and become more integrated into everyday life, the lines between digitization, digitalization, and digital transformation can blur. Additionally, the terms are sometimes used interchangeably in casual conversation or marketing materials, further contributing to the confusion (Verhoef et al., 2021). It is therefore essential to distinguish between these terms, as they represent distinct processes and have different implications for organizations and society as a whole. The existing definitions of ‘digitization’ and ‘digitalization’ fall short of allowing a comprehensive operationalization and analysis for the investigation. This dissertation is based on the assumption that companies are undergoing a fundamental digital transformation process to adapt to current market, environmental and technological challenges. This is a very comprehensive change

for which managers need to develop specific competencies. The following classifications provide a more detailed overview.

#### 2.1.1.1 Digitization

The term ‘digitization’ has its historical origin in the field of computing and information technology. It stems from the word ‘digit’, which refers to numerical digits or fingers (Bloomberg, 2018). Digitization has already been initiated in 1679, when Gottfried Wilhelm Leibniz developed the binary number system (Press, 2015). In the mid-20$^{th}$ century, the term became more popular when digital computers started to gain prominence and revolutionized data processing. Table 2 below provides an overview of definitions of digitization based on literature in information systems research.

**Table 2.** Definitions of ‘Digitization’.

| | |
|---|---|
| 1 | Digitisation means “a large proportion of data is now ‘born digital’, and analogue data can be inexpensively converted into digital form” (Clarke, 2019) |
| 2 | Digitization is "the technical process of converting analog signals into a digital form, ultimately into binary digits" (Legner et al., 2017) |
| 3 | “Digitization refers to the encoding of actions or representations of actions into a digital format (zeros and ones) that can be read, processed, transmitted, and stored by computational technologies” (Leonardi & Treem, 2020) |
| 4 | “Digitization is the process of changing from analog to digital form.” (O’Leary, 2023) |
| 5 | Digitization is “the [technical] process of converting analog signals into a digital form, and ultimately into binary digits (bits)" (Tilson, Lyytinen, & Sørensen, 2010) |
| 6 | “Digitization is the transition of information from analog to digital” (Vrana & Singh, 2021) |

The definitions show that digitization describes a technical process of converting analog information into digital format. This process includes converting physical documents, images, or other forms of data into digital files that can be stored, accessed, and manipulated electronically. For instance, writing an email instead of writing a letter by hand, or converting music from vinyl records to digital audio files

are forms of digitization. In addition, authors also point out that data does not need to be available analog, but that it can be created digitally from the start (Baskerville, Myers, & Yoo, 2020; Legner et al., 2017).

#### 2.1.1.2 Digitalization

According to Frenzel et al. (2021), the concept of digitalization has evolved alongside the concept of digitization. While it was originally limited to the conversion of analog signals into digital quantities, the term has been significantly expanded. It is worth noting that the growth of digitalization has paralleled the rapid development and widespread adoption of new digital technologies, such as business intelligence, artificial intelligence, machine learning, cloud computing, and the Internet of Things over the last decade. Different to digitization, digitalization goes beyond mere conversion and involves the use of digital technologies to transform business processes, operations, and customer interactions. The majority of definitions are focused on certain aspects of digitalization, such as the penetration of everyday life and the working environment by technical innovations. Table 3 summarizes selected existing definitions:

**Table 3.** Definitions of 'Digitalization'.

| | |
|---|---|
| 1 | Digitalization is about "interpretation and management of the world […] [through] processes, that are almost entirely dependent on digital data" (Clarke, 2019) |
| 2 | "Digitalization is intensified ICT diffusion throughout all areas of life, (mobile) digital networking, computerization, and intelligent or self-learning components of work systems" (Ganz, Dworschak, Schnalzer, 2018) |
| 3 | "Digitalization describes the manifold sociotechnical phenomena and processes of adopting and using digital technologies in broader individual, organizational, and societal contexts" (Legner et al., 2017) |
| 4 | "Digitalization refers to the ways in which social life is organized through and around digital technologies" (Leonardi & Treem, 2020) |
| 5 | Digitalization is a "socio-technical process of applying digitizing techniques to broader [...] contexts" (Tilson, Myers, & Yoo, 2010) |
| 6 | "Digitalization is using digitized information to simplify specific processes and operations" (Vrana & Singh, 2021) |

According to the definitions, digitalization refers to socio-technical dynamics involved in the adoption and use of digital technologies. Key technologies—such as social media, cloud computing, artificial intelligence, and big data—are instrumental in this transformation, enabling organizations to reshape their existing business processes. For instance, Verhoef et al. (2021) highlight the emergence of new online and mobile communication channels that facilitate seamless interactions between customers and businesses, fundamentally changing traditional firm-customer relationships. This transition often leads to the establishment of new sociotechnical frameworks that rely on digital tools previously unimaginable. By enhancing process coordination and improving customer value through better user experiences, digital technologies allow organizations to optimize existing business processes (Verhoef et al., 2021).

#### 2.1.1.3 Digital Transformation

The verb ‘transform’ is derived from the Latin word ‘transformare’ and means 'to reshape, to redesign’ (Vial, 2019). As Kane et al. (2017) stated, the term shows that organizations need to “rethink how they do business” (p. 7) due to digitalization. Although the necessity for significant change still exists, the excessive and improper use of digital transformation in recent years have tended to weaken the term’s potency (Kane, 2017). In general, according to Gerdenitsch and Korunka (2019), digital transformation “is to be understood as the social change process that is caused by further developments in the field of information technologies” (p. 25). These changes also have far-reaching consequences for organizations, as they significantly change business models, structures and processes, forms of work and leadership, as well as the interfaces to customers, products and services (Hess, 2019). Table 4 on the next page provides an overview of the existing definitions from scientific literature:

**Table 4.** Definitions of 'Digital Transformation'.

| | |
|---|---|
| 1 | "Digital transformation is concerned with the changes digital technologies can bring about in a company's business model, which result in changed products or organizational structures or in the automation of processes" (Hess et al., 2016) |
| 2 | "Digital transformation is the technology-induced change caused by digital technology. It embraces the necessary goal-oriented organizational, process, and technological transformation necessary for organizations to succeed in the digital age" (Legner et al., 2017) |
| 3 | Digital transformation means a "deep and accelerating transformation with regard to processes, activities, competencies and models, in order to take advantage of the changes and opportunities offered by the inclusion of digital technologies into an organization" (Moreira, Ferreira, & Seruca, 2018) |
| 4 | "Digital (business) transformation is the process of exploiting digital technologies and supporting capabilities to create a robust new digital business model" (O'Leary, 2023) |
| 5 | Digital transformation "describes a company-wide change that leads to the development of new business models which may be new to the focal firm or industry" (Verhoef et al., 2021) |
| 6 | Digital transformation is "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2019) |

The definitions either see digital transformation as change or process that occur due to digital technologies. Different to digitalization, digital transformation does not only affect specific business processes, but the overall organization, most notably, the core business model. However, some authors argue that digital technologies represent only a fraction of digital transformation. They emphasize that factors such as strategy, talent management, skills development, organizational structure, and leadership are equally, if not more, critical to achieving successful digital transformation (Hess, 2019). According to Kane (2017), what is crucial is not only that a company reacts to the changes caused by digitalization, but also how the organization adapts to the transformation process, and how it operates and delivers value in a digital world. The transformation process is also about the digitalization of the environment, e.g., customers, employees, competitors, who also have a mutual

influence on the digitalization within the respective organization through their digital changes (Kane, 2017). A problem with digital transformation is that it is often defined as a process that occurs once and ends at a certain point in time (Gray & Rumpe, 2017). However, this process will take a long time and will not be over in the foreseeable future. That is why, according to Gray & Rumpe (2017), it makes more sense to define digital transformation as a continuous adaptation process to a permanently changing environment. The transformation process does not end once the organization has successfully transformed itself - there remains a permanent and continuous need for transformation afterwards. This definition of the digital change that Kane believes organizations are implementing also fits the concept of continuous self-renewal of companies (Kane, 2017).

#### 2.1.1.4 Synthesis of the Key Terms

Digitization, digitalization, and digital transformation are different concepts and it is crucial to differentiate between them to ensure clarity and precision in understanding their nature and implications. Digitization is the process of converting information from analog to digital format. In contrast, digitalization involves leveraging digital technologies to enhance processes and develop new business models. Together, these two processes pave the way for digital transformation, which involves a comprehensive change in an organization's operations, strategies, and culture to fully leverage digital technologies for innovation and growth. For organizations, digital transformation is a process that includes both digitization and digitalization (Verhoef et al., 2021). Whereas digitization is required for digitalization, digital transformation requires both digitization and digitalization. In this regard, digitization and digitalization can be regarded as antecedents of digital transformation. Regarding the hierarchy and progression in terms of complexity and impact, the three terms can be illustrated in form of a pyramid, as seen in Figure 4.

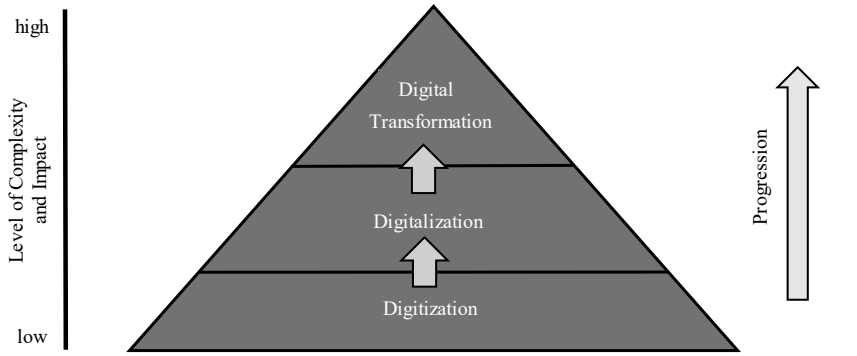


**Figure 4.** The relationship between digitization, digitalization, and digital transformation (developed by the author).

The pyramid visualization of digitization, digitalization, and digital transformation highlights the progression from basic digitization efforts at the bottom to more advanced and transformative digital initiatives at the top. Each level builds on the previous one and contributes to the overall digital maturity and competitiveness of the organization.

In terms of managerial competence, digital transformation is the most relevant as it requires a deep understanding of technology, business strategy, and organizational change. While digitization and digitalization are more focused on operational efficiency and process improvement, managers leading digital transformation initiatives need to be able to think strategically, drive innovation, and lead organizational change. They need to have a strong grasp of digital technologies and their potential impact on the business. Therefore, digital transformation is the term that will be used throughout the dissertation.

Building on our understanding of key terms in the digital age, the next section will delve into the foundational concepts of artificial intelligence, including algorithms, machine learning, and deep learning.

### 2.1.2 Artificial Intelligence and its components

Artificial Intelligence (AI) is "the ability of a manmade system comprising of algorithms and software programs, to identify, interpret, generate insights, and learn from the data sources to achieve specific predetermined goals and tasks" (Chowdhury et al., 2023, p. 2). In other words, this system is able to mimic the cognitive functions of the human brain (Pereira et al., 2023). While digital technology is about information handling, AI, as a special form of digital technology, involves learning, reasoning, and decision-making processes. Common examples of AI technologies include for example natural language processing tools (e.g., chatbots) or computer vision systems (e.g., facial recognition software). Especially in the post-digital phase, AI technologies are helpful to automate routine tasks and optimize operations. Since AI is often mixed up with algorithms, machine learning, and deep learning, it is necessary to distinguish each of the terms in this section.

#### 2.1.2.1 Algorithms

Algorithms in themselves are not a new development, and have been used in mathematics for centuries. But it is via the emergence of ML and AI that this term has come to be increasingly used in everyday life, as algorithms represent the basis for ML and AI (Cabiddu et al., 2022; Prahani et al., 2023). In general, an algorithm is defined as clear work instructions for solving a problem or task, whereby an input

is processed into an output in precisely defined steps (Domingos, 2018). The following characteristics must be met:

- **Uniqueness**: an algorithm must not be contradictory;
- **Feasibility:** every individual step is (actually) executable;
- **Finity:** the execution of the algorithm must be finite;
- **Termination:** after a fixed number of steps the algorithm must end and produce a result;
- **Determination:** if the same individual steps are followed under the same conditions, the algorithm must end with the same result each time it is executed;
- **Determinism:** after each individual step there can be at most one possibility of continuation. If an individual step X is followed by either the sequence Y or the sequence Z, this characteristic is not fulfilled.

Instructions for action that meet these criteria can appear in all conceivable forms—even in the analog world. As far as algorithms are concerned, this only refers to computer algorithms, i.e., those that process data electronically in the manner described above. If one wants to call data the new oil of the Internet, algorithms are the machines that process the raw material into a usable product. They include special systems that can range from the simplest calculations to applications that cannot be easily understood and reconstructed even with in-depth specialist knowledge.

#### 2.1.2.2 Machine Learning

The term machine learning (ML) was first used in 1959 by Arthur Samuel as "programming of a digital computer to behave in a way which, if done by human beings or animals, would be described as involving the process of learning" (Press, 2021). A special type of algorithms that adapt their actions based on "experience" represent the basis of ML. In this case, these "experiences" refer to data (Joshi, 2023). Such complex algorithms, the "self-adaptive algorithms" (Kreutzer & Sirrenberg, 2019), have been developed in particular since the 1990s (Joshi, 2023) and, with its application in ML, represent one of the most important sub-areas within AI (Domingos, 2018). Although the underlying learning algorithms are several decades old, ML has only experienced a major breakthrough in recent years. This is primarily due to the immensely increased availability of data (driven by inexpensive sensors, including in everyday tools) and the enormous increase in the computing power of modern processors.

The task of ML is to recognize previously unknown connections in data. In this way, a learning algorithm can be used for different forms of a problem, although it

is not “creative-thinking” but follows certain rules based on additional data. (Najafi, Najafi, & Farahmandian, 2024). In other words, it is the process of teaching a computer system to make predictions or decisions based on data rather than being explicitly programmed for each task.

A key element of ML relates to artificial neural networks (ANN). The ANN attempts to imitate the way the human brain works by processing information within the network in parallel via non-linear functions, thus enabling the independent recognition of complex non-linear relationships in data. These networks are a combination of hardware (especially a large number of processors working in parallel) and software and are currently the masterpiece in AI (Kreutzer & Sirrenberg, 2019).

Regarding the structure, the ANN is made up of different layers, including one input layer, several hidden layers, and an output layer. The original data is fed into the first layer and processed using complex algorithms that weight and aggregate the values. (Prahani et al., 2023). The data then passes through the subsequent layers to the next and finally outputs the result in the last layer (Kreutzer & Sirrenberg, 2019). ML can therefore be regarded as the process of learning between layers.

There are three main types of ML (Domingos, 2018; Kreutzer & Sirrenberg, 2019):

1. **Supervised learning:** This type of ML involves training a model on a dataset that includes labeled information, where each input is associated with its corresponding output. Based on these labels, the model learns to establish a relationship between inputs and outputs. Supervised learning is commonly applied to various tasks, including classification, regression, and prediction.
2. **Unsupervised learning:** In this type of ML, models are trained on datasets that lack labels, aiming to uncover underlying patterns or structures within the data. The model identifies and groups similar data points without explicit guidance. Unsupervised learning is typically used for tasks such as clustering, dimensionality reduction, and anomaly detection.
3. **Reinforcement learning:** This type of ML allows a model to learn decision-making by engaging with an environment and receiving feedback through rewards or penalties. The model aims to select actions that will maximize its overall reward over time. Reinforcement learning is particularly useful in applications like game playing, robotics, and autonomous driving.

These three types of ML can be combined or used in conjunction with each other to solve complex real-world problems.

#### 2.1.2.3 Deep Learning

Deep Learning (DL) represents a specialized branch of machine learning aimed at enhancing the efficiency of machine learning processes (Joshi, 2023). In essence, DL is an advanced form of machine learning, where 'deep' signifies the number of layers present in an ANN (Kreutzer & Sirrenberg, 2019). Depending on the system, there can be hundreds, thousands or even tens of thousands of hidden layers, supplemented by an output layer. Different to ML, DL involves more layers and is therefore capable of handling more complex tasks.

Overall, DL and ML differ in the types of data they handle and their learning methodologies (Joshi, 2023). Conventional ML needs structured and labeled data (such as numerical values), where human experts manually identify key features and design algorithms to help the computer process these features. As a result, ML relies more heavily on human guidance for its learning process compared to DL.

Conversely, DL models are capable of processing unstructured data, such as audio recordings or social media content. This ability allows them to discern differences between various data categories autonomously, without the need for human intervention. Essentially, a DL model requires only data and a task description to learn how to perform its designated task on its own.

DL therefore does not require prior human data processing (Prahani et al., 2023). Because it uses statistical data analysis to evaluate large data sets rather than algorithms, the deep learning approach often achieves better results compared to standardized ML approaches (Joshi, 2023). By using the DL approach, significant progress has been made in areas such as image recognition as well as natural language processing (NLP) and understanding (Kreutzer & Sirrenberg, 2019).

#### 2.1.2.4 Artificial Intelligence

AI is a special form of digital technologies that is marked by two primary features: opaqueness and self-learning (Brem, Giones, & Werle, 2021). Opaqueness refers to the lack of visibility into how AI algorithms function. AI technologies can often operate as black boxes, where users can input data and receive outputs without fully understanding the underlying decision-making processes. Self-learning pertains to the ability of AI systems to learn and adapt autonomously. Unlike traditional software, which operates on predetermined logic, AI systems possess cognitive capabilities that allow them to respond to environmental changes and improve their performance through exposure to more data. (Hutchinson, 2021).

Several classifications of AI can be found in the literature, which will be detailed next: 1) strong vs. weak AI, 2) narrow vs. general vs. super AI, and 3) mechanical vs. thinking vs. feeling AI. The distinction between weak and strong AI is made

based on the depth of understanding of a task (Siau & Yang, 2017; Fang, Su & Xiao, 2018; Kreutzer & Sirrenberg, 2019):

1. **Weak AI:** In applications with weak AI, the focus is on solving a specific problem, which is solved intelligently and autonomously on a human level —here the focus is on 'behaviour imitation'. This is not a deep understanding, as AI can only solve very limited and similar tasks. There are already numerous applications in the area of weak AI in practice today, for example navigation systems including route optimization, rudimentary chatbots, etc. A weak AI therefore only learns what is taught by human hands.
2. **Strong AI:** In contrast to weak AI, strong AI is intended to replicate and surpass human cognition (consciousness, creativity), independently recognize patterns and, in particular, draw conclusions. Applications of AI to this extent are not currently implemented in practice; such AI systems have only been implemented in some research settings (e.g., IBM's "Project Debater").

The possible range of uses allows a slightly different perspective on the classification of AI applications - although this results in a very similar classification to the approach presented above. A distinction is made here between narrow, general and super AI (Scheuer, 2020):

1. **Narrow AI:** These AI applications are aimed at a dedicated area of application and can effectively enhance human productivity. Previous research, and especially practical applications, are primarily located in this area. For example, speech recognition, visual pattern recognition or robot movements. 'Cognitive computing' is also sometimes used as a synonym.
2. **General AI:** In contrast to narrow AI, general AI can be used on any topic, i.e., across several – or all – knowledge domains. There has been little research done in this area of AI so far, so there are no practical applications yet.
3. **Super AI:** In a certain sense, from today's perspective, Super AI represents a science fiction scenario (Paschen, Pitt, & Kiezmann, 2020). In this form, the intelligence level of an AI application in every knowledge domain is higher than that of human experts in the respective domains - such an AI would thus exceed the swarm intelligence of all of humanity.

This classification can be viewed as the three intelligence levels of AI (Scheuer, 2020).

Finally, Koponen et al. (2025) and Huang & Rust (2021) categorize AI into mechanical AI, thinking AI, and feeling AI, and show how middle managers perceive them.

1. **Mechanical AI:** This type is used for simple, repetitive, and routine tasks. It is characterized by its ability to operate with minimal learning and adaptation, making it ideal for service standardization. Middle managers perceive mechanical AI primarily as technical tools that perform tasks automatically, such as handling routine customer interactions or processing data.
2. **Thinking AI:** This type is capable of performing complex, systematic, rule-based tasks. It can analyze large datasets and make informed decisions, thereby contributing to service personalization. Middle managers view thinking AI as a coworker that collaborates with human team members during various service processes, leading to a more integrated approach to task completion.
3. **Feeling AI:** This type is the most advanced and is designed for social, emotional, and interactive tasks. It can read and respond to human emotions, making it suitable for maintaining customer relationships and engaging in service relationalization. When middle managers view feeling AI as a coworker, they tend to anthropomorphize it, treating it as an equal team member that contributes to service interactions.

In synthesis, these classifications reflect different perspectives, but they are interconnected, illustrating an evolutionary view of AI development from simple automation to complex, human-like intelligence:

The weak AI / narrow AI category primarily includes mechanical AI— focused on routine, repetitive tasks with minimal learning.

The strong AI / general AI encompasses thinking AI—performing complex, rule-based, and decision-making tasks—and potentially feeling AI when emotional and social capabilities are integrated.

Super AI, in turn, represents the ultimate, highly advanced form of AI, potentially including both thinking and feeling capabilities at a level surpassing human intelligence.

Research successes to date in the field of AI include in particular aspects of narrow AI, in which intelligent systems are constructed to simulate human cognitive processes using information processing models and thus make these perception and intellectual abilities available by machine (Scheuer, 2020; Joshi, 2023).

