

Review

An Exploratory Literature Study into Digital Transformation and Leadership: Toward Future-Proof Middle Managers

Maartje Henderikx ^{1,2,*}  and Jol Stoffers ^{1,3,4} 

¹ Research Centre for Employability, Zuyd University of Applied Sciences, 6131 MT Sittard, The Netherlands; jol.stoffers@zuyd.nl

² Faculty of Educational Sciences, Open University of the Netherlands, 6419 AT Heerlen, The Netherlands

³ Faculty of Management, Open University of the Netherlands, 6419 AT Heerlen, The Netherlands

⁴ Research Centre for Education and the Labour Market (ROA), Maastricht University, 6211 LM Maastricht, The Netherlands

* Correspondence: maartje.henderikx@zuyd.nl

Abstract: This study aimed to obtain insight into the influence digital transformation has on future leadership behaviors and management. Up to now, most literature solely focuses on the need for strong strategic leadership to build and lead the transformation. This study was directed at future leadership behaviors and skills needed during and after digital transformation of management below senior level. An exploratory approach to review literature on digital transformation and leadership was used, inspired by the PRISMA protocol. Our findings show that digital transformation is a disruptive process that impacts the whole organization and results in new forms of working. This calls for altro-centric leadership, an other-centered leadership style. Specifically, soft skills such as empathy, humility, integrity and compassion are becoming increasingly important, as is understanding the power of digital technology. The emergence of artificial intelligence offers interesting opportunities. It could be used to handle quantifiable managerial tasks and evaluate the quantifiable part of performance, while managers focus on the soft skills side of management such as coaching, motivating and empowering employees. This study demonstrates the necessity to redefine leadership requirements in an increasingly digitalized world.

Keywords: digital transformation; leadership; skills development; management; soft skills



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1. Introduction

Digital transformation is on the agenda of all contemporary organizations as technological innovation accelerates and continues to influence everyday life and business [1–4]. It is a technology-driven, disruptive change process that ultimately enables business improvement [1,5,6]. A minority of organizations have already transformed, but most remain in early stages of digital transformation [5–8]. Such a transformation extends beyond mere technological change; it affects the organization and its processes as a whole [8,9]. In addition to strategic, organizational, and cultural challenges [1,10,11], it also brings leadership and management challenges [12,13].

Differences and similarities between leadership and management and the role of leadership in managerial work have been, and remain, topics of debate in the literature [14,15]. In this study, we follow the view that management and leadership are complementary, meaning that organizations need managers with leadership skills, such as the ability to motivate, empower, and coach employees, and anticipate and manage change, especially in a knowledge-based, creative economy [15–17]. We therefore follow the definition of House et al., who defined leadership as the “ability of an individual to influence, motivate and enable others to contribute toward the effectiveness and success of the organization of which they are members” [18] (p. 15).

Leadership is a crucial component of organizational success but has a complex and multi-dimensional nature [19]. Over the years, leadership theories evolved from mere focus on traits (i.e., Great Man and Trait theories) to skills and adaption of leadership styles to a situation (e.g., behavioral, situational and contingency theories) to more recent focus on employee engagement and person-centered styles (e.g., transformational, collaborative and servant leadership) [19,20]. The more recent theories emerged during the 1990s to 2000s, guided by an increasingly dynamic and globalized world, in which organizations changed more rapidly than ever before [19]. Yet, during the past decade, digital technology developments accelerated expansively, leading to a new era of change and digital transformation.

Literature on digital transformation and leadership has increased considerably over the past 5 years, primarily in the context of strategic management and information systems [5,21]. These studies mainly focused on strategic leadership challenges in light of digital transformation [1,8,21,22]. However, as more organizations are in the process of digital transformation, it becomes apparent that leadership challenges do not only concern top management, but all management layers [23], and that leading, guiding and managing these digital-technology-fueled transformations requires new understandings of leadership [10,12,13]. Specifically, the middle management layer is underexposed. Middle managers play a vital role in leading and supporting organizational change [22]; they are responsible for translating organizational strategies to daily operations and at the same time responsible for managing and leading daily operations [24,25]. They have extensive knowledge of the organization as well as connections within the organization at multiple levels [24,25]. After initiation of digital transformation, it is their role to support the continuing change process of digitalization and to lead and manage the new digital organization that is emerging [8].

Notwithstanding, to date, few studies have assessed the impact of digitalization on middle management leadership level. Answering calls for more research on the topic of digital transformation and leadership [5,6,8,13,19–22,26,27] and considering the key position of middle management in organizational change processes, this article presents an overview of a first explorative study into the influence of digitalization on middle managers' future leadership skills, behaviors and management practices. The overall research question that was explored is as follows: Which leadership skills, behaviors and management practices will be important for middle managers when leading, supporting and managing digitally transformed organizations into the future.

The purpose of this study was to obtain a general impression of the topic. Therefore, an exploratory approach to the study is considered most suitable [28,29]. The article is structured as follows: First, a condensed overview of the most prevalent leadership theories and approaches is provided in order to place the findings of this study in the larger picture of leadership theory. Next, the method section describes the search and analysis process leading to exploratory findings on the topic of digital transformation and leadership. Furthermore, the results section outlines and describes the findings. Lastly, the conclusion of this exploratory study includes a discussion of the findings as well as limitations and suggestions for future research directions.

2. Primary Leadership Theories and Approaches

Leadership theories developed from a traditional and personality focus to a situational and employee focus, generally characterized into five perspectives (adapted from [30]): (1) leadership as a combination of traits or personality characteristics, (2) leadership as a behavior, (3) leadership based on the environment or situation, (4) leadership as a relationship and (5) leadership based on 'the other.'

2.1. Leadership as a Combination of Traits or Personality Characteristics (1840s–1940s)

The first leadership theories appeared during the 19th century. The Great Man theory suggests that leaders are born not made, where leadership characteristics are innate and can only be passed on genetically from one generation to another [31]. This theory evolved into

Trait theory, which suggests that certain qualities or traits are required for good leadership. The traits can be inherited, but they can also be acquired through training and practice [30].

2.2. Leadership as a Behavior (1940s–1950s)

Behavioral theory focuses on leaders' actions and skills. Leaders are made, rather than born, through training and observation [32]. This theory emphasizes leaders' behaviors and how such behaviors affect their effectiveness as a leader and how such effectiveness affects followers [19].

2.3. Leadership Based on the Environment or Situation (1960s)

Contingency theory expands behavioral theory to include variables related to the environment that determine the best leadership style. According to Andibo [33], effective leadership depends on the fit between a leader's qualities and leadership style and environmental demands [33]. Similar to Contingency theory, Situational theory suggests that leaders should consider situational factors or circumstances when choosing the best course of action [19]. Effective leadership thus depends on the situation and the approach a leader chooses [34].

2.4. Leadership as a Relationship (1970s–1990s)

Transactional leadership theory focuses on achieving goals through mutual exchanges between a leader and followers. It uses rewards and punishments to achieve two-way, beneficial relationships between a leader and followers to achieve job performance [34]. Transformational leadership theory involves encouraging, motivating, and inspiring followers. Leaders and followers thus engage in two-way relationships, which lead to greater motivation, morality, and, subsequently, performance [35]. Transformational leaders also consider the fulfillment of individual potential and followers' needs [30,34]. Collaborative, or shared, leadership characterizes leadership as a shared process, during which leaders and followers collaborate to make decisions and share responsibilities [36]. Shared visions and values are part of such leadership, and relationships between collaborators are required for collaborative or shared leadership to be successful [37