Both Kreutzer & Sirrenberg (2019) and Scheuer (2020) see four fields of application or skill areas for AI. Kreutzer & Sirrenberg (2019) divide the fields of application into 1) natural language processing, 2) natural image processing, 3)

expert systems and 4) robotics. In contrast, Scheuer (2020) lists the four skill areas as 1) processing written language, 2) processing spoken language, 3) pattern recognition in visual skills & images and 4) navigation of knowledge. Taking a closer look, Scheuer's skill areas 1) and 2) can be subsumed into Kreutzer & Sirrenberg's (2019) application area 1), while skill fields 3) and 4) from Scheuer (2020) correspond to fields of application 2) and 3) from Kreutzer & Sirrenberg (2019) (expert systems are used to record, store and process information and knowledge, thus navigating it). If we add the field of application 4) from Kreutzer & Sirrenberg (2019), we get the four fields of application of AI (Figure 5):

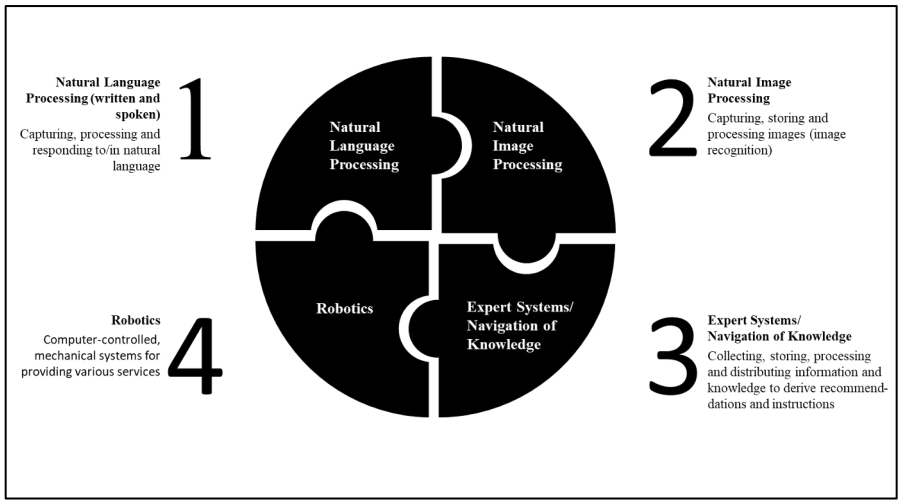


**Figure 5.** Fields of Application of AI-Technologies (based on Kreutzer & Sirrenberg, 2019).

In order to be able to cover these four areas of application and capability, Kreutzer & Sirrenberg (2019) propose three types of evaluations that can be used in isolation or building on one another: 1) descriptive (describing the current state), 2) predictive (predicting the future state) and 3) prescriptive (recommendations for action). Depending on the problem at hand, a different evaluation mode is appropriate, which also influences the choice of algorithms accordingly. Descriptive evaluations can be used to recognize unknown patterns, for example the analysis of communities in social media or topics in texts. For this purpose, descriptive statistics are used on the one hand, but also algorithms for association or cluster analysis on the other. Using methods of predictive evaluations - these include, for example, classification or regression - forecast models can be developed and, for example, the development of a specific attribute can be approximated. Finally, with the help of prescriptive

analysis methods, an optimization problem can be solved and, for example, it can be determined at which price sales can be maximized (Smyth et al., 2024).

Even if some, sometimes more science fiction-like, publications philosophize about strong or even super AI, which will largely replace human work, the direction in the literature shows a different path (Makarius et al., 2020; Murray, Rhymer, & Sirmon, 2021; Chowdhury et al., 2023). It is pointed out that in practical application the correct balance between human experience and the fast data processing enabled by AI should be used, i.e., as a strategic human-machine partnership (Krawkowski, Luger, & Raisch, 2022). Accordingly, a movement is also developing in research that examines and further develops this symbiotic relationship between people and technology: Augmented Intelligence or Intelligence Augmentation. This discipline strives for more efficient problem solving through the synergistic use of human and AI. Two approaches are interactive machine learning, in which people are increasingly involved in the learning process, and visual analytics, in which the latter automatically processes data and insights from the data in such a way that people can understand them be able to draw your own conclusions from it (Malhotra, 2021) However, the decisive factor for the use of AI is that the necessary prerequisites are created: a clear concept of which goals are to be pursued, the necessary level of digitalization, sufficiently high data quality and, last but not least, skilled people (Krawkowski, Luger, & Raisch, 2022; Chowdhury et al., 2023).

As a form of a summary of this section, Figure 6 illustrates how the presented terms are related to one another.

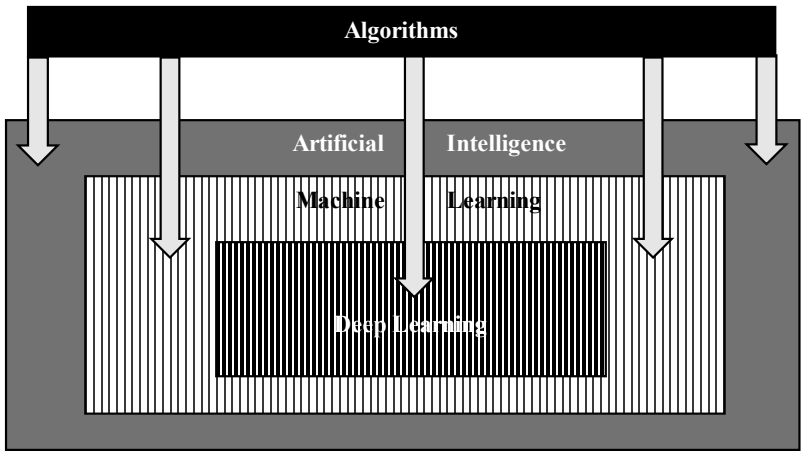


**Figure 6.** Comparative View of Algorithms, AI, ML, DL, and ANN (developed by the author).

Algorithms can be regarded as foundational to AI, ML, and DL, while ML represents a special form of AI and DL a special form of ML. The ANN are visible as vertical lines in the ML and DL rectangle. Higher amounts of vertical lines in the DL rectangle reflect higher number of layers in ANN, which is the key difference between DL and ML.

After having offered a foundational understanding of AI and its core components, it is now essential to explore how various research paradigms examine the integration and impact of technology within organizations, particularly through four distinct streams—positivist, social constructivist, sociomaterialistic, and predictive approaches.

### 2.1.3 Research on Technology in Organizations

Over the past few decades, technology has significantly transformed the business landscape. Nevertheless, Orlikowski (2010) notes that technology has garnered limited attention in management literature (p. 128). She refers to this phenomenon as 'absent presence', highlighting the paradox that, despite the essential role technology plays in organizations, only a small fraction of the literature has explored this subject (Orlikowski, 2010, p. 128). While all digital technology is a form of technology, not all technology is necessarily digital. According to Yoo, Henfridsson, and Lyytinen (2010), there are three distinguishing features between digital technologies and traditional technologies:

1. Reprogrammability: Digital technologies can be reorganized and repurposed for different functions than originally intended, which allows for flexibility and the emergence of new uses after deployment.

2. Data as a Common Asset: Digital technologies utilize data as a homogeneous source, which can be shared and decoded across different systems. This interoperability enables the potential for building complementary functions that are often unattainable which physical technologies.

3. Reinforcement and Self-Referencing: The growing number of digital devices and products amplifies the value of digital technologies through economies of scale, leading to enhanced benefits and faster learning in application development. This interconnectedness reduces entry barriers, allowing new entrants to contribute to and further strengthen digital innovation systems.

Before the advent of digital technologies in the digital age, technology was regarded as means by which organizations convert raw material inputs into finished outputs (Hatch & Cunliffe, 2006). Based on that, the term has developed and there are four streams of research that show how technology is studied.

#### 2.1.3.1 Positivist Approach

The initial exploration of technology within organizations began in the 1960s, focusing on how technology influences different types of organizations (Woodward, 1965; Perrow, 1967; Thompson, 1967). Early studies viewed technology as an external force with a direct impact on organizations, known as a 'technological deterministic' approach (Orlikowski, 2010). This approach considers technology as the driver of outcomes within organizations, with individuals, teams, and organizations being the ones affected by it. This perspective, referred to as 'contingency theory' by Klein (2006), seeks to understand how technology shapes organizational outcomes.

The perception of technological change as a mechanical process involves measuring and evaluating the impact of technology implementation. Studies aim to understand the development of technological change and the implementation of technology in organizations (Alavi & Henderson, 1981; Franz & Robey, 1984). Research has concentrated on identifying and evaluating the impacts of technology on organizations at various levels and across different functions (Kling, 1978; Kling & Iacono, 1984). However, this perspective often generalizes findings and tends to overlook the influence of specific situational and contextual factors that affect the interplay between technology and organizations (Orlikowski & Baroudi, 1991). Moreover, it frequently treats technology as a standardized entity that is uniformly adopted across different organizations, suggesting that technology exerts a direct and unmediated influence on organizational dynamics while ignoring the significant role of human agency in the process of technological implementation. In this view, individuals are often depicted as passive recipients of technology, lacking any substantial influence over it (Orlikowski & Baroudi, 1991; Cecez-Kecmanovic, 2016). Research on digitization typically examines its implementation on a global scale and its implications for organizations as well as specific groups or functions within them. Studies focus on identifying the factors that can promote the adoption of digital technologies. The technology acceptance model (TAM) is commonly used to analyze the success factors in digitization implementation (Venkatesh & Davis, 2000). Researchers often use this model to assess the impact of digitization, such as Bai and Gao (2014) studying consumer perceptions of Internet of Things. Additionally, research explores the broader effects of digitization on the individuals

as well as on the overall organization (Raguseo, 2018; Verma, Bhattacharyya, & Kumar, 2018).

#### 2.1.3.2 Social Constructivist Approach

In the 1980s and 1990s, researchers began to take the context into account in examining technology in organizations, challenging the perspective of technology as an external force (Orlikowski, 2010). This approach posists that technology is socially constructed and situationally bound, aligning with a social constructivist ontology (Leonardi & Barley, 2010). This perspective argues that reality is subjectively interpreted by individuals, leading to a more fluid and context-specific understanding of how technology is adopted. A change of technology is seen as a social phenomenon that involves interpreting the capabilities of technology and creating new practices to utilize it (Leonardi, Nardi, & Kallinikos, 2012).

In contrast to the positivist tradition, the interpretive approach sees technology as influenced and utilized by humans rather than inherently fixed (Orlikowski & Baroudi, 1991). However, this approach struggles to fully understand the various elements that make up a situation, with critics pointing out its lack of consideration for external factors and historical context (Orlikowski, 2010). Additionally, the social constructivist approach has been criticized for overly emphasizing human elements when studying technology in organizations. This focus often overlooks the importance of the technology itself, as it aims to contest positivist theories (Orlikowski, 2010).

#### 2.1.3.3 Sociomaterialistic Approach

As the social constructivist approach undermines the importance of technology, researchers have recommended an approach that focuses on the interaction between technology and humans in organizational practices. This line of research, known as ‘sociomateriality’ or ‘materiality’ examines how human and non-human elements, such as technology, shape reality and influence each other in practices (Orlikowski, 2007; Leonardi, & Barley, 2010). According to proponents of sociomateriality, social and material components are intertwined and co-create reality in situated practices. The central concept is that social and material elements are not distinctly separate; rather, they are intertwined and shaped by various actors within a specific set of practices (Cecez-Kecmanovic et al., 2014). Both human beings and technology are seen as mutually constructed entities, rather than one dominating the other (Feldman & Orlikowski, 2011).

Leonardi and Barley (2010) propose a more balanced perspective on the relationship between material and social elements, suggesting that some properties

are inherently material and influence social outcomes. They argue that while material characteristics exist independently, they are only actualized through human interaction and perceptions. They advocate for further research on how people engage with technology's materiality and how it influences organization. In contrast to other scholars like Orlikowski (2007) and Feldman & Orlikowski, 2011), Leonardi and Barley (2010) emphasize the importance of distinguishing between the social and material dimensions.

Sociomateriality and other materialistic approaches emphasize the significance of the collaborative influence of social and material factors in shaping reality. The correlation between the social and material elements can be perceived as distinct, intertwined, or synonymous depending on perspective. However, the study of these interactions in practices is essential. In the context of digitization, research focuses on how practices are changed by the joint efforts of individuals, managers, and digital technology. Studies (e.g., Scott & Orlikowski, 2014; Robey & Cousins, 2015) explore the combined impact of human and non-human entities on practices.

#### 2.1.3.4 Predictive Approach

Another approach for examining technology in organizations involves predictive studies. These studies assess potential advancements in technology, their adoption processes, and their economic impact (Jiang et al., 2017; Lu & Weng, 2018). Certain academic publications, such as the journal Technological Forecasting and Social Change, focus on these themes, and empirical papers often conducted Delphi studies. This approach, which originated in the 1950s, is particularly beneficial when experts are located in different locations or when conflicting opinions exist (Rowe & Wright, 2001). It is especially helpful in scenarios where predicting the future is challenging or when a group of experts can provide a more informed perspective (Abbasi, Tabatabaei, & Labbaf, 2016). In addition, delphi studies have been conducted to explore technological advancements in specific fields. For instance, several studies have been conducted in the field of Human Resource Management (HRM) over the past decade to predict the impact of technological advancements. While some studies aim to understand the overall implications of technologies (Abbasi, Tabatabaei, & Labbaf, 2016), others analyze the impacts of a certain technology (Strohmeier, 2018), or of a certain function of HRM (Habraken & Bondarouk, 2017).

Overall, predictive studies provide a unique lens through which to analyze the influence of digital technologies in organizations, enabling the creation of scenarios and the exploration of future possibilities. This approach is especially valuable for understanding emerging trends and their relationship with society. By focusing on topics such as the effects of digitization on management and leadership, researchers can anticipate how digital technologies will shape organizations and various

functions in the future. Utilizing techniques like the Delphi method, studies aim to predict the influence of digital technologies on organizations or specific areas (Strohmeier, 2018).

In examining technology within organizations, researchers have approached the topic from four distinct perspectives: the positivist perspective, the social constructivist perspective, the sociomaterial perspective, and the predictive perspective. Each of these viewpoints leads to different epistemological stances and research inquiries. Below is a summary table 5 that outlines the various methods for investigating technology in organizational contexts.

**Table 5.** Views to investigate digital technology in organizations.

| Approach/View | Role of Digital Technology | Research Question |
|---|---|---|
| Positivist | Digital Technology as external force | How does digitization affect organizations? |
| Social Constructivist | Digital Technology influenced by humans and context | How do individuals impact the adoption of digital technologies within companies? |
| Sociomaterialistic | Digital Technology intertwined with social elements | What changes occur in practices through a collaborative effort between employees, managers, and digital technology? |
| Predictive | Digital technology as a future phenomenon | How will organizations be affected by the influence of digital technology? |

#### 2.1.3.5 The Relation to Managerial Competencies

The four views on technology in organizations offer distinct lenses through which to examine and research managerial competencies in the digital age. As detailed next, each view provides a unique context for understanding how technology interacts with human agency and organizational practices, ultimately influencing the competencies needed by managers.

The positivist perspective emphasizes a deterministic relationship between technology and organizational outcomes. In this view, technology is seen as a tool that managers must effectively implement and leverage to achieve organizational goals. Researchers adopting this view can expect to identify competencies related to understanding and using digital tools and platforms (e.g., technological knowledge) and evaluating quantitative data related to technology implementation and its outcomes (e.g., data analysis skills).

The social constructivist view emphasizes the role of human interpretation and social context in the adoption and use of technology. This perspective highlights the necessity for managers to understand the social dynamics within their organizations From a social constructivist perspective, the researcher can expect a focus on how managers interpret and utilize digital technologies within their specific organizational contexts. Competencies may be seen as socially constructed, emphasizing how managers negotiate and shape technology use through their interactions and relationships. Relevant competencies include for example communication and collaboration to work with teams to interpret and utilize technology. Likewise, empathy and conflict management become critical as managers navigate diverse interpretations of technology among team members.

The sociomaterialistic perspective posits that social and material elements are intertwined and co-construct organizational reality. Here, the focus is on the interplay between human agency and technology. Researcher can expect to explore competencies that reflect this interaction, focusing on how managers navigate the complexities of both social and material aspects of digital technology. These competencies include for example the ability to integrate technology into everyday practices and workflows (integration skills), competencies in fostering innovation through the effective interplay of technology and human agency (innovation management), and analyzing and interpreting the implications of technology in organizational practices (critical thinking).

The predictive approach will allow researchers to identify competencies that are forward-looking, focusing on anticipating future developments in technology and their implications for management. This perspective can help in understanding how managers can prepare for and respond to technological advancements. Potential competencies are in the area of strategic thinking and foresight, as managers must be able to anticipate technological trends and their potential impact on the organization. Furthermore, they must stay informed about emerging trends and adapt strategies accordingly. Competencies in the area of continuous learning and adaptability are necessary as technology evolves.

In summary, researchers can expect to identify a mix of technology-related and human-related competencies across the four approaches. The positivist perspective may lean towards technical competencies, while the social constructivist and sociomaterialistic approaches emphasize interpersonal and contextual competencies. The predictive approach adds a forward-looking dimension, highlighting the importance of adaptability and continuous learning.

Having established how various perspectives on technology inform our understanding of managerial competencies, the thesis next delves deeper into the concept of competence. Understanding its origins, its evolution as an academic

concept, and its specific implications within management research will provide a clearer framework for assessing the competencies required in the digital age.

## 2.2 The Concept of Competence

The concept of competence is central in this doctoral dissertation. In ordinary English, competence is frequently employed to represent extensive specialist knowledge and experience. People who are competent in a specific subject can be considered experts in that discipline. Being competent indicates that someone is particularly good at something because they have knowledge about this issue and also know how to transform this knowledge into effective actions. A differentiation has to be made between competence and competency. In this dissertation, 'competence' is used to represent the overall capacity of a person to perform effectively in various situations, while 'competencies' refers to the specific attributes (e.g., knowledge and skills) that enable a person to perform effectively. In other words, competencies represent foundational elements of a person's overall competence, which follows the view of researchers such as Gonzi (1993), Eraut (1994), and Mulder (2014). The same goes with the terms 'managerial competence' and 'managerial competency'. Furthermore, the literature discusses competence either in the context of individuals (e.g., managerial competence by Boyatzis, 1982) and organizations (e.g., core competence by Prahalad & Hamel, 1990). This thesis discusses competence as individual-level concept and thus contributes to research in this branch of literature.

### 2.2.1 Genesis and first Accounts of Competence

#### 2.2.1.1 From King Hammurabi and Ancient Rome

From an etymological perspective, the word 'competence' stems from the Latin words 'competens' ('appropriate') and 'competentia' ('conjunction', 'correspondence') and meant being responsible and able for specific tasks (Vonken, 2017).

The concept of competence is considered to be ancient. Early accounts stem from ancient Persian culture during the time of King Hammurabi, the sixth king of the First Babylonian Dynasty (Mulder, 2011). Hammurabi, who was ruling from 1792 BC to 1750 BC, was famous for having 282 basic laws of his kingdom carved into

circular stone pillars of a Babylonian temple. These sets of laws, known as Hammurabi's Code of Laws, include economic issues (prices and tariffs), family law (marriage and divorce), criminal law and civic law. Besides, they entail also descriptions of Hammurabi as competent king in the original Akkadian language which were translated into English as 'rightful' and 'wise' (Harper, 1904).

Notions of competence can also be found in Ancient Rome in forms of profiles that listed the attributes of 'a good Roman soldier' (Draganidis & Mentzas, 2006; Sengupta, Venkatesh & Sinha, 2013; Sudirman et al., 2019). Not surprisingly, among these attributes were excellent fighting skills that Roman soldiers needed to defeat their enemies and to conquer territories. Besides, they had to be "highly skilled architects and engineers" in order to make weapons, build walls, roads, bridges and keep everything well maintained (Richardson, 2019). Therefore, many legionary camps trained their soldiers not only the skills to succeed in the battlefield, but also skills in various crafts such as blacksmithing or carpentry. The more valuable the skills of the soldier, the higher was his payment.

#### 2.2.1.2 Early accounts on Competence: The work of Childs (1910), Small (1914), and Dewey (1916)

According to Mulder (2014), written accounts of the competence concept in academic publications can already be found at the end of the 19th century in law dissertations. The competence of law courts was discussed in the dissertations of Roes (1885) and Viruly (1890) at the University of Leiden in the Netherlands. Even though these dissertations were written in Dutch, their titles, including the terms 'absolute competentie' (Roes, 1885) and 'relatieve competentie' (Viruly, 1890) imply that competence was already a topic for lawyers and jurists before it became an academic concept.

In the early 20th century, the concept of competence appeared in English publications. One of the oldest is the document 'Report of a Deputation appointed by the Council of University College, Reading, to visit selected centres of agricultural education and research in Canada and in the United States'. This report, dating from 1910, describes how a British committee traveled to the United States and Canada to examine local agricultural education practices. The author, principal W.M. Childs, uses the term 'competence' in relation to lecturers and teachers (pp. 31, 32; 73; 100), English farmers (p. 59) or Farm operators (p. 67), and judges or assessors (p. 59). Even though he does not define competence, it can be concluded that he implies each of these groups to have the ability to do their work well. This is a meaning of competence, which can also be found in the dictionaries. On page 75 of the report, Childs (1910, p. 75) uses a different notion of competence, writing "as

soon as a college has attained a sufficient measure of competence and strength as a university institution, it should itself determine and control its principal courses of study, and the examinations in connexion with them". Here, Childs relates competence not to a person, but to an institution, in the sense of what Prahalad and Hamel (1990) refer to as core competence of the organization. This indicates that the college has the necessary experience, staff, and management to provide a high-quality educational program. Childs (1910) even uses the word 'incompetence' (p. 84) to emphasize that numerous workers and practices fell short of the expected standards. Overall, the report demonstrates that the concept of competence in its various forms was already used in thoughts about agricultural education.

A second source of competence is from sociology. In the article 'The Social Graduation of Capital', Albion W. Small (1914) discusses three types of capital: tool-, management-, and finance-capital. His thoughts on competence address specifically management-capitalists. Small (1914) regards them as heads of an economic organization that are in a co-operative relationship with the laborers who are working for them as well as with the social community that enable industrial operations of the organization. In this co-operative relationship, Small (1914) states "the laborer has really a larger stake than anybody else in competent discharge of the managerial function. If it is not well performed, it may mean the loss of his job and indirectly of his life and the life of his family" (p. 731). This is one of the earliest sources that relates competence to the management role. Even though Small (1914), like Childs (1910), does not define the term, the second phrase implies that he uses it as indicator of good job performance. He exemplifies that being not competent enough would affect particularly the subordinates who may lose their job. Later, he re-emphasises the negative outcomes of incompetent management by saying "the difference between competent and incompetent management may quickly mean the difference between life and death for the business" (p. 732). This indicates that in order to be successful, any business depends on the competence of its managers. In this regard, the selection process of managers is crucial for the organization. Whereas competence in ordinary jobs such as bricklayers, plumbers, or electricians can be guaranteed through choosing by lot, the selection of managers requires "some method of competence" (p. 732). However, Small (1914) claims that the "present capitalistic system" does not have this kind of method yet. These thoughts are remarkable, especially the importance that competence plays in the selection process, a point that McClelland (1973) addresses almost 60 years late in his paper 'Testing for Competence Rather than for Intelligence'.

Finally, the concept of competence appears also in education in the work of the American educational philosopher John Dewey. In this book 'Democracy and Education', Dewey (1916) argues that education is fundamental to building a democratic society, as it fosters the essential skills and values that enable individuals

to actively participate in shaping their social and political contexts. Different from Childs (1910) and Small (1914) who use the term ‘competence’, Dewey (1916) applies the term ‘competency’ to convey his ideas regarding the objectives of education. On page 12, he describes how the social environment shapes an individual’s behaviour by stating that a child in a family of musicians will be stimulated by music until it “gains a certain competency in it” (p. 13). From this example, Dewey (1916) regards competency as ability of doing something well and as something that can be developed. This is different to the citation on page 43 where he states that each pupil shall become an expert in observing and recalling, or “an effective competent member of the group in which he is associated with others” (p. 43). In this example, Dewey (1916) regards being competent not only as being able of doing something well, but as being an expert in something, which goes even further. On page 76, he discusses the importance of education in fostering ‘industrial competency’, which is essential for individuals to secure their livelihoods. He emphasizes the democratic principle that everyone should have the opportunity to cultivate the competence necessary to select and follow a career path. Additionally, he explores the connection between ‘industrial competency’ and the concept of ‘good citizenship’. From these examples, Dewey regards competence as the ability to create a livelihood as well as the minimal prerequisite for pursuing an independent career and a comprehensive mastery of professionalism that is tied to citizenship and permits participation in a democratic society. Finally, he also recognises the importance of knowledge and self-determination for competence by noting that “the knowledge of a farmer is systematized in the degree in which he is competent” and that there is a difference between being efficient in carrying out the plans of others and being efficient in forming one’s own plans (p. 198). Even though Dewey (1916), like Childs (1910) and Small (1914), does not define the meaning of the concept, his perspective on competence is tied to the idea that education should play a vital role in fostering a democratic society. He believes that schooling is essential for individuals to make informed choices about their vocations or professions in a self-determined manner, ultimately enabling them to become responsible and engaged citizens.

### 2.2.2 Competence as an Academic Concept

In this section, I present three influential developments of competence as academic concept: motivation (2.2.1), intelligence (2.2.2) and performance (2.2.3).

#### 2.2.2.1 Competence and Motivation

As an academic concept, competence was first explored in 1959 in the article ‘Motivation reconsidered - The concept of Competence’ by the American psychologist Robert White. During this time, the drive reduction theory by Clark Hull was the most popular motivation theory in use in to explain why people engaged in specific behaviors. According to this theory, human behavior is designed to reduce biological drives such as hunger, sexual desire, or the need for warmth. Hull proposed that because these drives produce an unpleasant state, people are motivated to take actions that reduce them.

Different to this approach that saw ‘drives’ as the key notion for explaining human behaviour, White (1959) advocated ‘competence’ as the primary notion, referring to “... an organism’s capacity to interact effectively with its environment” (p. 297). Competence motivation differed from biological driven motivation, which served primary needs such as hunger, thirst, or sex. According to White (1959) every individual is intrinsically motivated to achieve competence in order to enhance one’s abilities in dealing with the environment. Each individual shows directed, selective, and persistent behavior followed by learning what effects this behavior has on the environment. White stated that this kind of behavior is often visible in the “playful and investigatory behavior of young animals and children” (p. 329). Through activities such as grasping, crawling, walking, as well as attention and perception or language and thinking, they learn to interact effectively with the environment.

White (1959) offered examples from biological tests and highlighted research demonstrating that behavior motivation is far more complicated than just reacting to certain desires. For example, he noted studies that revealed that dogs in need of certain nutrients would seek out specific foods containing these nutrients. Additionally, hormone levels contribute to more intricate sexual behaviors than what was previously considered in drive-reduction theories. He recommended seeing competence as a motivational term, stating that “...there is a competence motivation as well as competence in its more familiar sense of achieved capacity” (p. 318). White described the drive to achieve competence as ‘effectance’. He expressed skepticism about whether drives alone could sufficiently explain the behaviors necessary for attaining competence. He asserted, “Such activities in the ultimate service of competence must, therefore, be conceived to be motivated in their own right. It is proposed to designate this motivation by the term effectance, and to characterize the experience produced as a feeling of efficacy” (p. 329). This perspective continues to influence contemporary discussions surrounding competence. Children, students, and professionals alike are driven to learn and master increasingly complex tasks and skills to perform effectively within their environments. In response to this motivation in educational contexts, performance motivation assessments have been developed, including those addressing failure

anxiety, which has been identified as a significant barrier to succeeding in educational evaluations (Mulder, 2014). When faced with complex problems or demanding performance situations, the process of becoming competent—and thereby gaining confidence in one's understanding and ability to perform—is intrinsically rewarding.

Understanding competence as a motivator for performance has been essential in the broader study of learning, particularly in professional development. It is important to recognize that without performance motivation—the aspiration to attain a certain level of professional skill—professional learning would not occur at all.

#### 2.2.2.2 Competence and Intelligence

Harvard Psychologist David McClelland followed the approach of White. In 1973, he published his article 'Testing for Competence rather than Intelligence'. During this time, it was common for firms to hire candidates according to their results in intelligence and personality tests. Testing for intelligence meant that people from lower classes were disadvantaged in the selection process. As they had lesser access to educational institutes compared to people from higher classes, they scored lower in the tests and were sorted out by the employers. The high number of candidates who were screened out, especially among Foreign Service Information Officers, alarmed the US Department of State and the traditional selection criteria were started to be questioned. They worked together with McClelland to find out how the quality of the selection process could be improved. In general, McClelland (1973) criticized the use of aptitude and intelligence tests as tools of selection, as these tests would have no correlation to successful job performance. As they were similar to tests in schools and universities, they would be good in predicting academic performance but not job performance. For instance, McClelland (1973) described the intelligence test that potential policemen had to do. In order to pass this test, they had to know the meaning of terms such as "quell", "pyromaniac" and "lexicon" (p. 4). Whether or not these terms should be part of a policeman's vocabulary, McClelland doubted that knowing them indicates that candidates would be better policeman than candidates who did not know them. Therefore, McClelland stated that the best test for selecting good candidates was a test that sampled real job skills. Rather than relying on pen-and-paper tests, recruitment should be based on direct observation of how people perform job tasks. That means for testing who will be a good policeman, one should "find out what a policeman does, follow him and make a list of his activities" (p. 7), and create the test accordingly. This would also help in finding out superior performance and average performance. Superior performance, according to McClelland, did not only consist of intelligence but also of personal variables which he called "competencies" (p. 10). As examples, he mentioned communication skills,

patience, moderate goal setting, and ego development. Overall, he proposed the following testing principles (Mulder, 2014):

1. Employ criterion sampling techniques.
2. Assess the changes in knowledge and skills acquired.
3. Clearly communicate how individuals can enhance the trait being evaluated.
4. Include competencies from various 'clusters of life outcomes' in the evaluation process.
5. Assess responses not only to clearly defined issues but also to ambiguous instructions, reflecting the complexities of real-life scenarios.
6. Focus item sampling on overarching thought patterns, as they are more universal and applicable than specific minor skills, facilitating broader generalization.

So, while White (1959) highlighted the importance of motivation in learning and performance, McClelland (1973) stressed the need for more effective assessment methods in education. He argued that assessments should extend beyond evaluating basic skills, as these often fail to predict success in life and professional settings. This perspective has significant implications for the design of professional education and development programs. Alongside motivation, effective assessment was considered essential for preparing graduates for the workplace.

#### 2.2.2.3 Competence and Performance

Paralleling motivation (White) and intelligence (McClelland), there was a third influential development which aimed to connect competence and performance. Beginning in the 1960s, the performance improvement movement grew, with the goal of not only explaining behaviour, assessing competence, and providing training and development, but also of improving productivity and performance. Ludwig von Bertalanffy proposed general systems theory (GST) in 1968. It focuses on the interactions and interrelations between components within a system, emphasizing a holistic view of systems as a whole. The systems approach implied that examining individual behaviour was inadequate. Instead, it emphasized the interconnectedness of workplaces, work units, organizations, and their societal context. Performance enhancement technology was created to help industrial society enhance its efficiency and effectiveness.

Gilbert (1978) emphasized the connection between competence and performance, as reflected in the title of his book, ‘Human Competence: Engineering Worthy Performance’. In this book, Gilbert proposes three theorems to explain human competence. He goes away from the view that competent people are the ones

that work hard, know a lot, and are highly motivated. Since all these factors come at a price (e.g., time, money, energy), he regards them as "costly processes that we want to use as efficiently as possible" (p. 17). According to Gilbert, individuals who demonstrate competence are those who can create valuable results without using excessively costly behaviour (p. 18). This notion leads to his first theorem: Human competence is a function of worthy performance, which is a ratio of valuable accomplishments to costly behaviour. Mathematically, he writes this as W = A/B, where W stands for worthy performance, A represents valuable accomplishments, and B denotes costly behaviour. By separating accomplishments (e.g., selling a product) from behaviour (e.g., all actions before the sale), he underlines that the accomplishment is what makes the performance valuable, not the behaviour. Essentially, to enhance human competence, one should focus on increasing the value of accomplishments while decreasing the energy expended in the effort.

Gilbert's (1978) second theorem addresses the potential for improving performance (PIP), defined as "...the ratio of exemplary performance to typical performance" (p. 30). Mathematically, Gilbert puts it this way: PIP = W ex / W t. Here, exemplary performance refers to the highest levels of performance achieved in a specific activity over time, based on historical records. Gilbert notes that calculating PIPs is meaningful only for specific and identifiable accomplishments, as there is no "general quality of competence" (p. 30). He argues that PIPs are beneficial because they highlight potential and opportunity, making them far more positive than IQ tests, that he considers to be unfair.

Gilbert's (1978) third theorem, known as the management theorem, identifies how to uncover the underlying causes of both competence and incompetence. According to this theorem, deficient performance is always rooted in either a lack of behavioral repertoire or inadequate supporting environments. Ultimately, however, "the root cause lies in deficiencies within the management system" (p. 76).

The behaviour repertory encompasses the personal characteristics of individuals that they bring to their jobs, and the environment represents the work environment factors that encourage or impede performance. The concept of worthy performance (W), originally defined as the ratio of valuable accomplishments to costly behavior, can be further refined to reflect the ratio of valuable accomplishments (A) to the combined costs of the behavior repertoire (P), the environment (E), and management (M): W = A / (P + E + M).

From these three theorems, Gilbert's (1978) behaviour engineering model was derived. The model includes six components or variables: three environmental components (data, instruments, incentives) and three components for behaviour repertory (knowledge, capacity, motives). With this model, managers can systematically identify barriers to individual and organizational performance. Gilbert points out that performance issues may stem from a professional's lack of

competence, poor support systems, insufficient rewards, low motivation, or various personal challenges. The sequence of analysing performance problems is first to look at the components of environmental support (Does everyone know what is expected of them? Are the instruments to enable performance available? Are there sufficient incentives provided?) and then at the factors in the behaviour repertoire (Does everyone had the knowledge to perform the job? Is everyone physically and mentally capable of performing the job? Is everyone motivated to perform their job?). In this way, management can troubleshoot performance.

Overall, two aspects can be learned from Gilbert's (1978) work on human competence. First, performance should not be achieved at a high expense, so professionals should be competent enough to carry out specific activities at reasonable costs. Second, in situations of underperformance, managers should prioritize assessing the conditions of the working environment rather than immediately evaluating the competence of individual employees. Nowadays, these aspects are frequently overlooked, and performance issues are attempted to be 'fixed' by sending employees to professional training programs.

### 2.2.3 The Concept of Competence in Management

When discussing the concept of competence in the field of management, the terms 'management competence' (Bücker & Poutsma, 2010) and 'managerial competence' (Avkiran, 1999) can be found in the literature. Likewise, researchers investigating the specific knowledge and skills of competent managers also use the term 'management competencies' (Carson & Gilmore, 2000) or 'managerial competencies' (Debrah & Ofori, 2005). However, before the focus was on managerial competence, or before this term was even used, management scholars investigated the manager's role, function, characteristics and leadership styles.

#### 2.2.3.1 Precursors

Peter Drucker (1954) studied the roles and jobs of managers. In his book 'The Practice of Management', Drucker emphasized the importance of management as a profession and identified key competencies such as interpersonal skills, communication, and the ability to motivate and inspire others. He also stressed the need for managers to be adaptive and flexible in order to navigate the rapidly changing business environment.

Henry Mintzberg (1973) expanded on this concept by identifying the various roles managers assume depending on their activities. He also outlined different

paradigms for understanding managerial work. Mintzberg argued that traditional management education focused too heavily on technical skills and theoretical knowledge, and that managers needed practical experience and a holistic understanding of the organizations they lead. He highlighted competencies such as networking, collaboration, and decision-making as essential for modern managers.

Alongside the roles and functions of an effective manager, previous research has also emphasized the characteristics and leadership styles that contribute to managerial effectiveness. Argyris (1962) studied the impact of managers' interpersonal competence (the ability to deal effectively with others) upon organizational effectiveness. Blake and Mouton (1964) developed the managerial grid, which outlines essential approaches for leveraging human resources to enhance productivity. In a related line of inquiry, Appley (1974) explored the fundamental principles of management—specifically, the art of accomplishing tasks through others—by examining the nature, processes, and qualities of effective leadership. Although not explicitly speaking about managerial competence, the goal of these studies was to "systematically discover what competent management is" (p. 8), as pointed out by Richard Boyatzis (1982). In this regard, the work of earlier management theorists was a precursor for the competence development in the field of management and influenced further research on this subject, as shown in the next section.

#### 2.2.3.2 Implementors

During the 1970s the concept of competence was introduced in the field of management. McClelland (1973) built upon the concepts and theories of the earlier researchers mentioned in the previous section. With his consulting firm, McBer & Company, he studied not only functions and demands of jobs, but also the organizational environment and the competencies of the people performing the jobs.

During this time the American Management Association (AMA) wanted to find competencies that differed successful managers from less successful ones. Together with McBer and Company, they undertook a large-scale study with more than 1,800 managers to develop a competency model. As competencies, they identified specialized knowledge, intellectual maturity, entrepreneurial maturity, interpersonal maturity and on-the-job maturity, which managers require to perform their jobs successfully. These competencies, labelled as 'managerial competencies', were defined as "generic knowledge, motive, trait, self-image, social role, or skill of a person that is causally related to superior performance" (Hayes, 1979, p. 2). However, the inclusion of motive, trait, self-image and social role are controversial, because these characteristics are quite distinct from competence.

Returning to the work of White (1959), motive refers to an individual's inner drive or reason for behaving in a certain way. It is the underlying psychological factor that energizes and directs behaviour towards a specific goal or outcome. Traits, on the other hand, are enduring characteristics or qualities that are consistent across different situations and over time. Self-image is the mental picture or perception that individuals have of themselves. Finally, social role refers to the set of expectations, behaviours, and responsibilities associated with a particular position or status within a social group or society (Spencer & Spencer, 1993).

Knowledge and skills are components of managerial competence, which is also evident from the definition of Patricia McLagan (1980), who proposed to make competency a key topic of Human Resource Management (HRM). According to McLagan (1980), competencies were "the knowledge and skills which underlie effective job performance" (p. 22). In order to enhance the performance of their human resources, organizations needed to develop competency models. McLagan (1980) defined them as "decision tools, which describe the key capabilities required to perform a job" (p. 23). These decision tools could be used for all elements of the HRM process, such as recruitment and selection, assessment, individual development planning, training and curriculum design, individual career planning, succession planning and career pathing. McLagan underlined the importance for organizations to integrate competency models in their HR systems. At the time, HR decisions tended to be made intuitively, based on job descriptions and skill lists. While job descriptions focused more on the aspects of the job rather than the qualification of the individual, skill lists were often lengthy and unclear, which made it difficult to compare skills across several groups. By focusing on competencies, organizations could make their selection criteria more valid and reliable, more succinct, better comparable across groups and less reliant on intuition. However, she pointed out that successful integration of competency models requires top management support (McLagan, 1980, p. 26).

In 1982, Richard Boyatzis, a colleague of McClelland at McBer Company, wrote "the first empirically-based and fully-researched book on competency model development" (Rothwell & Lindholm, 1999, p. 93). This book, titled 'The Competent Manager', increased the popularity of the term "competency" in the business and management sector (Woodruffe, 1993; Cardy & Selvarajan, 2006). Boyatzis defined competency as "an underlying characteristic of a person", that could be "a motive, trait, skill, aspect of one's self-image or social role, or a body of knowledge which he or she uses" (Boyatzis, 1982, p. 21). This definition has much in common with Hayes (1979) - unsurprisingly since these are all from the same school of thought – and therefore has the same weaknesses as already pointed out earlier.

According to Boyatzis (1982), competencies would lead to “effective and/or superior performance in a job” (Klemp, 1980, cited by Boyatzis, 1982, p. 21). He developed a model of effective job performance, which consisted of three components: the individual’s competencies, the job’s demands and the organizational environment. With this model, he emphasized that competent performance does not only require individuals who possess relevant competencies, but that it is also dependent on the characteristics of the job and the organizational context. The more of these components are consistent, the higher is the likelihood that effective performance will occur.

Boyatzis and his colleagues at McBer Company wanted to determine the competencies for effective managerial performance. They conducted a large-scale study with more than 2,000 people in 41 managerial jobs and from 12 organizations. Their sample included managers from different level groups (entry level, middle level, executive level) and functions (marketing or public relation, manufacturing or operations, personnel, finance or budget and procurement). The study resulted in 19 generic competencies that effective managers tend to have, e.g., efficiency orientation, self-confidence, and developing others. These managerial competencies were sorted into five distinct clusters: Goal and Action Management, Leadership, Human Resource Management, Directing Subordinates, and Focus on Others.

Despite the significance of the work by Boyatzis (1982) it implies that different managerial jobs require the same competencies, which has been widely questioned. For instance, Collin (1989) argued that the AMA model fails to capture the dynamic and constantly changing nature of job requirements and does not allow for the development of the specific competencies needed for individual job roles. Likewise, the idea of generic managerial competencies has been empirically refuted by Jacobs (1989).

#### 2.2.3.3 Successors

Building upon Boyatzis’ work, Lyle and Signe Spencer summarized 20 years of competency research by McClelland and McBer and Company. Their book ‘Competence at Work: Models for Superior Performance’ from 1993 is one of the “most research-oriented” and “comprehensive” books on competency modelling (Rothwell & Lindholm, 1999, p. 95). Using the findings from 286 competency studies, the authors created a Competency Dictionary for the 21 most common competencies that lead to superior performance in managerial jobs. The Competency Dictionary consists of six competency clusters in which the authors sorted two to four competencies. For each competency, they provided a definition as well as behavioral indicators to show how the competency can be demonstrated in the job.

Compared with the work of Boyatzis (1982), both frameworks recognize the importance of being able to adjust to and thrive in changing environments, of working effectively with others and building positive relationships, and of taking proactive action and demonstrating initiative in the workplace. However, Spencer and Spencer (1993) place a greater emphasis on technical skills and expertise, and less on leadership, which is a key dimension in the framework of Boyatzis (1982).

Overall, the Competency Dictionary by Spencer and Spencer presents the competencies "in generic form, in scales to cover behavior in a wide range of jobs, and to be adapted for many applications" (Spencer & Spencer, 1993, p. 23). According to the authors, these competencies would cover 80-95% of the characteristics of superior performance in most jobs. However, they also raised some cautionary notes about using generic models. First, due to their generic characteristic, they can be applied to all jobs, so they are never precise. Second, they represent only the 21 most common competencies and therefore disregard unusual or unique competencies that certain jobs require. Third, higher levels on the scale do not indicate better performance, as "each job has an optimal point on the scale" (p. 24).

Besides competency frameworks, also taxonomies for managerial competencies have been developed. In general, taxonomies offer a more structured and systematic approach to defining competencies. A well-known work on taxonomies for managerial competencies is the 'hyperdimensional' taxonomy of managerial competence by Robert P. Tett, Hal A. Guterman, Angela Bleier and Patrick J. Murphy, from 2000. They analysed twelve previously published taxonomies and provided two justifications for their inadequacy. First, no model outperformed another in terms of method, population, purpose, content, complexity and comprehensiveness. Secondly, earlier models primarily aimed at identifying broad performance dimensions, while Tett et al. (2000) argued for the necessity of deconstructing some of these wider dimensions into more manageable components. Following this insight, the researchers created an initial draft of 47 managerial competencies derived from twelve established taxonomies that encompassed 109 dimensions. This draft was subsequently validated through two studies in which members of the Academy of Management provided expert feedback on the model. As a result of these evaluations, six additional competencies were incorporated. The revised framework, now consisting of 53 managerial competencies, underwent further assessment in a third study. This thorough process culminated in a final taxonomy featuring nine domains, encompassing a total of 53 managerial competencies. Tett et al. (2000) determined that this final taxonomy demonstrated a high degree of specificity, as the consulted experts successfully classified behavioral elements into well-defined categories, achieving significant agreement and accuracy.

In 2002, Dave Bartram proposed the ‘Great Eight’ competencies model, which he then developed with help from SHL, a publisher and provider of psychometric tests intended to predict workforce performance. Even though it attempts to describe all human behavior, it is primarily directed at the management profession. Based on a content analysis of different academic and practice-related competency models, Kurz & Bartram (2002) created the Universal Competency Framework, which was later updated by Bartram (2005). They identified 112 competencies, the so-called “component competencies” that form the basic competencies and are not broken down further. Using the competency models examined and the 112 basic competencies, they aggregated them into 20 competency dimensions. They stand for the competencies that over the past 20 years have been regularly found in job analyses and utilized by assessment and development centers. By further aggregating these 20 competence dimensions, they derived eight higher-level factors, the “Great Eight”.

Since its creation, the Great Eight Model has been employed in a variety of different contexts, for a variety of reasons, and has proved useful in operationalizing performance at work (Rojon, McDowall, & Saunders, 2015). Even though it attempts to describe all human behavior, it is primarily directed at the management profession. Whereas other frameworks on managerial competence only include a small number of competencies (e.g., Spencer & Spencer, 1993; Tett et al., 2000), the Great Eight consist of 112 competencies. The model is easy to understand and apply, making it practical for use in talent management practices such as recruitment, selection, and development. Furthermore, the fact that it is based on extensive research and validation studies lends it credibility and reliability (Bartram, 2005).

However, as with many types of competency models, critics argue that taxonomies are overly simplistic or reductionist in their approach to assessing talent and potential, overlooking the complexity and multifaceted nature of human behavior and performance (Shippmann et al., 2000; Winterton, 2012; Stevens, 2013). They may lack specificity in certain competencies, leading to ambiguity and inconsistency in interpretation and assessment. And since they primarily focus on individual competencies, they may overlook the importance of team dynamics, organizational culture, and other contextual factors in achieving success.

#### 2.2.3.4 Rationale for a Generic Approach to Managerial Competencies

The presented studies in the previous sections (Boyatzis, 1982, Spencer & Spencer, 1993; Tett et al., 2000; Bartram, 2005) provide valuable insights into the necessary competencies of managers. Taking a critical stance, though the literature on

managerial competencies is not very specified regarding the type of managers being studied. This can be seen from the sample of articles that have been analysed for identifying components of managerial competence (essay 1). Table 6 shows a collection of 18 empirical studies that specify the authors and publication date, the types of managers (top, middle, line), the industry sector, and the geographical context where the research was conducted.

**Table 6.** Empirical studies on Managerial Competencies, highlighting the Types of Managers, Industry Sector, and Geographic Context of the Studies.

| Authors | Types of Managers | | | | Industry sector | Geographic Context |
|---|---|---|---|---|---|---|
| | Top | Middle | Line | Not specified | | |
| Avkiran (1999) | | X | | | banking | Australia |
| Bernardin et al. (2016) | | X | | | retail | USA |
| Carson and Gilmore (2000) | X | | | | - | - |
| Carstens and De Kock (2017) | X | | X | | - | South Africa |
| Chen and Wu (2011) | X | | | | manufacturing, service | China, Taiwan |
| Daouk-Öyry et al. (2021) | X | | | | healthcare | Lebanon |
| Debrah and Ofori (2005) | | | | X | construction | Tanzania |
| Donbesuur et al. (2023) | X | X | | | digital service | Ghana |
| Fjelstul and Tesone (2008) | X | X | X | | hospitality | USA |
| Levenson et al. (2006) | | X | X | | consumer goods | USA |
| Ngai et al. (2011) | X | | | | textile, fashion | Hong Kong |
| Pedraza-Rodríguez et al. (2023) | | | | X | mainly manufacturing | Ecuador |
| Sambasivan et al. (2009) | | | | X | manufacturing | Malaysia |
| Siu (1998) | | X | | | hospitality | Hong Kong |
| Tett et al. (2000) | | | | X | education | USA |
| Veliu and Manxhari (2017) | X | X | X | | - | Kosovo |
| Wickramasinghe and De Zoyza (2009) | | | | X | telecommunication | Sri Lanka |
| Wickramasinghe and De Zoyza (2011) | | | | X | telecommunication | Sri Lanka |

The empirical studies on managerial competencies present a fragmented landscape, characterized by variations as regards the manager type, industry sector, and geographical context studied. This heterogeneity poses challenges for drawing generalized conclusions about managerial competencies across different settings.

For instance, the studies vary as regards the types of managers investigated. Some focus exclusively on middle managers (e.g., Siu, 1998; Avkiran, 1999), while others explore top managers (e.g., Chen & Wu, 2011; Daouk-Öyry et al., 2021). There are also studies that do not specify the manager type (e.g., Tett et al., 2000; Debrah & Ofori, 2005) or encompass a range of manager types (e.g., Fjelstul & Tesone, 2008; Donbesuur et al., 2023). This could suggest either a generic approach to managerial competence or a lack of focus as to management level studied. The

lack of consistency in defining and categorizing manager types complicates comparisons across studies and diminishes the ability to form a cohesive understanding of what competencies are deemed essential for effective management.

Furthermore, the studies cover a variety of sectors, including banking, retail, healthcare, manufacturing, and hospitality, among others. The geographical contexts of the studies span multiple countries, including Australia, the USA, South Africa, China, Lebanon, Ghana, Ecuador, Malaysia, Hong Kong, Kosovo, and Sri Lanka. This diversity can enrich the understanding of managerial competencies, but it also introduces complexity. Cultural, economic, and regulatory differences across these regions may influence the competencies deemed essential for effective management.

Therefore, the findings from studies focusing on specific types of managers or particular sectors may not be generalizable to other contexts. For example, competencies identified as critical for middle managers in the banking sector in Australia may not apply to top managers in the retail sector in the USA.

Given the fragmented and context-specific nature of the existing literature on managerial competencies, this dissertation approaches the concept of managerial competencies generically. A generic study of managerial competencies can identify the knowledge and skills that are universally applicable across various sectors and manager types. This can facilitate the development of a more cohesive understanding of what constitutes effective management. Another reason why this dissertation does not specify on competencies of a particular type of manager or industry is that it fits better to the non-empirical research method chosen.

One can see from Table 6 that even though there are some papers that do not specify the type of manager studied, most empirical studies focus on a certain kind of manager. However, the studied sample also included 12 non-empirical articles (e.g., Kanungo & Misra, 1992; Harvey & Richey, 2001; Bücker & Poutsma, 2010; Shet & Pereira, 2021). None of these referred to any type of manager when discussing managerial competencies. In non-empirical articles, authors aim to clarify concepts related to managerial competencies without focusing on specifics of different managerial roles. By not limiting the discussion to a particular type of manager, they can propose ideas that may apply across various managerial roles and industries. This is also in line with the objectives of this dissertation.

In this regard, the fragmented literature on managerial competencies and the better alignment with the non-empirical research method are the reasons why this dissertation investigates managerial competencies via a generic approach.

Furthermore, since traditional models of managerial competence were developed before the widespread adoption of technology in the workplace, they emphasize interpersonal skills and business acumen, rather than technological understanding. In the pre-digital phase, technology may have been seen as something that was

primarily the domain of IT professionals, a specialized competency, rather than something that all managers needed to be proficient in. However, during the mid-digital phase, as technology has become increasingly integrated into all aspects of business, also competencies related to digital technologies have become crucial for managers at all levels. This brings us to the concept of digital competence which is presented in the next section.

## 2.3 The Concept of Digital Competence

The change in the economic and working world toward increased automation, an increased importance of technologies, alongside the dynamic and rapid development of digital technologies is leading to a need for changed and renewed competence profiles (Konle-Seidl & Danesi, 2020; Hazan et al., 2024). This leads to extensive adjustments in qualifications and qualification structures, resulting in the paradigm of lifelong learning (Aepli et. al., 2017). In the labour market, digital technologies are incorporated into work processes and are changing the competencies of professionals, e.g., dentists digitally modelling dentures (Guitert, Romeo, & Kolas, 2020). Nowadays, good education is indispensable for each individual person as well as for society and the economy as a whole. Digital transformation has a significant impact on everyday lives and work. It requires skills in dealing with new technologies as well as creative and critical thinking. For example, technological knowledge, data analysis, adaptability to change, networked and process-oriented thinking and dealing with uncertainties have become important. The question is to what extent these new competence requirements can be understood as digital competencies?

As with the concept of competence, there is a lack of clarity in the definition and understanding of digital competence, as no appropriate and commonly accepted definition exists (Ilomäki et al., 2016). Moreover, a plethora of terminology surrounding ‘digital competence’ is available, such as ‘computer literacy’, ‘digital literacy’, or ‘digital skills’ (Ala-Mutka, 2011; Gallardo-Echenique et al., 2015; Spante et al., 2018). In their systematic literature review of 70 articles, Ilomäki et al. (2016) identified 34 terms that describe competencies and skills to deal with digital technologies. They conclude that digital competence, as a term that is rarely precisely defined, is a potential borderline concept. Different actors give the term a slightly different meaning, yet it is explicit enough to generate general and cooperative discussions between different cultures, as it combines elements from different research disciplines.

### 2.3.1 Origins of the Concept of Digital Competence

The origins of the concept of digital competence stem from several competence concepts and terms (e.g., Ala-Mutka, 2011; Belshaw, 2012; Leaning, 2017). This is shown in the following historical overview that highlights five key stages in the development of digital competence. For clarity, the key terms and concepts of each stage are written in italics.

***1960s – 1970s:*** The increasing spread of electronic communication systems and mass media led to the concept of *visual literacy*, the acquisition of which enables a person to distinguish and interpret actions, objects and symbols (Belshaw, 2012; Leaning, 2017). The negative effects of technology gave rise to *technological literacy*, which includes the ability to use the most important modern systems and ensure that all technological activities are efficient and appropriate (Belshaw, 2012).

***1980s – early 1990s:*** With the mass distribution of personal computers, the term *computer literacy* emerged, which ranged from the ability to operate computers and accessories to programming skills or the use of common software packages (Bawden, 2008; Ala-Mutka, 2011; Belshaw, 2012). Due to the emergence of the World Wide Web and the increasing use of computers for communication, *computer literacy* was replaced by *ICT literacy*. Either this referred to learning how to use technologies or, in a conceptual sense, the use of information in digital technologies, communication instruments and networks in order to survive in the knowledge society (Belshaw, 2012). The latter meaning also corresponds to the understanding of *information literacy* that was expanded by the British Society of College, National and University Libraries (SCONUL) in 1999, which was coined by library societies in 1974. Basic IT skills were now included (SCONUL, 1999, p. 8). Due to the increasing use of digital media, expanded access to a mass of information for all and the emergence of the knowledge society, the traditional understanding of the efficient and effective finding and use of information for problem solving and decision-making has been supplemented by creative and productive aspects (Belshaw, 2012; Leaning, 2017). At the same time, the concept of *media literacy* developed, which is about understanding the nature of existing media genres, how media construct messages and how they are interpreted (Bawden, 2008; Ala-Mutka, 2011).

***Late 1990s – 2000:*** *Internet literacy*, *Internet skills* or *network literacy* were developed in the early 2000s. This includes the role and use of networked resources, the finding and processing of information in non-linear 'hyperlink' forms or strategic skills for successful targeted activities on the Internet (Ala-Mutka, 2011, p. 24). The term *digital literacy* became popular with the publication of the same name by Paul

Gilster in 1997 (Gilster, 1997 cited in Bawden, 2008, p. 18). Gilster generally sees *digital literacy* as the ability to use, critically assess and understand information from various digital sources - ultimately as an essential ability to master one's life (Bawden, 2008). In 1998, the term *digital competence* came up in research for the very first time. In his short article 'Computed and Digital Radiography', John Strauss described the process and the effects of how digital imaging systems transform general radiography. In this technological and medical context, he also mentioned 'digital competencies', but presented no definition of the term.

***2000s – 2010:*** The first definition of *digital competence* appeared 2004 in a conference paper with the title 'Personality Theory and Human Factors Research'. The author, Mark E. Koltko-Rivera, described *digital competence* as "competence in working within a highly computerized environment" (Koltko-Rivera, 2004, p. 261). In 2006, the European Commission formulated *digital competence* as one of eight key competences that citizens required for lifelong learning. This report is regarded as one of the forerunners in digital competence research (e.g., Cartelli, 2010; Ilomäki et al., 2016; Godhe, 2019), and paved the way for the increasing interest in this concept, which, according to Spante et al. (2018), started around 2010.

***2010 – today:*** In order to identify the major components of *digital competence*, the DigComp project has been launched in 2010 by the Joint Research Centre on behalf of the Directorate General for Education and Culture. The outcome of this project should be a reference framework to understand and develop *digital competence* in Europe. In the final report that was published in 2013, Ferrari (2013) identified 21 digital competencies with three proficiency levels (foundation, intermediate, advanced) and classified them into five areas: information, communication, content-creation, safety and problem-solving. In the following years, the framework was consistently updated. The latest version of the DigComp framework came out in 2022 as "DigComp 2.2", and focused on examples of knowledge, skills and attitudes applicable to each competency. For each of the 21 competencies, the authors provided 10-15 statements related to knowledge, skills, attitudes as well as scenarios for employment and learning.

This historical development of the concept of digital competence shows that, parallel to the introduction of new digital tools and technologies, new types of competencies have always been developed, leading to the contemporary concept of digital competence.

### 2.3.2 Digital Skills and Digital Literacy – Clarifying the Terms

As pointed out by several researchers (Ala-Mutka, 2011; Vieru, 2015; Murawski & Bick, 2017), the concept of digital competence is not yet applied consistently. Instead, various terms are used that convey similar meanings, prompting experts to refer to it as a "jargon jungle" (Ferrari, 2012, p.11). There are currently two terms in use that are sometimes referred to as digital competence, but do not necessarily mean the same thing: digital skills and digital literacy. According to van Laar et al. (2020), digital skills are typically conceptualized via a merely technical dimension. Thus, digital skills are limited to the technical aspect of using digital technologies, such as operating software, navigating the internet, creating digital content. In the majority of research literature, they are classified as prerequisites, subordinate characteristics or more practical aspects of digital competence or literacy, not as equivalent (Martin and Grudziecki, 2006; Ala-Mutka, 2011; Ilomäki et al., 2016; Iordache, Mariën and Baelden, 2017). Furthermore, digital skills are mainly used in the policy-related documents of the OECD and the WEF. In the relevant EU documents, skills are referred to as subset of competence (Ferrari, 2013; EU Council, 2018) that stands as knowledge and attitude on one level. The distinction between skills and the higher-level competence or literacy largely corresponds to the concept of competence used in this dissertation.

It is more difficult to differentiate digital literacy from digital competence, since both terms are often used synonymously (Ilomäki et al., 2016; Iordache, Mariën and Baelden, 2017). The term digital literacy is a little older than digital competence. It has its roots in the broader concept of literacy, which traditionally referred to the ability to read and write (Spante et al., 2018). As technology advanced and digital tools became more prevalent in society, the definition of literacy expanded to include the ability to navigate and critically evaluate information in digital formats. However, there is disagreement whether digital competence or digital literacy is the dominant concept. For instance, Ala-Mutka (2011) explains that literacy should be understood as a continuum, which is divided into progressive phases from basic skills to the upper end as competence. Martin and Grudziecki (2006), on the other hand, see digital competence in an opposite sense, namely as a basic level of digital literacy, whereby digital literacy means the successful use of digital competence in life situations. Spante et al (2018) warn against the overly general use of digital literacy and digital competence in research and recommend avoiding cross-references to avoid incompatibilities. They conclude that in the research field more attention should be paid to the origin of definitions and to analyze how the different definitions might complement or contradict each other. Consequently, this

dissertation should not only focus on the use of the term digital literacy or digital competence. It should also consider the meaning attributed to these terms and examine the extent to which this aligns with the concept of competence as overall capacity of a person to perform effectively in various situations.

### 2.3.3 Definitions of Digital Competence and common Elements

In an increasingly digital world, the term 'digital competence' has emerged as a crucial concept that encompasses a variety of skills and understandings essential for effective participation in the digital landscape. As technology continues to evolve, so do the definitions and interpretations of what it means to be digitally competent. Various scholars, organizations, and educational institutions have proposed definitions that, while distinct in their phrasing, seek to capture the multifaceted nature of digital competence (Table 7).

**Table 7.** Definitions of Digital Competence.

| | |
|---|---|
| 1 | Digital competence involves "being able to explore and face new technological situations in a flexible way, to analyze, select and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one's own personal responsibilities and the respect of reciprocal rights/obligations". (Calvani et al., 2008) |
| 2 | Digital competence "involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet". (European Parliament, 2006) |
| 3 | Digital competence is 'the set of knowledge, skills, attitudes, abilities, strategies and awareness that are required when using ICT [information and communication technologies] and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge |

| | |
|---|---|
| | effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning and socialising'. (Ferrari, 2012) |
| 4 | Digital competence clearly involves more than knowing how to use devices and applications. It consists of (a) technical digital technologies skills, (b) the ability to use digital technologies in a meaningful way for working, studying and other everyday activities, and (c) the ability to critically evaluate digital technologies. (Guitert, Romeu, & Colas, 2020) |
| 5 | Digital competence consists of the skills and practices required to use new technologies in a meaningful way and as a tool for learning, working and leisure time, understanding the essential phenomena of digital technologies in society as well as in one's own life, and the motivation to participate in the digital world as an active and responsible actor. (Ilomäki et al., 2016) |
| 6 | Digital competence is a conglomerate of knowledge, skills, and attitudes connected to various purposes (communication, creative expression, information management, personal development), domains (daily life, work, privacy and security, legal aspects) and levels. (Janssen et al., 2013) |
| 7 | Digital competence consists in the ability to adopt and use new or existing information technology to analyse, select and critically evaluate digital information in order to investigate and solve work-related problems and develop a collaborative knowledge body while engaging in organizational practices within a specific organizational context. (Vieru et al., 2015) |

Following an examination of these definitions, five common elements of digital competence can be noted:

First, digital competence consists of combinations of input factors. These input factors are mostly knowledge and skills. Further authors also consider attitudes (Ferrari 2012; Janssen et al., 2013; Vieru et al., 2015) or abilities (Oberländer, Beinicke, & Bipp; 2020). Research on competencies of individual people is often based on the concept of Knowledge, Skills, and Attitudes (KSAs). Likewise, authors in the field of digital competence regard it as combination of skills, knowledge, and attitudes (Ferrari, 2012; Janssen et al., 2013; Vieru et al., 2015). KSAs are the input factors that an individual requires to perform a certain task. Whereas knowledge is

regarded as the facts, information, principles, or theories that a person has in a specific field, skills are considered as the ability to apply this knowledge to perform a certain task (Ferrari, 2013; Oberländer, Vieru et al., 2015; Beinicke, & Bipp, 2020). Attitudes, on the other hand, are the "ways of thinking" (Vieru et al., 2015) or "motivators of performance" (Ferrari, 2013).

Second, definitions on digital competence agree that the instrumental application and use of digital technologies is the focus and a prerequisite. All analyzed definitions understand digital competence as the 'use' of new technologies, digital technologies, or ICT to achieve certain goals. At this point, digital competence must be distinguished from broader concepts of competence, in which the focus is on skills in order to be able to work successfully in an increasingly complex working world characterized by ICT. These skills are often referred to as '21st century skills'. They include types of competencies such as 'Creativity and Innovation', 'Flexibility and Adaptability/Agility' or 'Initiative and Self-Direction' and are therefore broader and more abstract than digital competence. They can, but do not necessarily have to, be underpinned by the use of digital technologies (Van Laar et al., 2020).

Third, digital competence is among the key competences because it is essential and need to be continually developed further for the development of a person in a modern working world characterized by constant change, uncertainty and complexity. The concept of key competences was developed by the OECD under the 'Programme for International Student Assessment (PISA)'. These are of central value for a person's personal, social and professional development in a modern society and for full participation in its design. For the OECD (2005), key competences are characterized by the fact that they contribute to valuable outcomes for society and people, that they help people to meet important requirements in different contexts and that they are important not only for specialists, but for everyone. The EU largely agrees with this understanding of the term and defines key competences as competences that all people need for their personal fulfillment and development, employability, social inclusion and active citizenship (EU Council, 2018, p. 7). Key competences are often associated with the lifelong learning paradigm. They represent a dynamic combination of knowledge, skills and attitudes that need to be developed throughout life (EU Council, 2018, p. 12). According to Ferrari (2013) they are intended to enable people to adapt to a world characterized by change, complexity and interdependence, which largely corresponds to the description of the digital age. Understood in this way, key competences are comparable to the '21st century competences' described. In addition to digital competences, the EU further considers reading and writing skills, mathematical and scientific skills (EU Council, 2018).

Fourth, digital competence enables the critical, safe and responsible application and use of ICT, in particular for communication, creation and analysis of electronic

content as well as problem solving in the world of work. The core element of digital competence is described by the oft-quoted sentence from Gilster's pioneering work from 1997: “digital literacy is about mastering ideas, not keystrokes”. Although digital competence requires knowledge of digital systems in the work process and the qualifications to use these systems, they include significantly more. This can also be seen in the previous concepts such as information literacy, ICT literacy or media literacy, which do not primarily address technical skills, but rather the search, use and analysis of digital content. The definition of the EU Council (2018, p. 9) and Martin and Grudziecki (2006, p. 256) already lists some typical digital competence areas that can be found in the DigComp model.

Fifth, the basic requirement for the development of digital competence is technological knowledge to use digital tools and technologies. Digital competence is often viewed in a traditional, narrower understanding as the ability to properly use computers, smartphones or software. This view is therefore close to technical science (Ilomäki et al., 2016). Iordache et al. (2017) describe this operational, technical and formal knowledge as “knowing and using hardware” and “knowing and using digital tools and software” (p. 15). For the authors, based on their analysis of several sources, this also includes knowledge about using the Internet, including its structures such as menus, hyperlinks and associative navigation. Examples of these include ‘Selecting and using digitally controlled devices’, ‘Using the Internet and using web services’ or ‘Selecting and using digital means of communication’.
It is doubtful to what extent technological knowledge can be used to successfully overcome ‘new and unforeseen challenges’ according to the working definition of competence, especially since mastering them is not all that complex (e.g., when it comes to knowing how to use a touchscreen). In addition, such knowledge is required almost everywhere in the world of work. This also applies to mastering writing and calculation programs (Sinell, 2020). Bawden (2008) also differentiates in a similar way between digital competence (in the sense of digital literacy) as a broad concept that combines other relevant competencies, but is based on basic technical skills in the sense of computer and ICT literacy. Digital competence, however, focuses on ‘softer’ skills such as evaluating information and creating knowledge, along with a range of understandings and attitudes. Against this background, it is noticeable that the EU reference competence model ‘DigComp 2.1’ (Vuorikari, Kluzer, & Punie, 2022) does not list such application skills as its own competence. In summary, these can be viewed as a – very important – preliminary stage or basic requirement for the development of digital competence.

Based on the outlined distinctions between the concepts of competence vs. competencies (section 1.2.2) and the five commom elements of digital competence definitions, the following working definitions can be established:

**Digital competence** refers to the overall capacity of an individual to effectively navigate, use, and critically engage with digital technologies in diverse contexts. It encompasses not only the ability to utilize digital tools and platforms but also the critical thinking, problem-solving, and ethical considerations required for responsible and effective participation in a digital society. Digital competence is essential for personal, social, and professional development in an increasingly complex and technology-driven world, necessitating continual growth and adaptation to new and evolving digital landscapes.

**Digital competencies** are the specific attributes—comprising knowledge, skills, and attitudes—that enable an individual to perform effectively in digital environments. Digital competencies serve as foundational elements of an individual's overall digital competence, facilitating the successful application of digital technologies to achieve specific goals and to adapt to ongoing changes in the digital landscape.

The definition of digital competencies does not interpret them narrowly as merely the use of technologies. Instead, it positions them as foundational attributes that include knowledge, skills, and attitudes, which are necessary for effective performance in digital environments. This broader interpretation encompasses not only technical skills but also critical and ethical dimensions, suggesting that competencies include the ability to adapt and respond to the demands of a digital society. Therefore, it does not limit itself to just the use of technologies.

Referring back to the previous section, these definitions can help clarify the distinctions between digital skills, digital literacy, and digital competence/competencies. Digital skills refer to digital competencies and can be seen as a subset of them. They refer specifically to the practical abilities to use technology (e.g., using software applications, navigating the internet, etc.). Digital literacy is closely related to digital competence, but it might be seen as a complementary concept focused on information processing and communication skills in digital environments.

In summary, digital competence represents the broader capacity to engage with digital technologies effectively, while digital competencies consist of the specific knowledge, skills, and attitudes that support this overall competence.

## 2.4 Synthesis and Bridge to the Research Design

The exploration of the conepts of digital technology and AI (section 2.1), as well as the concepts of competence (section 2.2), and digital competence (section 2.3) provided a comprehensive foundation for understanding the evolving landscape of

managerial competencies in the digital age. Together, these sections delineated the interconnectedness between digital transformation, the concept of competence, and the emerging necessity for digital competence for managers.

Section 2.1 articulated the transformative role of digital technology and AI in reshaping managerial practices. It emphasized the need for managers to not only possess technological knowledge but also to develop critical thinking and adaptability in a rapidly changing digital environment. The distinctions made between digitization, digitalization, and digital transformation are pivotal, as they underscore the layered complexities of digital integration in organizations. This differentiation is crucial in establishing the context for competencies required by managers, as each phase entails distinct challenges and necessitates a specific set of competencies.

The discussion on AI—its components, classifications, and applications—highlighted the necessity for managers to understand both the technological aspects and the ethical implications of AI in decision-making processes. The emphasis on algorithms, machine learning, and deep learning illustrated the increasing reliance on data-driven insights, which, in turn, requires managers to develop competencies that bridge traditional managerial skills with new technological demands.

Section 2.2 delved into the concept of competence, tracing its historical roots and its evolution as an academic concept. It established a nuanced understanding of competence as a multidimensional concept that encompasses the interplay between motivation, intelligence, and performance. This critical examination is vital as it reveals the shifting paradigms in competence research, moving from a focus on individual traits to a more holistic view that incorporates contextual factors such as organizational culture and technological influences.

The differentiation between competence and competencies—where competence represents a person's overall capacity and competencies refer to specific attributes—served as a framework for analyzing managerial competencies in the digital age. This distinction is particularly relevant when considering the competencies necessary for navigating digital transformation, as they must be contextualized within the ever-evolving technological landscape.

Section 2.3 introduced digital competence as a concept that encapsulates the necessary competencies for effective participation in a digital society. The historical overview of the concept of digital competence revealed its development alongside technological advancements, emphasizing the necessity for continuous adaptation to new digital landscapes. The common elements identified across various definitions of the concept of digital competence highlight the importance of integrating technical skills with critical thinking, ethical considerations, and the ability to navigate complex digital environments.

This section 2.3 elucidated the need for a comprehensive understanding of digital competence that transcends mere technical proficiency. The distinction between digital competence, digital skills, and digital literacy underscores the multifaceted nature of competencies required by managers in the digital age. This broader interpretation aligns with the overarching theme of this dissertation, which posits that effective management in a digital context necessitates a blend of both foundational competencies and advanced digital competencies.

The synthesis of these sections underscores the necessity for a systematic literature review as the primary methodological approach of this dissertation. Given the complex interrelationships between digital technologies, AI, and managerial competencies, a literature-based inquiry is essential to establish a foundational understanding of these concepts. The systematic literature reviews conducted in essays 1, 2, and 3 are designed to address the identified research gaps and sub-research questions by collating existing definitions of managerial competence and frameworks related to digital and AI-related managerial competencies.

The methodological choice of a systematic literature review is justified by the fragmented and evolving nature of the literature on these topics. This approach allows for a comprehensive examination of existing frameworks, facilitating the development of cohesive models that integrate managerial competencies with digital and AI-related requirements.

The integration of both qualitative content analysis and semantic decomposition as analytical techniques further enhances the depth of inquiry. Qualitative content analysis in essays 2 and 3 enables the exploration of themes and categories related to digital and AI-related managerial competencies, while semantic decomposition in essay 1 aids in unpacking the complex definitions of managerial competence present in the literature. This dual approach not only enriches the understanding of managerial competencies but also enables the identification of areas for future exploration.

# 3 Methodology

This study primarily seeks to identify competencies that enable managers to navigate challenges in the digital age. Theoretically, the study aims to adapt, analyze, and combine existing literature and practices related to managerial competencies within the context of digital transformation and AI, thereby enriching and organizing the existing knowledge in this area. Practically, the study aspires to create a comprehensive framework for managerial competencies that is easily understandable and applicable for managers and their organizations.

To achieve the objectives of the study, I formulated three distinct but interconnected sub-questions derived from the main research question:

*Main RQ: What competencies do managers require to successfully navigate in the digital age?*

*SQ1: What are the conceptual components of the concept of managerial competence?*

*SQ2: How can a model of digital competencies be conceptualised for managers?*

*SQ3: Which managerial competencies are essential for making use of AI?*

Johnson and Clark (2006) point out that, we, as business and management researchers, should recognize the philosophical assumptions that accompany our methodological selections, as these will greatly influence both our actions and our comprehension of the subjects we are exploring (Johnson and Clark, 2006). The choice of philosophical stance is crucial, as it will guide our approach to literature analysis and the interpretation of findings (Guba & Lincoln, 1994).

The researcher's ontological, epistemological and methodological decisions serve as the primary sources of direction for the researcher's activities (Guba & Lincoln, 1994). Ontology and epistemology are foundational concepts in research methodology that shape how researchers understand the nature of reality (ontology) and the nature of knowledge (epistemology) (O'Gorman & MacIntosh, 2015). When

examining the competencies required for managers in the digital age, a coherent ontological and epistemological stance is vital for guiding the systematic literature review and the semantic and content analysis employed in this dissertation. Therefore, this chapter focuses on the methodological choices made in the study, detailing the non-empirical research design employed. It provides a thorough rationale for the selected ontological and epistemological choices, the non-empirical research method and underlying analyses.

## 3.1 The Study's Ontological Choices

Ontology refers to the study of the nature of reality and what exists (Saunders, Lewis, & Thornhill, 2019). If a 'real' world is assumed to exist, inquiries center around understanding "how things really are" and "how things really work" (Guba & Lincoln, 1994, p. 108). For a researcher, defining one's ontology is the first step in developing the research design (O'Gorman & MacIntosh, 2015). Ontology also helps to determine which research questions are valuable to pursue, which investigative methods can be relied upon, and what the potential practical implications of researchers' activities may be (Al-Mahoudi & O'Mahoney, 2015).

Ontological assumptions can generally be categorized into two main types: objectivism and subjectivism, so researchers must clarify whether they perceive reality as objective or subjective.

Objectivism posits that reality is external and independent of individual perceptions or interpretations. It adopts a realist ontology, treating social entities similarly to physical entities in the natural sciences, meaning they exist independently of our awareness or understanding (Saunders, Lewis, & Thornhill, 2019). This reality consists of "hard, tangible and relatively immutable structures" (Burrel & Morgan, 1976, p. 5) such as family, religion, and the economy, into which people are born. As these objects can be measured and tested, it is feasible to identify and articulate universal principles and facts using reliable and replicable methods.

Subjectivism asserts that social reality is shaped by the perceptions and actions of individuals. It supports a nominalist view, which posits that social phenomena and their structures are constructed by researchers and social actors through names, concepts, and labels that help structure reality, without acknowledging any inherent 'real' structure behind these concepts (Burrel & Morgan, 1976). This leads to the idea that multiple realities exist, since each person experiences and perceives reality differently. Therefore, a subjectivist researcher focuses on the diverse opinions and narratives that illuminate the various social realities experienced by different social actors (Saunders, Lewis & Thornhill, 2019)

In this dissertation, I assert that managerial competence and the underlying managerial competencies are real concepts that exist within the literature, even if they are currently vague, dispersed, and poorly defined (section 1.3). This aligns with the objectivist view that there is an objective reality (in this case, the existence of managerial competencies) that can be discovered through systematic exploration and analysis. The focus on exploring, defining, and clarifying the concept of managerial competence positions this research within an objectivist ontology. Different to subjectivism, the aim of this dissertation is not to explore subjective experiences of managerial competencies but to clarify and define them in an objective manner based on existing literature. By recognizing that managerial competencies exist as identifiable concepts within the literature, this dissertation seeks to bring clarity to these concepts, thereby contributing to the objective understanding of managerial effectiveness in the digital era.

This ontological stance is particularly relevant given that the existing literature on managerial competence is characterized by terminological confusion and a lack of consensus. The dissertation aims to address these ambiguities by systematically exploring and defining managerial competencies, thus clarifying their existence and relevance in the context of digital transformation and AI. This approach implies that while interpretations of managerial competence may vary, the underlying concept itself remains a tangible entity that can be analyzed and understood. Therefore, it facilitates the identification of commonalities and divergences in existing definitions, thereby contributing to a more precise understanding of the concept. This allows to build a coherent framework that delineates digital and AI-related managerial competencies.

## 3.2 The Study's Epistemological Choices

Epistemology, on the other hand, deals with the nature and scope of knowledge (Scherer, Does & Marti, 2015). It addresses questions such as 'What is knowledge?', 'Who or what has the capacity of knowing?', 'How much can be known?' (Reihlen & Schoeneborn, 2022), 'What is the nature of the relationship between the knower or would-be knower and what can be known?' (Guber & Lincoln, 1994, p. 108), 'What forms of knowledge can be obtained?', 'How can one sort out what is to be regarded as 'true' from what is to be regarded as 'false'?' (Burrel & Morgan, 1976). Given the fact that various types of knowledge—numerical, textual, visual, and narrative— are considered valid (Saunders, Lewis & Thornhill, 2019), a wide range of epistemological approaches co-exist in management studies. Reihlen & Schoeneborn (2022) cluster them into epistemologies of representation,

epistemologies of interpretation, epistemologies of imagination, and epistemologies of intervention. In general, researchers differentiate between various epistemologies, such as positivism and anti-positivism (Burrel & Morgan, 1976), positivism, post-positivsm, critical theory, and constructivism (Guber & Lincoln, 1994), positivism, critical realism, action research, and interpretivism (O'Gorman & MacIntosh, 2015) positivism, conventionalism, postmodernism, critical theory, and pragmatism (Johnson & Duberley, 2000), and subject–object model, interpretivism, critical theory, postmodernism, functionalism, and rational-choice theory (Scherer, Does & Marti, 2015).

For this dissertation, a positivist epistemology is adopted. Positivism holds that knowledge is derived from empirical evidence, observable phenomena, and logical reasoning (Saunders, Lewis, & Thornhill, 2019). According to positivism, knowledge can be acquired through systematic observation, measurement, and analysis, which resonates with the methodology of conducting a systematic literature review and employing semantic and content analysis.

Through systematic literature reviews, I am seeking to explore and clarify the concepts of managerial competence and managerial competencies. By analyzing existing literature and synthesizing findings, I aim to uncover objective truths about managerial competencies that can be universally recognized and applied.

My thesis builds upon the idea that there is a literature, and that there is a concept called 'managerial competence', though it is presently vague, unclear, and dispersed. By meticulously reviewing and analyzing this literature, I aim to arrive at a clearer, more robust understanding of the concept. This view that knowledge is out there and can be uncovered through rigorous analysis aligns with a positivist epistemology, which values the objective construction of knowledge based on observable evidence. This approach emphasizes the importance of rigorous methodology, empirical validation, and the pursuit of generalizable knowledge (O'Gorman & MacIntosh, 2015).

Having argued for a positivist epistemology, I also briefly give reason why other epistemological approaches may not be suitable.

Interpretivism would not be suitable, because it focuses on understanding the subjective meanings individuals attach to their experiences (O'Gorman & MacIntosh, 2015). However, my research does not prioritize individual interpretations or experiences but rather seeks to clarify an objective concept that exists within the literature. While semantic decomposition and qualitative content analysis involve interpretive activities, in this study, their application is guided by a systematic, transparent framework designed to uncover objective, replicable elements of managerial competencies within the literature. These methods are employed not to explore subjective experiences but to deconstruct and synthesize

existing definitions into their fundamental components, thereby clarifying the concept in an objective manner consistent with the positivist paradigm.

Furthermore, the interpretive steps are explicitly documented—such as frequency counts, coding procedures, and categorization—allowing for reproducibility and minimizing researcher bias. This structured interpretive approach aligns with the positivist goal of identifying universal principles and objective truths within the literature, rather than exploring individual or subjective perspectives.

Critical realism acknowledges the complexity of reality and the influence of social contexts and structures on knowledge formation (Saunders, Lewis, & Thornhill, 2019). However, my dissertation primarily aims at finding competencies that managers require to successfully navigate in the digital world, rather than exploring the underlying social structures or contexts that may shape these competencies.

While pragmatism focuses on the practical application of knowledge and the consequences of ideas, it does not prioritize an objective truth (Johnson & Duberley, 2000). My dissertation is more focused on uncovering existing knowledge rather than exploring the practical implications or applications of that knowledge in varied contexts.

Finally, post-modernism questions the existence of objective truths and emphasizes the fluidity of knowledge (Scherer, Does & Marti, 2015). This is different from the assumption of my dissertation that there are identifiable concepts (managerial competencies) that can be defined through systematic exploration.

In summary, this dissertation is underpinned by an objectivist ontology and a positivist epistemology. This framework allows to assert the existence of managerial competencies as a definable concept within the literature and to systematically explore and clarify its components in the context of digital transformation and AI. This approach also emphasizes the pursuit of objective knowledge that can enhance our understanding of managerial competencies, thereby addressing the gaps and ambiguities present in the current literature.

## 3.3 Research Method

This dissertation aims to construct a theoretical understanding of managerial competencies rather than test specific hypotheses or examine causal relationships using empirical data. As a study that does not collect empirical data, this study can be categorized as non-empirical.

### 3.3.1 Non-empirical Research Method

Non-empirical research methods are vital components of scholarly inquiry, distinct from empirical methods that rely heavily on data collected through observations, experiments, or statistical analysis (Morrow & Brown, 1994). Instead, non-empirical methods draw on theoretical frameworks, personal insight, and synthesis of existing literature to provide in-depth analysis, critique, and evaluation of phenomena within a given field (Dan, 2017). These methods serve to provide a theoretical understanding of a complex field, such as managerial competence, which encompasses various overlapping definitions. Lastly, they are also useful in areas where empirical data may be scarce, complex, or difficult to interpret, enabling researchers to contribute to theoretical advancements and offer nuanced perspectives.

According to Dan (2017), non-empirical methods can be broadly categorized into two main types:

**1. Review-oriented Methods**

This category encompasses approaches designed to evaluate and synthesize existing literature within a specific research domain. Review-oriented methods aim to consolidate findings, identify trends, and articulate gaps in the literature to inform future research directions. Examples of review-oriented methods are:

- **Systematic Review**: This method seeks to rigorously assess all available research on a particular topic according to a predefined protocol. It involves a comprehensive search strategy, the inclusion of diverse databases, and clear criteria for the selection of studies to minimize bias (Booth, Sutton, & Papaioannou, 2016). The outcome is a systematic synthesis, often accompanied by an assessment of the quality of included studies, providing a robust overview that informs evidence-based practice and highlights areas requiring further investigation.
- **Integrative Review:** Integrative reviews, as defined by Elsbach and Van Knippenberg (2020), are a form of literature review that systematically reviews, critiques, and synthesizes representative literature on a particular topic in an integrated manner to generate new frameworks and perspectives. They go beyond merely describing existing literature; instead, they derive new insights through integration and critique of the reviewed research. Integrative reviews are considered a standalone form of research that can yield novel conceptual frameworks or theories, and they typically include a methodology section that allows for replication of the review process.
- **Problematizing Review:** Alvesson and Sandberg (2020) define a problematizing review as an approach that aims to critically interrogate and

reimagine existing literature rather than simply integrating it. The goal of a problematizing review is to challenge and rethink conventional understandings of phenomena, generating new ideas and perspectives. They adopt a critical perspective, suggesting that scholars are not neutral in their framing of concepts (Dzhengiz et al., 2023).

- **Meta-Analysis:** Often paired with systematic literature reviews, meta-analysis quantitatively synthesizes results from multiple studies to identify overall trends and relationships. By employing statistical techniques to combine datasets, researchers can produce a more comprehensive understanding of underlying patterns and effects, enhancing the reliability of conclusions drawn from individual studies (Snyder, 2019). This method is particularly useful in fields like psychology, medicine, and social sciences, where diverse studies can yield varying results.

Overall, a plethora of terms and definitions for review articles exists, which Kunisch et al. (2022) summarize using the umbrella term 'review research' (p. 11).

**2. Reflection-oriented Methods**

In contrast to review-oriented methods, reflection-oriented methods are subjective and rely heavily on the author's personal insights, experiences, and interpretations (Morrow & Brown, 1994). These methods do not necessarily seek to aggregate or quantify existing data; instead, they provide critical perspectives on events, theories, and practices. Common forms include:

- **Critical Studies:** This type of work involves in-depth analysis and critique of existing theories, frameworks, or practices within a specific discipline. Researchers draw upon their own experiences, existing literature, and theoretical concepts to evaluate the strengths and weaknesses of particular arguments or methodologies (Morrow & Brown, 1994). Critical studies can uncover biases, challenge established norms, and promote innovative ideas that push the boundaries of traditional discourse.
- **Editor's Introduction:** Often found in academic journals, editorials serve as introductory pieces written by the editor to contextualize the content of the issue. They provide insights into the thematic focus, significance of the topics discussed, and reflections on the current state of research in that area (Nundy, Kakar, & Bhutta, 2022). Through personal interpretation and authoritative articulation, editor's introductions set the tone for the articles that follow and can offer valuable perspectives on emerging trends in the field.

The chosen methodology is underpinned by a systematic literature review, therefore this dissertation can be categorized as review-oriented. The systematic literature review is complemented by means of semantic decomposition and inductive content analysis.

Given that the aim of this research is to build a comprehensive understanding of the concept of managerial competencies amid rapid technological advancements, a non-empirical, review-oriented approach is appropriate as it facilitates a deeper analysis of existing theories and frameworks without the need for primary data collection. Given the emergent nature of managerial competencies in a rapidly evolving context marked by digital transformation and the rise of AI, a thorough literature-based inquiry allows for a comprehensive understanding of theoretical frameworks and definitions surrounding managerial competencies.

### 3.3.2 Systematic Literature Review

In this dissertation, a systematic literature review was conducted to explore the underlying components of the managerial competence concept (essay 1) as well as to identify digital managerial competencies (essay 2) and AI-related managerial competencies (essay 3). A systematic literature review offers a scientific and organized approach to analyzing existing literature. In particular, this methodology ensures a comprehensive overview of the existing literature through a replicable process with explicit inclusion and exclusion criteria, minimizing the potential for bias and enhancing the quality of the conclusions drawn (Snyder, 2019). This makes a systematic literature review different from a traditional or narrative literature review (see Table 8). For topics that have been less explored, systematic literature reviews and their synthesized insights can encourage scholars and business practitioners to pursue additional empirical evidence for the studied phenomenon (Denyer & Tranfield, 2009). In this context, they are crucial for fostering insights on the current advancements within a specific subject area and identifying a future research agenda that encourages ongoing discussions about it (Patriotta, 2020).

**Table 8.** Differences between Systematic Literature Review and Traditional Literature Review (based on Denyer & Tranfield, 2009; Briner & Walshie, 2014).

| Systematic Literature Review | Traditional or Narrative Literature Review |
|---|---|
| - Aims to answer a specific research question through an unbiased synthesis of relevant studies | - Offers a general summary of a topic without a specific research question |
| - Follows a structured protocol with clear inclusion/exclusion criteria and search strategies | - Lacks a standardized methodology, leading to subjective and variable processes |
| - Ensures transparency and rigor to minimize bias in the review process | - More susceptible to bias from subjective study selection and result interpretation |
| - Highly reproducible due to strict adherence to protocol and thorough documentation | - Less reproducible due to unclear documentation of the process |
| - Provides clear answers, identifies research gaps, and suggests implications for practice or policy | - Identifies trends and themes without definitive conclusions |
| - Usually takes longer due to the detailed process of study selection and analysis | - Typically faster to complete, as it avoids exhaustive searching and analysis |

Typically, researchers formulate specific research questions prior to the literature search, as well-defined research questions are essential for guiding the systematic literature review process (Booth, Sutton, & Papaioannou, 2016). Furthermore, it is crucial to establish clear inclusion and exclusion criteria ahead of the search for relevant literature. Establishing clear criteria for including or excluding studies helps maintain the focus and validity of the review (Efron & Ravid, 2019). The inclusion of various academic databases ensures that the review captures a wide range of literature, including peer-reviewed articles, books, conference papers, and grey literature (Booth, Sutton, & Papaioannou, 2016). Evaluating the quality and relevance of the selected studies is essential for ensuring high standards of evidence in the findings (Snyder, 2019). This assessment can involve using predefined checklists or frameworks that gauge the rigor of the methodologies employed in the reviewed articles. As for all systematic literature reviews in this dissertation, the Academic Journal Guide from 2021 was used to ensure that all papers met a certain quality standard before the analysis. After analyzing the pertinent literature, the findings from individual studies are synthesized to address the predetermined research questions (Efron & Ravid 2019).

As outlined by Hulland & Houston (2020), a good review article summarises the scope of the subject area and gives an overview of the current state of knowledge, addresses discrepancies among existing studies, integrates and synthesizes extant knowledge, identifies gaps in the literature, and derives potential areas for future research. Additionally, Booth, Sutton, & Papaioannou (2016) indicate that an effective review article should be clear, transparent, and reproducible. This implies that the information within the article is organized in a comprehensible way, the rationale behind methodological decisions and procedures is clearly explained, and the processes, methodologies, and data sources used in the creation of the article can be verified and examined by external parties.

The systematic literature review conducted in essay 1 of the dissertation aims to identify and analyze articles with definitions of the term ‘managerial competence’. Given the diverse interpretations and definitions of managerial competence across

various studies, the systematic literature review provided a structured approach to collate these definitions. The search was conducted using the Scopus database, covering publications until the end of 2024. A range of keywords related to managerial competence, were included: “competent manager*”, “managerial competenc*”, “manage* competenc*”, “managerial skills”, “management skills”, “managerial expertise”, “management expertise”, “managerial capability*”, and “management capability*”.

To ensure the relevance and quality of the collected information, several filtering criteria were applied: (1) Subject area limited to business, management, and accounting; (2) Document type restricted to peer-reviewed journal articles; (3) Language limited to English; (4) Publication stage confined to finalized articles.

These criteria resulted in an initial sample of 1,036 articles. This number was further refined to 174 articles by including only those from journals ranked 3, 4, and 4* in the Academic Journal Guide (AJG) 2021. A review of these articles yielded 31 with unique definitions of managerial competence. 143 articles were excluded, primarily because they focused on organizational capabilities (N = 101) or provided general definitions by citing other authors (N = 42).

Overall, the systematic literature review was critical in establishing a foundational understanding necessary for further analysis and decomposition of the concept.

The primary objective of essay 2 was to develop a conceptual model of digital managerial competencies. A systematic literature review allows for a thorough exploration of existing literature on digital competencies and managerial competencies, enabling a holistic understanding of what is required of managers in dealing with digital technologies. The systematic literature review therefore provided a structured basis for the development of the conceptual model.

This review aimed to identify papers on digital competencies linked to effective managerial performance and existing frameworks or models for these competencies. The search was performed using the Web of Science database with the query: “digital competenc*” OR “digital skill*” AND (“manager*” OR “leader*” OR “leadership skill*” OR “leadership competenc*” OR “management skill*” OR “management competenc*” OR “managerial skill*” OR “managerial competenc*”. Without a publication date limit, the initial search yielded 3,976 results. I narrowed these down to 317 papers by focusing on journal articles, review articles, and conference papers in English, specifically in the Business and Management subject areas.

To ensure quality, I initially targeted journals ranked at least 3 by the AJG 2021, but expanded to include those ranked 2 due to a limited number of articles. Ultimately, I reviewed 91 papers, filtering out 23 that did not focus on individual competencies and 27 that lacked a framework or model of digital competencies. This left 41 relevant papers for analysis. Additionally, I identified seven more papers

through their reference lists. Since the digital managerial competencies model is based on the DigComp framework, I also included all four versions of the DigComp framework and five reports applying it, resulting in a final dataset of 57 studies.

The objective of the systematic literature review in essay 3 was to explore and identify the competencies managers need in the digital age, with an emphasis on AI-related competencies. The systematic literature review allowed for a thorough examination of existing literature on managerial competencies in relation to AI, providing a comprehensive understanding of how these competencies differ from traditional ones. The literature search was conducted using the Web of Science database, focusing on keywords related to AI (e.g., "intelligent automation," "expert systems") and managerial competencies (e.g., "managerial skills", "expertise"). The search string created was:

("Artificial Intelligence" OR "AI" OR "intelligent automation" OR "intelligent systems" OR "machine learning" OR "machine intelligence" OR "expert systems" OR "robotics") AND ("managerial competenc*" OR "management competenc*" OR "managerial skill*" OR "management skill*" OR "managerial expertise" OR "managerial qualities") OR (manager* AND ("competenc*" OR "skill*" OR "AI capabilit*" OR "ability" OR "quality")).

Following the methodology of prior AI literature reviews (Basu et al., 2023; Chowdhury et al., 2023), this string was applied to titles and abstracts, yielding 2,952 publications. After applying filters for relevance—specifically, publications from the last decade (2014-2024), peer-reviewed journal articles in English within business and management disciplines—the sample was narrowed to 391 articles. To ensure quality, only articles from journals ranked 3, 4, or 4* in the AJG 2021 were included, resulting in 88 articles. Finally, a review of these papers identified 27 that focused on individual AI-related managerial competencies, excluding those discussing organizational capabilities.

Table 9 provides on overview of how the systematic literature reviews in the three essays were conducted. It shows information regarding the databases, search strings, publication period, limitation criteria, additional criteria, and final sample.

**Table 9.** Overview of the Systematic Literature Reviews in the three Essays of the dissertation.

| | Essay 1 | Essay 2 | Essay 3 |
|---|---|---|---|
| **Database** | Scopus | Web of Science | Scopus, Web of Science |
| **Search String** | "competent manager*" OR "managerial competenc*" OR "manage* competenc*" OR "managerial skills" OR "management skills" OR "managerial expertise" OR "management expertise" OR "managerial capability*" OR "management capability*" | "digital competenc*" OR "digital skill*" AND ("manager*" OR "leader*" OR "leadership skill*" OR "leadership competenc*" OR "management skill*" OR "management competenc*" OR "managerial skill*" OR "managerial competenc*") | ("Artificial Intelligence" OR "AI" OR "intelligent automation" OR "robotics" OR "conversational agent" OR "chatbot" OR "algorithmic HRM" OR "algorithmic management") AND ("managerial competenc*" OR "management competenc*" OR "managerial skill*" OR "management skill*") OR (manager* AND ("competenc*" OR "skill*" OR "AI capabilit*")) |
| **Search in** | titles, abstracts, keywords | titles, abstracts, keywords | titles, abstracts, keywords |
| **Original Sample** | 3,875 | 3,976 | 2,952 |
| **Publication period** | not set | not set | 2013 - 2023 |
| **Limitation Criteria** | | | |
| **Subject Area** | business, management | business, management | business, management |
| **Document-type** | peer-reviewed journal articles | journal articles, review articles, conference papers | peer-reviewed journal articles |
| **Language** | English | English | English |
| **AJG rating** | 3, 4, 4* | 2, 3, 4, 4* | 3, 4, 4* |
| **Additional Criteria** | only competencies of individuals<br>only unique definitions | only competencies of individuals<br>frameworks of competencies | only competencies of individuals |
| **Final sample** | 31 | 57 | 25 |

The criteria were quite similar for each essay (e.g., business and management as subject areas, publications in English). Due to the fact that the initial sample for essay 2 was rather low, also review articles and conference papers, as well as publications with an AJG rating of 2 were considered.

For essay 3, only publications from 2013-2023 were considered, given the high topicality of the subject and the rapid development of AI technologies.

## 3.4 Data Analysis

### 3.4.1 Semantic Decomposition

Linguists acknowledge that humans comprehend complex meanings by breaking them down into inherent components (Wierzbicka, 1996). The methodological approach that involves breaking down complex concepts into their fundamental components or "primitives" is called semantic decomposition (Akmajian et al., 2017). This technique allows researchers to gain deeper insights into the meanings and relationships of various elements within a specific context. In the realm of managerial competence, semantic decomposition provides a structured way to analyze and clarify the multifaceted nature of the concept of managerial competence, thereby enhancing construct clarity. Since semantic decomposition allows for recognizing patterns in the data, it is particularly suitable for analyzing definitions of managerial competence (essay 1). Furthermore, this method has proven valuable in identifying important elements of concept definitions (e.g., Vial, 2019; Hund, 2021) which were then used to formulate synthesis-type definitions.

In essay 1 of this dissertation, semantic decomposition was applied to enhance construct clarity of the managerial competence concept. After identifying 31 unique definitions, the subsequent step was to write them into an Excel spreadsheet and apply semantic decomposition to break down the identified definitions into their constitutive elements (primitives). According to Wierzbicka (1996), primitives are the set of atomic concepts that cannot be further decomposed. For example, Burgoyne (1989) defined managerial competence as "a manager's ability and willingness to perform a task" (p. 57). This definition included the following constituting primitives: 1) manager, 2) ability, 3) willingness, 4) perform a task. Each primitive is then analyzed within the context of the respective definition in order to find overarching features of the extant definitions, which are then used for improving construct clarity (Suddaby, 2010). Overall, the analysis of the definitions involved the following steps:

- Identification of Definitions: The first step entailed cataloging various definitions of managerial competence from the selected literature into an Excel spreadsheet. Each definition was examined to discern its underlying meanings and implications.
- Decomposition into Primitives: Using a structured analytical framework, the captured definitions were decomposed into their basic semantic units or constituting primitives.
- Frequency Counting: The frequency of each constituting primitive was counted to identify which ones appeared more than once.
- Definition Comparison: For those primitives that had a frequency greater than one, the researchers checked their definitions in the Oxford Dictionary of English (ODE 2010) to facilitate comparison among them.
- Identification of Key Components: Through this comparison, the researchers identified seven prime primitives that represent the key conceptual components of managerial competence: Role, Proficiency, Disposition, Capability, Action, Context, and Effectiveness. Table 10 shows the constituting primitives and their frequencies for the primitive 'role'.

**Table 10.** Constituting Primitives and their Frequencies for the Primitive 'Role'.

| **Primitive 1: Role** | |
|---|---|
| *Constituting Primitives* | *Frequency* |
| Manager/Managers | 12 |
| Managerial job/Managerial jobs | 2 |
| Demands | 1 |
| Executives | 1 |
| Organization's management | 1 |
| Management jobs | 1 |
| Managerial occupations | 1 |
| Person | 1 |
| Roles | 1 |
| Specific areas of management | 1 |
| Top managers | 1 |

This primitive emerged from a total of 23 constituting primitives, with the terms 'manager' and 'managers' being the most frequently mentioned within this context.

Overall, the identification of primitives through semantic decomposition provided a nuanced understanding of the managerial competence concept. By clarifying the components of managerial competence, the analysis allowed for a more comprehensive view that underpins effective management practices in organizations.

### 3.4.2 Qualitative Content Analysis

Qualitative content analysis is a research method used to interpret textual data and extract meaningful patterns or themes from data. Qualitative content analysis is a systematic approach that allows researchers to analyze various forms of communication, including written texts, interviews, or visual materials.

It involves creating categories to identify patterns within the gathered textual data. The key and noteworthy findings are then summarized based on this categorization and analysis (Gaur & Kumar 2018, p. 281). Coding can be done inductively (developing codes from the data) or deductively (applying predefined codes based on existing theories).

The content analysis process typically consists of several stages, including defining the research question, selecting the texts for analysis, identifying segments of text and labeling them with codes, developing categories, analyzing the categories in the context of the research questions, and evaluating the study's reliability. These

phases may not always occur in a linear fashion and can involve iterative loops, where the researcher revisits earlier phases based on new insights gained during the analysis. The goal of qualitative content analysis is to go beyond mere description, seeking to understand the underlying meanings and implications inherent in the data. In the context of this dissertation on competencies for managers in the digital age, qualitative content analysis plays a crucial role in synthesizing findings from the systematic literature review of existing research.

In essay 2 and 3 of this dissertation inductive content analysis was employed to analyze the competencies extracted from various studies on digital managerial competencies and AI-related managerial competencies. By starting from the identified competencies in the literature, it was possible to categorize and reorganize them into a more coherent model.

The data in essay 2 were analyzed using inductive qualitative content analysis, suitable for research with limited prior studies, such as digital competencies in management. The goal was to understand the content's meaning by conceptualizing data and grouping codes into categories, developed during the coding process without pre-existing lists.

Following Mayring's (2014) systematic approach, the analysis used clauses as coding units, each paper as a context unit, and all 57 papers as the recording unit. Categories were defined as descriptors of competency elements (knowledge, skills, attitudes), with an emphasis on broader, interpretative groups to identify key dimensions of digital competencies.

The process involved reading all papers, extracting competency statements into an Excel spreadsheet, assigning initial codes, and iteratively grouping these into categories and main categories. Table 11 shows this process that resulted into the main category 'self-assessment and self-development'.

**Table 11.** The Creation of the Main Category 'Self-Assessment and Self-Development'.

| Competency Statement | Initial Coding | Category | Main-Category |
|---|---|---|---|
| To recognize personal strengths and weaknesses in various skills | Self-Awareness of Skills | | |
| To understand where one's own digital competence needs to be improved | Self-Awareness of Competence | | |
| To understand how personal values align with professional goals | Values and Goals Alignment | Self-Assessment | |
| To assess the impact of one's behavior on team dynamics | Behavior Assessment | | |
| To regularly assess one's own performance on key projects and tasks | Performance Assessment | | |
| To establish clear, measurable objectives for personal and professional growth. | Objective Development | | |
| To create a timeline for achieving specific skills or competencies | Achieving Skills | | |
| To prioritize developmental goals based on current performance and future aspirations | Goal Prioritization | Goal Setting | |
| To identify resources and support systems necessary for achieving personal goals | Achieving Goals | | |
| To regularly evaluate progress toward set goals and adjust them as needed | Evaluate and Adjust Goals | | |
| To seek constructive feedback from peers and supervisors to enhance performance | Seeking Feedback | | |
| To actively seek constructive criticism from colleagues and supervisors | Seeking Feedback | | |
| To analyze feedback objectively to identify areas for improvement | Feedback Analysis | | |
| To document feedback received to track changes in behavior and performance over time | Feedback Documentation | Feedback | |
| To implement suggestions from others as a means of enhancing performance | Implement Suggestions | | |
| To analyze feedback in the context of personal goals and aspirations | Feedback Analysis | | **Self-Assessment and Self-Development** |
| To express gratitude for feedback received, fostering a culture of open communication | Gratitude for Feedback | | |
| To engage in peer evaluations to gain insights from colleagues' perspectives | Seeking Feedback | | |
| To keep up to date with the digital revolution | Staying Updated | | |
| To improve or update one's own digital competence | Competence Improvement | | |
| To seek opportunities for self-development | Self-Development Opportunities | | |
| To actively pursue opportunities for acquiring new skills and knowledge | Self-Development Opportunities | | |
| To stay updated on industry trends and best practices relevant to one's field | Staying Updated | Self-Development | |
| To participate in professional networks and communities for shared learning experiences | Active Learning | | |
| To conduct periodic reviews of skills and competencies to ensure relevance | Staying Updated | | |
| To embrace challenges as opportunities for learning and development | Self-Development Opportunities | | |
| To utilize online platforms and resources for self-paced learning opportunities | Active Learning | | |
| To reflect on past experiences to identify patterns of success and failure | Analyzing Past Experiences | | |
| To engage in regular self-reflection to evaluate personal growth and areas for improvement | Self-Reflection | Self-Reflection | |
| To maintain a journal to track personal development and insights gained | Documenting Reflection | | |
| To analyze successes and setbacks to inform future actions and strategies | Learning from Experiences | | |

The content analysis of the skills and competency statements resulted into a framework highlighting technological knowledge, soft skills, and e-leadership skills as key dimensions and 19 categories of digital managerial competencies.

To ensure reliability, two additional researchers independently coded parts of the data, resolving discrepancies through discussion. This led to refinements, including renaming categories (e.g., 'positive thinking' to 'curiosity and open-mindedness'), merging categories, and adjusting the framework to 18 main categories.

Validation was further enriched by two focus groups with managers, training experts, and labor market intermediaries who confirmed the framework's structure and suggested additions (e.g., adding aspects of AI and cybersecurity in the competency descriptions). The final model reflects these inputs and is summarized in a revised framework of digital managerial competencies.

The analysis of AI-related managerial competencies in essay 3 was conducted in a similar way. Each of the 27 papers was read from the beginning line by line, and whenever a text segment contained a competency statement or example, it was manually extracted into an Excel spreadsheet and assigned a preliminary code. Codes were alphabetically sorted, grouped by keywords, and categorized into nine competency dimensions, encompassing a total of 40 competencies.

Subsequently I performed a comparative analysis with the identified AI-related managerial competencies and the 'Great Eight' competencies established by Kurz & Bartram (2002). This comparative analysis identified three categories of managerial competencies related to AI: (1) competencies that are the same as traditional ones,

(2) traditional competencies enhanced by AI elements, and (3) entirely new competencies. In this regard, inductive content analysis revealed significant shifts and additions relevant to AI, and allowed comparisons with traditional managerial competencies.

# 4 Findings

## 4.1 What are the conceptual components of Managerial Competence?

As this dissertation investigates the competencies of managers in the digital age, it is imperative to understand the overarching concept, namely managerial competence, as well as the underlying elements that build up this concept.

Essay 1 sought to clarify the concept of managerial competence, a concept that has suffered from ambiguity and inconsistency in prior literature. A primary concern is the lack of clarity surrounding the definitions of competence and competency. Scholars like Hartle (1995) and Dooley et al. (2004) suggest that competencies encompass not only observable attributes such as knowledge and skills but also intangible traits and motivations. This blending of distinct elements can lead to tautological descriptions where the definitions are circular—essentially stating that competencies are those attributes that enable competent performance without clearly delineating what those attributes are.

While some literature attempts to differentiate between competence and competency—where competence is about meeting job standards (task-oriented approach) and competency involves the underlying attributes necessary for superior performance (person-related approach) (Burgoyne, 1988; Woodruffe, 1993)—this distinction is often criticized as being overly convoluted. The debate echoes broader issues about how concepts are defined within management literature. Authors like Hoffmann (1999) and Stoof et al. (2002) argue that attempts to separate the terms are ultimately futile, leading to greater confusion rather than clarity.

The variations in definitions are also influenced by cultural and geographical contexts. For instance, the American approach to competence, as seen in the work of McClelland (1973), emphasizes psycho-social characteristics associated with superior performance. In contrast, European frameworks consider cognitive, functional, and social dimensions, focusing on performing to required standards rather than exceeding them (Winterton, 2009). This variability poses challenges for multinational organizations in establishing a cohesive understanding of managerial competence that aligns with their diverse workforces.

A more useful distinction which was also adopted in this dissertation is the view of ‘competence’ as generic or holistic concept, referring to a person’s overall capacity, and ‘competency’ as being foundational to this overall capacity, referring to specific attributes (e.g., Eraut, 1994).

Essay 1 focused on the holistic concept of managerial competence. By applying Suddaby's (2010) four basic elements of construct clarity—definitions, semantic relationships, scope conditions, and theoretical coherence—alongside additional practical considerations, we have made a systematic contribution to understanding the conceptual components of managerial competence.

A significant finding of our study is that nearly 36% of the reviewed literature failed to provide adequate definitions of managerial competence—the very foundation for construct clarity. In stark contrast, the 47 articles that did attempt definitions presented 31 unique interpretations. From our semantic decomposition of these definitions, we identified seven key components:

1. **Role**: Refers to the specific position or function of an individual within an organization, typically associated with managerial tasks and responsibilities. It encompasses the expectations tied to that position in relation to the organization's goals and values.
2. **Proficiency**: Represents the level of skill or expertise a manager possesses related to specific tasks or functions. It is an indication of how well a person can perform their job duties based on their knowledge and practice.
3. **Disposition**: Refers to the inherent qualities, attitudes, or personality traits that influence a manager’s behavior and decision-making. It encompasses personal characteristics that affect how a manager approaches their role and interacts with others.
4. **Capability**: Describes the potential ability of a manager to perform actions effectively. It reflects the combination of proficiency and disposition, indicating not just what a manager can do, but also the conditions or circumstances that allow them to achieve desired outcomes.
5. **Action**: Involves the observable behaviors or responses a manager exhibits in specific situations. It is the implementation of proficiency and disposition to achieve results, often linked to managerial tasks such as decision-making, problem-solving, and communication.
6. **Context**: The environment or setting in which a manager operates, which can include organizational culture, market dynamics, and situational factors. Context influences how managerial competence is perceived and enacted, as it shapes the requirements and expectations of the managerial role.
7. **Effectiveness**: Refers to the degree to which a manager's actions lead to positive outcomes for the organization. It is often measured by the impact of

managerial decisions on performance, productivity, and overall organizational success.

The seven primitives exhibit a blend of person-related and task-related characteristics. Whereas proficiency and disposition lean more toward the individual attributes of the manager, role, action, context, and effectiveness are more related to the tasks and conditions within which managerial competence is applied. Capability has both person-related and task-related aspects. While it describes the potential of an individual manager to act effectively based on their attributes (which is person-related), it also implies the conditions and circumstances that may affect their ability to perform tasks effectively (task-related). Therefore, capability serves as a bridge between the individual attributes of a manager and the demands of the tasks they face. In this regard, the two primitives proficiency and disposition can be considered managerial competencies that—together with the five remaining primitives—form managerial competence.

This systematic approach enabled us to propose an initial working definition of managerial competence, which emphasizes the combination of skills, knowledge, and characteristics that enable managers to positively impact organizational performance. Our examination confirms the calls from previous research for greater specificity in defining managerial competencies. Notably, the inclusion of both personal and structural elements highlights the interplay between individual attributes and the overarching organizational environment. This insight aligns with literature advocating for a more nuanced portrayal of managerial competence (Dai & Liang, 2012; Jena & Sahoo, 2014), though the recalibration of our definition based on subsequent discussions is essential.

As we explored the semantic relationships among the identified primitives, we uncovered the complexities inherent in the concept of managerial competence. For instance, while skills and knowledge are critical components, it is evident from our findings that they are often conflated with managerial competencies—a confusion that detracts from clarity. Moreover, the lack of contemporary acknowledgment for traits and motives as integral elements of managerial competence reflects a potential oversight in understanding the deeper personal attributes that contribute to effective management (Boyatzis, 1982; Spencer & Spencer, 1993). The relationships among the components illuminate the multidimensional nature of managerial competence, with constructs like capability and action representing both potentiality and actuality. This distinction underscores the dynamic nature of managerial work, necessitating an adaptive approach to competency development. As the literature indicates, competencies cannot be static or universally applicable across diverse contexts (Bradley, 1991; Bartlett & Ghoshal, 1997). This perspective necessitates further empirical inquiry to explore how these constructs interact in varying organizational contexts.

Our findings also delineate the scope conditions under which the concept of managerial competence is relevant. We argue that the terms ‘manager’ or ‘managers’ should not be included in definitions for clarity, as this leads to tautological reasoning. However, recognizing managerial roles as key scope conditions allows for a more precise understanding of the contexts in which managerial competencies apply. This realization aligns with existing literature that highlights the importance of context in shaping managerial competencies (Antonacopoulou & FitzGerald, 1996; Burgoyne, 1989). The variability of managerial competencies across different contexts further complicates the notion of universal applicability. As our findings suggest, identical roles in different organizations might require different competencies due to contextual influences. Consequently, our work adds to the ongoing discourse surrounding the contextualization of competencies, emphasizing that organizational culture, structure, and external forces significantly shape the requisite competencies for effective management.

Finally, we discussed the theoretical coherence of the managerial competence concept, demonstrating how the seven identified components—role, proficiency, disposition, capability, action, context, and effectiveness—interrelate. These components collectively form a comprehensive framework that allows us to understand managerial competence as a multidimensional concept. Our definition emphasizes that managerial competence encompasses both proficiency and disposition, which together create a capability to perform effective organizational actions (Grenda & Palmunen, 2025). While classical definitions of managerial competence often emphasize proficiency and disposition, they treat managerial competence as a more static set of skills applicable across various situations (e.g., McLagan, 1980; Boyatzis, 1982; Spencer & Spencer, 1993). In contrast, our definition stresses that competence is contingent upon the specific role and organizational context, which aligns with contemporary understandings of leadership and management that recognize the dynamic nature of these environments (e.g., Stuart & Lindsay, 1997). Moreover, our definition implies that managerial competence can evolve based on experience and context, whereas classical definitions might not emphasize this adaptability.

We have established that for managerial competence to exist, all seven components must be present simultaneously. This interdependence highlights the importance of context and role, two structural forms that delineate the scope of managerial competence. Our findings suggest that an individual's managerial competence can vary significantly across different contexts or roles, thus underscoring the dynamic nature of this construct.

We further identified three key conceptual dimensions that illustrate the relationships among these components (Figure 7). The first dimension emphasizes the interplay between agency and structure, where managers are influenced by

organizational demands while also possessing the agency to reshape their roles and contexts. The second dimension focuses on the connection between individual and organizational levels, revealing how individual actions can impact organizational effectiveness and create feedback loops that enhance both proficiency and disposition. Finally, we examined the relationship between potentiality and actuality, emphasizing that a manager's capability is shaped by their role and context, allowing for a multitude of potential actions that can be realized through effective execution.

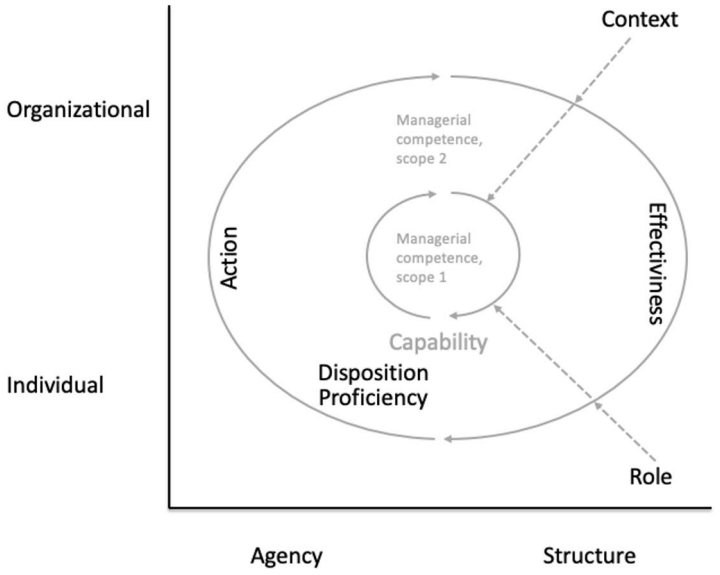


**Figure 7.** The Conceptual Components of Managerial Competence (Grenda & Palmunen, 2025).

This framework not only enhances construct clarity but also responds to calls for a comprehensive understanding of managerial competence (Cheng, Dainty, & Moore, 2003; Winterton, 2009).

## 4.2 How can a model of digital managerial competencies be conceptualised and what competencies does it include?

The findings of essay 2 contribute to the ongoing discourse surrounding digital competencies by offering a structured model that intricately weaves together three critical dimensions: technological knowledge, soft skills, and e-leadership skills. Based on these findings, digital managerial competencies can be defined as a comprehensive set of knowledge, soft skills, and leadership skills that enable managers to effectively leverage digital technologies in organizational contexts.

**Table 12.** The three Dimensions and 18 Areas of Digital Managerial Competencies.

| | |
|---|---|
| **I. Technological Knowledge** | |
| **Knowledge about Hardware and Software:** | Understanding and effectively using foundational digital tools and protecting digital systems. |
| **Knowledge about Information Management:** | Finding, analyzing, and securing digital information while recognizing potential biases and cybersecurity threats. |
| **Knowledge about Digital Content:** | Creating, editing, and safeguarding digital content and personal identity online. |
| **Advanced Technological Knowledge:** | Customizing, troubleshooting, and developing digital and AI-based applications for diverse work needs. |
| **II. Soft Skills** | |
| **Self-Assessment and Self-Development:** | Continually evaluating and updating one's digital and professional skills through proactive learning. |
| **Curiosity and Open-Mindedness:** | Demonstrating eagerness to learn, experiment, and adapt to new digital practices and trends. |
| **Ethics and Responsibility:** | Acting responsibly and ethically in digital environments, considering societal and individual impacts. |
| **Creativity and Innovation:** | Using digital tools to generate new ideas, improve processes, and address challenges creatively. |
| **Problem Solving:** | Analyzing issues systematically and leveraging digital resources to find effective solutions. |
| **Communication (face-to-face and digital):** | Clearly and effectively sharing information and engaging with others through various communication channels. |
| **Emotional Intelligence:** | Recognizing and managing emotions in digital interactions to foster positive relationships. |
| **III. E-leadership Skills** | |
| **Data-driven Decision Making:** | Utilizing data analysis to inform, evaluate, and refine organizational strategies and actions. |
| **Strategic Vision and Planning:** | Developing and implementing long-term plans aligned with organizational values and goals. |
| **Change Management:** | Leading and facilitating technological and organizational change to ensure successful adoption and integration. |
| **Self-Leadership:** | Maintaining self-awareness and motivation to guide personal performance and growth. |
| **Inspiring and Motivating Others:** | Encouraging and supporting team members to develop skills and perform at their best. |
| **Managing Diverse Teams:** | Leading inclusive and culturally aware teams using digital tools for effective collaboration. |
| **Trust Building:** | Establishing credibility and positive relationships by demonstrating reliability, respect, and ethical behavior. |

The dimension 'technological knowledge' underscores the foundational role that a manager's understanding of digital tools and technologies plays in their effectiveness. As outlined by various scholars (Ala-Mutka, 2011; Gerasimenko & Razumova, 2020), technological knowledge extends beyond mere familiarity with devices; it encapsulates a comprehensive understanding of hardware, software, information management, and evolving technological trends. Importantly, the delineation of areas—ranging from basic understanding to advanced technological expertise—highlights the isolating pressures that emerging technologies can exert on managerial efficacy. Given the pace of technological change, it is critical that

managers engage with advanced knowledge continuously to leverage these tools effectively within their organizations.

The inclusion of soft skills in the digital managerial competencies model presents a paradigm shift in how we perceive managerial aptitude. As suggested by contemporary research (Berenstein et al., 2020; Succi & Canovi, 2020), soft skills are increasingly recognized as indispensable not only for immediate workplace performance but also for long-term career progression and organizational loyalty. The seven identified soft skills—ranging from self-assessment to conflict management—reflect the transversal nature of these competencies. They enable managers to foster a positive work environment, especially critical in a post-COVID-19 landscape marked by remote work and digital communication challenges. The emphasis on soft skills validates their status as equally critical as technological prowess in the digital age, thus requiring educational institutions and employers to prioritize soft skills development in their training programs.

The 'e-leadership skills' dimension solidifies that effective management within digital contexts necessitates a unique set of competencies that blend leadership abilities with digital fluency. As articulated by van Wart et al. (2019), the competencies outlined in the SEC model elucidate the need for managers not only to engage their teams digitally but also to navigate the intricate changes inherent in digital transformations. The seven e-leadership skills presented in this study align with contemporary organizational needs for leaders who can motivate, build trust, manage change, and foster collaboration in virtual settings. This duality of focusing on interpersonal relations while leveraging technology is crucial in an age where employees increasingly question their leaders' competence in managing hybrid workforces.

The distinctions between soft skills and e-leadership skills within the framework of digital managerial competencies primarily lie in their scope, focus, and application in digital contexts. Soft skills encompass interpersonal and intrapersonal skills such as self-assessment, curiosity, ethics, creativity, communication, and emotional intelligence. These skills are crucial for personal development, effective collaboration, ethical conduct, and adaptive problem-solving in any organizational setting. They serve as the groundwork for building trust, fostering innovation, and managing relationships—elements essential to leadership but rooted in intrinsic human capabilities.

In contrast, e-leadership skills are specifically oriented toward leveraging digital technologies and data-driven approaches to guide organizational strategy and decision-making. These skills include for example data-driven decision making, strategic planning with digital tools, change management in digital environments, self-leadership in virtual settings, and managing diverse teams and trust-building through digital means. E-leadership skills emphasize the application of technological

tools, analytical methods, and strategic thinking tailored to the digital landscape, enabling managers to lead effectively in virtual, decentralized, or technologically complex environments.

What makes these categories 'digital competencies' is their integration within the digital transformation of organizations. While soft skills are universally relevant, their effective development and application are increasingly mediated by digital tools—such as virtual communication platforms, digital content creation software, and data analytics tools—that require managers to adapt and expand their interpersonal and cognitive abilities for online and hybrid contexts. In a digital environment, these skills often require adaptation—for example, effective digital communication, emotional intelligence in online interactions, and responsible data handling are all soft skills that must be adapted to the digital context to be effective. Similarly, e-leadership skills are inherently digital, because they explicitly involve the use of digital tools and data to lead, strategize, and make decisions. These skills are crucial in digital environments but are not solely about technology; instead, they are about applying managerial principles in the context of digital transformation, as articulated by van Wart et al. (2019).

The analysis presented in this essay underscores the prevalent focus on technology within the frameworks of digital competencies, as evidenced by established models such as the DigComp framework. While recognizing the centrality of technology, it is vital to emphasize that modern managers must not only possess technical expertise but also excel in soft skills—skills that have grown indispensable in an ever-evolving work landscape. The insights drawn from existing literature, including contributions by Bartel (2018), Marrero et al. (2018) and Centeno et al. (2019), affirm that soft skills play a pivotal role in job performance and career advancement. Indeed, their relevance has become increasingly pronounced in the wake of COVID-19, where remote work has necessitated heightened interpersonal dynamics and support-focused management strategies (Wang et al., 2021).

The integration of all three dimensions underscores that digital managerial competencies are not solely about technical expertise but also involve adaptive, interpersonal, and strategic skills tailored to the digital transformation of organizations. Developing these competencies holistically is crucial for managers to lead effectively, innovate, and sustain organizational success in the digital age.

Essay 2 proposed a comprehensive framework that integrates knowledge and skills with emphasis on both digital and non-digital skill sets. Such a nuanced perspective aids in demystifying the competencies required for effective management, suggesting that e-leadership skills represent a distinct yet interconnected component of the digital competence.

In response to calls from scholars such as Giraud et al. (2022) and Zahoor et al. (2023), this work elucidates the necessity of a multidimensional approach to understanding the competencies required for effective management in a digital environment. By merging the areas of soft skills, e-leadership skills, and technological knowledge under the umbrella of digital managerial competencies, this framework addresses a critical gap in the literature regarding the multifaceted nature of managerial effectiveness in an increasingly digital workplace.

## 4.3 Which managerial competencies are essential for implementing AI in companies and how do they differ from traditional managerial competencies?

The purpose of essay 3 was to identify and analyze AI-related managerial competencies and explore how they compare to traditional managerial competencies as represented in the 'Great Eight' model by Kurz & Bartram (2002). The analysis of 25 articles through inductive content analysis yielded a total of 40 AI-related managerial competencies, which were organized into nine distinct competency dimensions: leadership, strategic thinking, communication and collaboration, technological understanding, critical thinking, creativity and innovation, flexibility and adaptability, lifelong learning, and customer-focus and quality management. This extensive body of research leads to some critical insights concerning the evolving landscape of managerial competencies in an AI-driven environment, which can be categorized into three main types: competencies identical to traditional ones, traditional competencies enhanced by AI, and entirely novel competencies (Table 13).

**Table 13.** AI-related Managerial Competencies identified after comparison with the 'Great Eight'.

| | |
|---|---|
| **AI-related Managerial Competencies Mirroring Traditional Competencies** | |
| **Leadership** | 1.1 Initiating and Directing Actions<br>1.4 Motivating Employees<br>1.5 Building and Managing a diverse Organizational Culture<br>1.7 Facilitating Knowledge Sharing |
| **Strategic Thinking** | 2.4 Having sound Business Knowledge<br>2.5 Managing Change<br>2.6 Managing your Time effectively<br>2.7 Considering Sustainable Business Practices |
| **Communication and Collaboration** | 3.1 Communicating effectively face-to-face<br>3.3 Collaborating with various Stakeholders<br>3.4 Showing Empathy<br>3.5 Demonstrating Emotional Intelligence<br>3.6 Negotiating and Solving Problems<br>3.7 Being Patient and Tolerant |
| **Critical Thinking** | 5.2 Evaluating and Interpreting Information critically |
| **Creativity and Innovation** | 6.2 Transforming original ideas into tangible outcomes<br>6.3 Being willing to engage in risky situations |
| **Flexibility and Adaptability** | 7.1 Adapting and thriving in changing environments<br>7.3 Withstanding and Recovering quickly from Challenges |
| **Lifelong Learning** | 8.1 Learning continuously and improving yourself |
| **Customer-focus and Quality Management** | 9.2 Achieving and Maintaining a desired level of Quality |
| **Traditional Managerial Competencies enhanced by AI** | |
| **Leadership** | 1.2 Making Decisions with Help of AI<br>1.3 Influencing Employees' view towards AI<br>1.6 Building Trust among Employees for AI<br>1.8 Providing AI Training and Development Opportunities<br>1.9 Guiding and Supporting Employees in AI Upskilling |
| **Strategic Thinking** | 2.2 Monitoring and controlling AI activities<br>2.3 Using AI to identify Business Opportunities |
| **Technological Understanding** | 4.1 Knowledge and Skills in Programming and Big Data<br>4.4 Understanding issues relating to Ethics, Privacy, and Security |
| **Critical Thinking** | 5.1 Gathering and analysing data and information with AI |
| **Customer-focus and Quality Management** | 9.1 Creating enhanced Customer-Experience with AI |
| **New AI-related Managerial Competencies** | |
| **Strategic Thinking** | 2.1 Integrating AI with Human Workers, Processes, Business Strategy |
| **Communication and Collaboration** | 3.2 Communicating effectively via online tools |
| **Technological Understanding** | 4.2 Profound Understanding of Mathematics and Statistics<br>4.3 Understanding Basic Functions of AI |
| **Creativity and Innovation** | 6.1 Producing original and unusual ideas |
| **Flexibility and Adaptability** | 7.2 Adjusting easily to Changes |
| **Lifelong Learning** | 8.2 Being curious to learn about AI<br>8.3 Being open to new Technologies |

The comparative analysis of the 40 AI-related managerial competencies with the 'Great Eight' model unveils a significant overlap; 21 identified competencies are identical to those traditionally established by Kurz and Bartram. This suggests that the foundational skills of effective management remain intact despite the advancements brought by AI technologies. Key competencies such as initiating and directing actions, motivating employees, and ensuring quality management continue to play vital roles in effective managerial practice.

Moreover, the analysis also indicates that 11 of the identified AI-related competencies correspond to existing traditional competencies but require an extension to include specific AI aspects. For instance, competencies such as 'Making Decisions with Help of AI' and 'Guiding and Supporting Employees in AI Upskilling' suggest a necessary evolution in traditional competency frameworks to accommodate the integration of AI-driven tools in decision-making processes and workforce development.

One of the most noteworthy findings of this study is the emergence of eight new managerial competencies that could not be directly linked to the 'Great Eight' model. These competencies reflect the unique challenges posed by AI and the evolving nature of managerial roles. For example, the competency of 'Integrating AI with Human Workers, Processes, and Business Strategy' highlights the need for managers to align AI initiatives with organizational objectives effectively, showcasing that digital transformation requires a thoughtful integration of technology into existing workflows rather than mere implementation.

Similarly, the competency 'Communicating Effectively via Online Tools' emerges as crucial in the contemporary work environment characterized by remote communication and collaboration tools. The importance of this competency has intensified due to the recent global shift towards remote work, thereby necessitating adeptness in leading teams across various digital platforms. However, caution is advised, as researchers have pointed out that digital communication lacks the richness of face-to-face interactions, thereby underlining the need to maintain a balance.

Moreover, the competencies related to continuous learning underscore the necessity of managers to cultivate an attitude of lifelong learning. In contrast to the 'Learning and Researching' area mentioned in the 'Great Eight', which suggests periodic learning, the competency 'Being Curious to Learn about AI' emphasizes continuous adaptation and curiosity about ever-evolving technologies. This proactive learning approach equips managers with the agility required to keep pace with rapid developments in AI.

The findings reveal a strong interrelationship between traditional managerial competencies and their AI-enhanced counterparts. For instance, leadership competencies such as 'Motivating Employees' and 'Building Trust' necessitate a

reevaluation in the context of AI. Managers must now not only inspire and guide their teams but also do so while alleviating concerns about AI, fostering trust in technology-driven processes, and providing targeted training to navigate AI's complexities effectively.

Competencies related to strategic thinking have similarly evolved; managers need to utilize AI not as a replacement but as a tool that augments their strategic oversight. The ability to monitor AI activities and leverage data-driven insights for identifying business opportunities illustrates the intertwined nature of AI technology and traditional strategic frameworks.

While the findings suggest a shift towards AI-related competencies, it is essential to emphasize that certain uniquely human competencies persist in their importance. Skills such as emotional intelligence, empathy, active listening, and conflict resolution remain irreplaceable components of effective management. The intrinsic nature of these skills—rooted in human intuition and social intelligence—cannot be duplicated by AI technologies, thus reinforcing the argument that human competencies will remain relevant, if not more so, amid technological advancements.

In conclusion, the findings underscore that technology, particularly AI, plays a transformative yet integrative role in shaping managerial competencies. The evolving landscape of managerial practices calls for refinement rather than complete reformation of existing competency frameworks. Managers equipped with a blend of traditional and new competencies will be better positioned to navigate the complexities and uncertainties of leading in an AI-enhanced environment, thereby reinforcing the importance of enduring humanistic skills amidst the rapidly changing technological landscape. Through continuous learning, effective communication, and a strong foundation in AI functionalities, managerial effectiveness can be significantly enhanced, positioning organizations for sustained success in the face of digital transformation.

## 4.4 Synthesis of the Findings

The synthesis of findings from the three essays leads to a comprehensive answer regarding the competencies that managers require in the digital age.

The foundational layer involves **technological knowledge**, which has become indispensable for managers to understand, leverage, and adapt to digital tools and platforms. This includes familiarity with hardware and software, information management, cybersecurity, digital content creation, and advanced technological understanding such as AI and big data (essay 2). Such knowledge forms the backbone of effective digital management, enabling managers to harness

technologies to improve organizational efficiency, innovate processes, and make data-driven decisions.

Complementing technical understanding are **soft skills**, which have gained heightened importance in the digital age. Skills such as self-assessment, curiosity, ethics, creativity, problem-solving, emotional intelligence, and effective communication are critical for fostering a collaborative and innovative organizational culture (essay 2). These skills facilitate adaptability, resilience, and interpersonal effectiveness—qualities that are essential in remote or hybrid work environments where traditional face-to-face interactions are limited. Soft skills underpin a manager's capacity to motivate teams, manage conflicts, build trust, and maintain a positive working environment amidst rapid change and uncertainty.

Building upon these are **e-leadership skills**, which are specifically tailored to digital contexts. These include data-driven decision-making, strategic planning with digital tools, change management in digital settings, self-leadership in virtual environments, and managing diverse and distributed teams (essay 2). E-leadership skills emphasize the strategic application of digital tools to lead effectively, inspire innovation, and cultivate trust in virtual teams. They also involve the capacity to adapt leadership styles to the unique demands of digital transformation, fostering agility and fostering a culture of continuous learning.

Furthermore, the integration of **AI-related competencies** exemplifies the evolving skill set required for managers to thrive in an AI-enhanced environment. These competencies extend beyond traditional managerial skills, encompassing the ability to understand AI functionalities, oversee AI-driven processes, interpret complex data outputs, and ethically manage AI applications (essay 3). Managers must also develop new competencies such as integrating AI with human workflows, guiding AI upskilling initiatives, and maintaining a strategic perspective on AI's role in organizational value creation. These competencies reflect a blend of strategic, technological, and human-centric skills, acknowledging that AI is not merely a tool but a transformative force that requires managers to adapt and evolve continuously.

In addition to technical and interpersonal skills, a commitment to **lifelong learning** and **adaptability** are paramount (essay 3). The ability to embrace continuous learning and to remain curious about emerging technologies like AI ensures that managers can keep pace with rapid developments.

A salient feature of the competencies required in the digital age is their interdependence and contextual sensitivity. Managerial effectiveness depends on the simultaneity of technical knowledge, soft skills, e-leadership skills, and AI related competencies—each influencing and reinforcing the others. For example, possessing advanced technological knowledge is insufficient without the soft skills to communicate effectively about digital initiatives or to motivate teams through change. Similarly, strategic thinking must be augmented by technological

knowledge and AI understanding to navigate complex environments effectively. The importance of context deserves emphasis—competencies need to be adaptable to specific organizational, cultural, and industry settings, recognizing that what is relevant in one environment may differ in another. In guise of synthesis, these insights are summarized in a visual form in Figure 8.

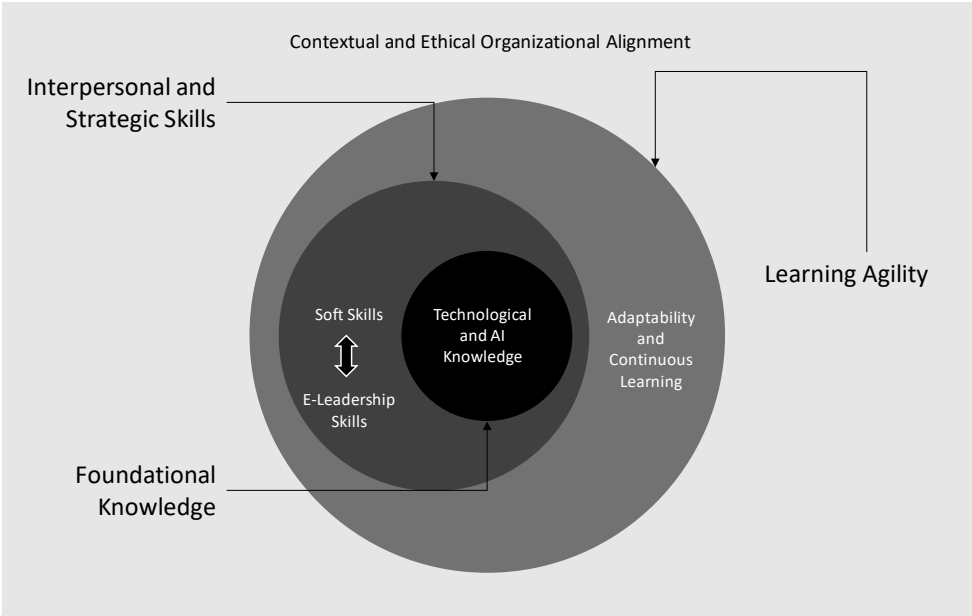


**Figure 8.** Managerial Competencies in the Digital Age (developed by the author).

This figure depicts the core competencies required for managers in the digital age, organized into three interconnected layers. At the innermost level, the foundational knowledge includes technological and AI knowledge, serving as the essential base for understanding and leveraging digital and AI tools. Surrounding this is the middle layer, representing interpersonal and strategic skills such as soft skills (e.g., communication, emotional intelligence) and e-leadership skills (e.g., data-driven decision-making, change management). The outermost layer emphasizes learning agility—characterized by adaptability and continuous learning—which allows managers to stay responsive to rapid technological changes and evolving organizational contexts. All these elements are embedded within a broader framework of ethical and organizational alignment, ensuring that digital competencies are applied responsibly and in harmony with organizational values and cultural considerations.

# 5 Discussion and Conclusions

The findings on managerial competencies in the digital age are next analyzed through the lens of the four perspectives of technology discussed in section 2.1.3: positivist, social constructivist, sociomaterialistic, and predictive. Each perspective offers a different lens for understanding how these competencies relate to technology within organizations.

**1. Technological Knowledge and the Positivist Perspective**

The emphasis on technological knowledge aligns closely with the positivist approach, which perceives technology as an external, standardized entity that influences organizational outcomes in a deterministic manner. This perspective views technological knowledge as a critical factor enabling managers to understand, adopt, and leverage digital tools—reflecting a belief that mastering the technical aspects of technology correlates with improved organizational performance. The focus on hardware, software, cybersecurity, and advanced technologies like AI exemplifies the positivist view that technology exerts a measurable, direct impact on organizational efficiency and decision-making.

**2. Soft Skills and the Social Constructivist Perspective**

Soft skills such as emotional intelligence, creativity, and communication resonate with the social constructivist approach. This perspective considers technology as socially constructed and situationally dependent, emphasizing human interpretation, meaning-making, and the development of practices around technology use. The importance of soft skills underscores that successful digital management depends on human agency, social interactions, and contextual understanding. Managers are seen as active agents who interpret and shape technology's role through their social interactions, making soft skills crucial for mediating technological adoption and fostering a collaborative digital culture.

**3. E-Leadership and the Sociomaterialistic Perspective**

E-leadership skills—such as managing virtual teams and data-driven decision-making—are best understood through the sociomaterialistic lens. This approach emphasizes the intertwined relationship between social and material elements, recognizing that effective digital leadership involves co-constructing organizational realities with technology. Managing distributed teams and leading change in digital contexts require not only understanding digital tools but also engaging with the material affordances of technology and the social practices around them. The sociomaterialist perspective highlights that leadership in digital environments is a practice shaped jointly by human and technological factors.

**4. AI-related Competencies and the Predictive Perspective**

Understanding AI functionalities, overseeing AI-driven processes, and ethically managing AI applications involve forward-looking, strategic thinking, aligning with the predictive perspective. This perspective emphasizes anticipation of future technological developments and adapting managerial strategies accordingly. Competencies in AI reflect a proactive, anticipative approach, preparing managers to navigate emerging technologies and their organizational implications—hallmarks of the predictive view.

**5. Lifelong Learning and the Most Suitable Perspective**

The emphasis on continuous learning and adaptability intersects with all perspectives. In particular, though it reflects the essence of the predictive perspective, emphasizing the need for continuous adaptation to technological change. It underscores the importance of agility and proactive learning to stay ahead in an ever-evolving digital environment.

After having discussed the competencies in light of the four perspectives, it appears that no single perspective fully encapsulates all aspects of them. However, the sociomaterialistic approach offers the most comprehensive framework for understanding the complex, intertwined nature of the competencies identified. Why is this? Because it recognizes that technological knowledge, soft skills, e-leadership skills, and AI competencies are not isolated or purely deterministic but are co-constructed through social practices, material interactions, and human-technology relationships. It emphasizes that technology and human agency mutually shape organizational realities, aligning well with the multifaceted competencies needed in the digital age.

Adopting a sociomaterialistic view suggests that effective digital managers must transcend simple technical expertise or social skills alone. They need to develop a nuanced understanding of how social processes and technological artifacts co-evolve and influence organizational realities. This perspective emphasizes the importance of competencies such as integrating technology seamlessly into daily practices, fostering innovation through social-technical interplay, and critically interpreting the implications of digital tools within organizational contexts. Moreover, it underscores that managerial success in the digital age hinges on the ability to navigate complex, intertwined social and material worlds—requiring a blend of technical, social, and strategic competencies that are adaptable and forward-looking.

In summary, the dissertation articulates a dynamic, contextually aware framework of managerial competencies that emphasizes the importance of both enduring competencies and new demands posed by the digital age. By articulating these competencies, this research fills a vital gap in understanding how managers can effectively navigate and lead in increasingly complex and technology-driven environments. Following from this synthesis of the dissertation's main findings, the next section outlines how this dissertation and each essay contributes to prior research, addressing research gaps introduced earlier in this thesis (section 1.3).

## 5.1 Theoretical Contributions

This doctoral dissertation offers theoretical contributions to the evolving discourse on managerial competencies, particularly amidst the rapid advancements in digital technology and AI. As stated in section 1.3, the research addresses four critical gaps within the literature, thereby contributing to a more nuanced understanding of the managerial competencies that are essential for success in a digitally transformed organizational landscape. The research gaps and contributions of each essay are visualized in Figure 9.

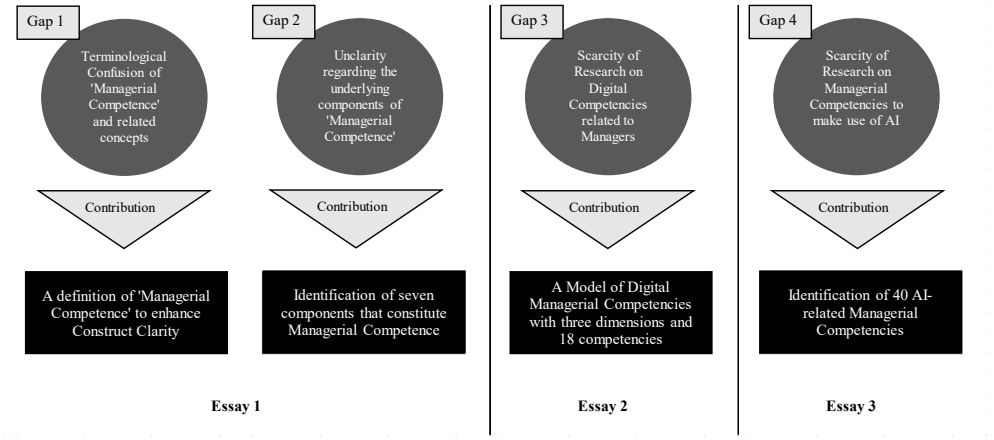


**Figure 9.** The Contribution of each Essay to the Research Gaps.

One of the key theoretical contributions of this dissertation lies in a thorough examination and clarification of terminologies surrounding the concept of managerial competence. As identified in the first research gap, the terminological confusion surrounding concepts such as ‘competence’, ‘competency’, ‘skills’, and ‘capabilities’ poses challenges for scholars and practitioners seeking to establish a cohesive understanding of what constitutes effective managerial practice (Winterton, Delamare-Le Deist, & Stringfellow, 2006). Through a systematic literature review, essay 1 unpacks the ambiguous definitions that characterize existing literature. By proposing a refined definition of managerial competence—rooted in seven key components (role, proficiency, disposition, capability, action, context, and effectiveness)—this dissertation enhances theoretical clarity and coherence regarding this concept.

The second contribution addresses the unclarity regarding the underlying components of the concept of managerial competence. By systematically reviewing the literature, the thesis identifies and decomposes the essential elements that constitute managerial competence, thus providing a nuanced understanding of its components. This exploration reveals that traditional definitions have often overlooked critical aspects influences that shape managerial effectiveness. Taking a closer look, the research not only underscores the multifaceted nature of managerial competence but also highlights the interplay between individual attributes (proficiency, disposition, capability) and organizational contexts. This contributes to the broader academic discourse by bridging terminological discrepancies and promoting a unified framework that can be widely applied across diverse management contexts. Additionally, the emphasis on the necessity of context serves

to ground discussions of managerial competence in the realities and complexities faced by managers in their respective environments.

The third theoretical contribution of this dissertation is its exploration and articulation of digital managerial competencies. Essay 2 addresses this research gap by conceptualizing a model of digital managerial competencies. This model integrates three dimensions: technological knowledge, soft skills, and e-leadership skills. By emphasizing the importance of these competencies in a digital context, the research provides a comprehensive framework that encapsulates the requisite competencies for effective management in the digital age. The acknowledgment of soft skills and e-leadership skills, alongside technological knowledge, emphasizes a paradigm shift in managerial competencies. While technological knowledge has been a focal point in existing discussions on digital competencies, this dissertation foregrounds the increasingly vital role of soft skills and e-leadership skills overlooked in previous models (e.g DigComp). The COVID-19 pandemic has intensified the demand for competencies such as emotional intelligence, adaptability, and communication, particularly in virtual settings. By introducing soft skills and e-leadership skills into the framework of digital managerial competencies, this research not only expands the litany of skills recognized as vital for contemporary managers but also offers a timely response to the socio-professional shifts that have accentuated the importance of these skills in post-pandemic professional landscapes (Anton-Sancho, Vergara, & Fernandez-Arias, 2021; Blanka, Krumay, & Rueckel, 2022; Segura Rondan et al., 2022). It refines existing frameworks by illustrating that modern managers must strive for a balance of hard, e-leadership skills and interpersonal soft skills in an increasingly complex and digital workplace. This contribution reinforces the idea that successful management transcends mere technical know-how and encompasses essential human factors, thereby addressing a gap in the literature regarding the holistic nature of managerial competence in the digital age.

Finally, the fourth contribution of this dissertation is the identification of AI-related competencies that are necessary for effective implementation and use of AI technologies in organizations (essay 3). The comparative analysis of these competencies against traditional frameworks reveals both overlaps and novel concepts, thereby enriching the theoretical landscape. The identification of competencies such as ‘Integrating AI with Human Workers’ and ‘Communicating Effectively via Online Tools’ highlights the need for managers to evolve their traditional competencies to address the unique challenges posed by AI, thereby making a substantial contribution to the understanding of how AI is reshaping management practice.

By focusing on AI-related managerial competencies, the study addresses a notable gap in current research. Prior investigations have largely overlooked this

micro-level analysis, with the existing discourse primarily featuring fragmented insights scattered across various studies (Charlwood & Guenole, 2022; Pereira et al., 2023). By classifying 40 AI-related managerial competencies, the dissertation not only consolidates these scattered findings but also enriches the foundational models of managerial competencies established by earlier scholars (e.g., Spencer & Spencer, 1993; May, 1999; Kurz & Bartram, 2002). This classification illuminates the intricacies of managerial roles in an AI-integrated workplace and highlights the complexity and diversity of competencies required beyond mere data analysis and technical skills.

In summary, this dissertation's theoretical contributions address critical gaps in the literature surrounding managerial competencies in the digital age. By clarifying terminological confusion, exploring conceptual components, developing a model for digital competencies, and identifying AI-related managerial competencies, this dissertation enhances the understanding of effective management in contemporary organizational contexts. These contributions not only provide a foundation for future research (section 5.4) but also offer practical implications for enhancing managerial effectiveness in an era characterized by rapid technological change (section 5.2).

## 5.2 Managerial Implications

The findings of this dissertation carry profound implications for managerial practices, development programs, and organizational strategies, particularly in an era increasingly characterized by digital transformation and the proliferation of AI. By systematically exploring the competencies required by managers to navigate the complexities of the digital age, this research provides a comprehensive framework for understanding, developing, and implementing effective managerial strategies. The key managerial implications of this dissertation are detailed next.

In the short-term, it is recommended that organizations conduct evaluations of their managers' current competencies, specifically focusing on technological knowledge, soft skills, and e-leadership skills (as outlined in essay 2). Organizations should implement targeted training programs that address gaps in these competencies, enabling managers to handle today's digital challenges effectively. For instance, they can undertake an internal skills audit to identify current competencies of managers against the evolving demands of digital transformation. Likewise, they can develop workshops focused on key areas, such as digital tools, soft skills (e.g., communication, conflict resolution), and e-leadership skills tailored to remote and hybrid work environments. Lastly, they can adopt micro-learning techniques and digital resources to facilitate ongoing learning and real-time

application of skills, and enable managers to become "learning managers" (Hamilton, Hall, & Hamilton, 2021).

With the rapid shift towards digital communication tools, managers should prioritize creating environments where team members feel encouraged to share insights and best practices regarding digital tools and AI implementations, as suggested by Coutifaris and Grant (2022). In order to achieve this, organizations can establish frequent check-ins and reflection sessions where team members can discuss the integration of AI and digital tools in their work processes. It is also possible to implement mechanisms for continuous feedback to ensure managers can quickly adapt practices based on team input and technological advancements.

Medium-term implications relate to the integration of AI-related managerial competencies and the development of management programs. As organizations begin to optimally integrate AI into their operations, managerial competencies must evolve to include a novel set of AI-related managerial competencies alongside traditional competencies, as outlined in essay 3. To achieve this, organizations should reevaluate and reshape competency frameworks to accommodate AI-related skills, including integrating traditional managerial competencies with specific AI aspects (Giraud et al., 2023). They should also develop cross-functional training initiatives that enable managers from different departments to understand and employ AI in diverse contexts.

Furthermore, organizations need to conceptualize and implement a model of digital managerial competencies that harnesses the strengths of both soft skills and technological knowledge, ensuring that managers are prepared for the complexities of digital transformation. For example, creating dedicated development programs for emerging managers that focus on cultivating knowledge and skills essential for leading in digital environments (e.g., building trust and motivating remote teams), or mentorship initiatives where seasoned managers guide novel ones in navigating digital complexities, encouraging knowledge sharing, and providing real-world insights.

Finally, long-term implications concern continuous adaptation and innovation and the reinforcement of human-centric competencies. The ongoing evolution of technology necessitates that organizations foster a culture of lifelong learning and continuous adaptation (Chiarini & Kumar, 2022). Managers will need to remain at the forefront of digital advancements and anticipate future needs concerning AI integration and digital competencies. This is why organizations need to cultivate structures that prioritize learning and adaptability, encouraging managers and employees to continuously update their skills and knowledge. It also requires to allocate resources for ongoing research into emerging technologies, focusing on how these innovations can enhance managerial practice and organizational effectiveness.

As technology permeates managerial practices, the emphasis on uniquely human competencies such as emotional intelligence, empathy, and interpersonal relationships should not diminish. Rather, these qualities will become even more critical amid technological advancements. The research underscores the importance of maintaining a balance between technical competencies and human-centric managerial competencies. Effective management in the digital age necessitates not only technical proficiency but also strong interpersonal competencies. Organizations should ensure that their competency frameworks reflect this duality and support managerial development that prioritizes soft skills (e.g., emotional intelligence, relationship-building) alongside technical training. The stronger focus on human-centric competencies also means that organizations can establish policies and programs that prioritize employee well-being and mental health, encouraging managers to foster supportive environments that address the human side of change in digital transformation. Table 14 provides an overview of the short-, medium-, and long-term implications and the possible response/change strategies discussed in this section:

**Table 14.** Managerial Implications in the Short-, Medium, and Long-Term.

| | Focus Area | Recommendation/Action | Responsible Parties | Expected Outcomes |
|---|---|---|---|---|
| Short-Term | • Competency Evaluation | • Conduct assessments of current technological, soft skills, and e-leadership skills | • HR, Managers | • Identify skill gaps and areas for immediate development |
| | • Targeted Training Programs | • Implement workshops on digital tools, soft skills, and remote management | • Training Departments, Managers | • Enhance managers' digital and interpersonal skills |
| | • Continuous Learning | • Adopt micro-learning and digital resources for ongoing skill development | • HR, Learning & Development | • Foster a culture of continuous, real-time learning |
| | • Digital Communication & Feedback Mechanisms | • Establish regular check-ins, reflection sessions, and feedback channels | • Managers, Team Leaders | • Improve adaptation to digital tools, promote open sharing |
| Medium-Term | • AI-related Competency Frameworks | • Reevaluate and update competency models to include AI-specific skills | • HR, Leadership Teams | • Prepare managers for AI integration, cross-functional understanding |
| | • Cross-Functional AI Training | • Develop programs enabling understanding and application of AI across departments | • Training & Development Teams | • Foster interdisciplinary AI competence |
| | • Digital Managerial Competencies | • Design development programs focusing on soft skills and technological integration | • Leadership Development | • Build holistic digital managerial competencies |
| | • Mentorship & Knowledge Sharing Initiatives | • Encourage experienced managers to mentor others in digital management | • HR, Senior Managers | • Accelerate skill transfer and experiential learning |
| Long-Term | • Culture of Continuous Learning & Innovation | • Foster lifelong learning, invest in research on emerging technologies | • Organizational Leadership | • Maintain adaptability and technological relevance |
| | • Balance Human & Technical Skills | • Update competency frameworks to emphasize soft skills like emotional intelligence | • HR, Managers | • Sustain human-centric leadership in digital transformation |
| | • Employee Well-being & Support Policies | • Develop programs promoting mental health, emotional support, and well-being | • HR, Organizational Leaders | • Enhance employee resilience and engagement in digital work environments |

The implications stemming from this dissertation underline the necessity for contemporary organizations to rethink and redefine their managerial competency frameworks in light of digital transformation and AI advancements. By clearly assessing skills, fostering open communication, integrating AI-related competencies, developing management models, promoting continuous learning, and maintaining a focus on human-centric competencies, organizations can position themselves and

their managers for success in an increasingly complex and digital work environment. These strategies not only enhance managerial effectiveness and adaptability but also contribute to sustained competitive advantage in the digital age.

## 5.3 Limitations

While this dissertation has aimed to systematically explore managerial competencies in the digital age, several limitations must be acknowledged. These limitations could impact the generalizability, applicability, and comprehensiveness of the findings. Herein are the primary limitations identified during the research process:

First, this dissertation is grounded in a non-empirical approach utilizing systematic literature reviews and semantic and inductive content analysis. While this methodology allows for theoretical framework construction, it lacks empirical validation. In other words, the focus on existing literature may limit the identification of novel or emerging competencies that are not yet well-documented in the academic literature. As new technologies continue to shape managerial roles, the reliance on established literature may inhibit the discovery of new competencies that are becoming increasingly vital for managers in the digital age. Consequently, the findings might not fully encapsulate the complexities and nuances of real-world managerial practices, potentially limiting their applicability in practical settings.

Second, the systematic literature review process is inherently subjective, with the selection of included studies and the interpretation of findings influenced by the researchers' perspectives and biases. Although efforts were made to ensure a comprehensive and systematic approach, and to strengthen reliability (through structured and transparent procedures, use of multiple coders, validation through focus groups), the potential for bias in the literature selection and analysis remains a limitation that could impact the robustness and reliability of the findings.

Third, although this dissertation aims to clarify the terminology and propose a working definition, the inherent ambiguity surrounding key terms such as ‘competence’, ‘competency’, and ‘skills’ persists. This ongoing ambiguity poses challenges for researchers and practitioners attempting to adopt a cohesive understanding of managerial competencies, thus complicating the applicability of the proposed definitions across diverse organizational contexts.

Fourth, while this dissertation emphasizes the contextual nature of managerial competencies, it does not provide an exhaustive exploration of how these competencies vary across different organizational environments, industries, and cultural contexts. The findings may not be universally applicable to all managerial settings, given that nuances related to culture, governance, and sectoral dynamics

influence the competencies required for effective management. Likewise, responsibilities and work characteristics of managers can vary depending on their level within the organization (e.g., top management vs. middle or line management). Future studies should aim to investigate these contextual differences to develop a more nuanced understanding of managerial competencies.

Finally, the rapid evolution of digital technologies and AI presents a challenge for the static frameworks developed in this dissertation. The systematic literature reviews conducted in this dissertation predominantly focus on publications available up to the end of 2024. This limitation means that emerging research published after this date might not be represented in the findings or discussions, potentially leading to an incomplete picture of the evolving landscape of managerial competencies related to digital transformation and AI. Furthermore, competencies identified may quickly become outdated as technologies advance or new managerial paradigms emerge. As a result, continuous reevaluation and adaptation of the proposed competency frameworks will be necessary to maintain their relevance.

## 5.4 Future Research Directions

Given the limitations identified in this dissertation, several promising avenues for future research emerge, aimed at enhancing our understanding of managerial competencies in the digital age. These directions seek to address the gaps highlighted and contribute to a more comprehensive and practical understanding of competencies required for effective management in a rapidly changing landscape.

One promising avenue involves conducting quantitative and qualitative empirical studies to validate the proposed competency frameworks across different organizational settings, industries, and cultural contexts. For instance, large-scale surveys could be developed to assess the prevalence, importance, and perceived gaps in specific competencies among managers at various levels—top, middle, and line—in both technology-intensive and traditional sectors. Research questions such as “To what extent do managers in technology-driven organizations possess the identified competencies, and how do these compare across industries?” or “Which managerial competencies are most predictive of organizational performance in AI-integrated environments?” can help determine the relative importance of each competency dimension and reveal contextual variations. Such studies can employ validated measurement instruments or develop new scales aligned with the identified constructs, allowing for cross-sectional and longitudinal analyses to track competency development over time.

Complementing quantitative approaches, in-depth qualitative research—such as case studies, ethnographies, and action research—can provide rich insights into how managerial competencies manifest in real-world settings. For instance, case studies of organizations leading digital transformation initiatives can elucidate how managers leverage technological knowledge, soft skills, and AI-related competencies in practice. Research questions such as "How do managers interpret and enact digital competencies in complex organizational change processes?" or "What social and material practices shape the development and deployment of AI competencies among managers?" can uncover contextual factors, organizational routines, and cultural influences that facilitate or hinder competency application. Such qualitative investigations can also explore the challenges managers face in acquiring and integrating new competencies, providing nuanced guidance for designing effective training and development programs.

Another vital strand of future research involves examining the developmental pathways and learning processes through which managers acquire, refine, and adapt their competencies. Longitudinal studies tracking managers' competency development—through training programs, experiential learning, mentorship, or peer collaboration—would shed light on the dynamics of competency evolution in digital contexts. Research questions such as "What are the most effective pathways for developing AI-related managerial competencies?" or "How does ongoing learning influence managers' ability to adapt to digital disruptions?" can inform the design of targeted interventions and organizational policies aimed at fostering continuous learning. Moreover, experimental or quasi-experimental designs can evaluate the effectiveness of specific training initiatives, such as AI literacy courses or soft skills workshops, in enhancing managerial competencies and organizational outcomes.

Given the importance of context highlighted in the current research, future studies should also explore cross-cultural and industry-specific variations in managerial competencies. Comparative research across different national contexts can reveal how cultural factors influence the prioritization and development of competencies. For example, "How do cultural differences shape managers' perceptions of the importance of soft skills versus technological knowledge in digital leadership?" or "What contextual factors determine the relevance of AI competencies in different industry sectors?" Such studies can employ cross-national surveys, comparative case studies, or mixed-method approaches to generate actionable insights for multinational organizations and policymakers.

Furthermore, the intersection between managerial competencies and organizational performance in AI-enabled environments warrants empirical investigation. Longitudinal panel studies examining the relationship between managers' competency profiles and key performance indicators—such as innovation capacity, operational efficiency, employee engagement, and customer satisfaction—

can establish causal links and inform competency-based selection and development strategies. Research questions like “How do managerial competencies influence the success of AI implementation projects?” or “Which competencies mediate the relationship between digital training and organizational agility?” can guide organizations in designing competency models that are aligned with strategic objectives.

An emerging and critical area for empirical exploration concerns the ethical implications and social consequences of AI adoption, and the corresponding managerial competencies required to navigate these challenges responsibly (Zhang et al., 2023; Deepa et al., 2024) Qualitative research, including interviews and focus groups with managers, can explore how ethical considerations are integrated into decision-making processes involving AI. Quantitative studies can investigate whether specific competencies—such as ethical awareness, social responsibility, and bias mitigation—predict responsible AI governance and stakeholder trust. Research questions such as “What competencies are associated with ethical AI management?” and “How do managerial values influence AI deployment in different organizational contexts?” will be essential in developing holistic competency frameworks that encompass technical, strategic, and moral dimensions.

Another strand of future research involves exploring the role of technological affordances and social practices in shaping managerial competencies, through sociomaterial and constructivist empirical approaches. For example, ethnographic studies examining how managers interact with digital tools and AI systems in daily routines can reveal the co-evolution of social and material competencies. Research questions such as “How do managerial practices adapt to the affordances of AI and digital platforms?” or “What social practices foster the development of effective digital leadership skills?” can deepen our understanding of the situated, practice-based nature of managerial competencies.

Lastly, considering the rapid pace of technological change and the emergence of novel AI applications, future research must adopt an anticipatory and adaptive perspective. Scenario planning, Delphi studies, and horizon scanning can be employed to forecast future competency requirements and prepare managers for upcoming challenges (e.g., Philip, Gilli, & Knappstein, 2023). Research questions such as “What competencies will be critical for managers in the AI-driven organizations of the future?” or “How can organizations foster organizational agility to adapt to unforeseen technological disruptions?” will help organizations remain proactive and resilient.

The rapidly evolving landscape of digital technologies and AI necessitates a robust and nuanced empirical research agenda aimed at deepening our understanding of managerial competencies and their practical applications. While the current

dissertation provides a comprehensive conceptual framework and categorization of managerial competencies—ranging from technological knowledge and soft skills to AI-related competencies—significant gaps remain in translating these insights into empirical evidence that can inform practice and policy. Moving forward, a multi-faceted research agenda should be designed to validate, refine, and expand the theoretical constructs through empirical studies, thereby fostering a richer and more context-sensitive understanding of managerial competencies in the digital and AI-driven organizational environments.

# Abbreviations

| | |
|---|---|
| AI | Artificial Intelligence |
| AJG | Academic Journal Guide |
| AMA | American Management Association |
| ANN | Artificial Neural Networks |
| DL | Deep Learning |
| KSA | Knowledge, Skills, Attitudes |
| ML | Machine Learning |

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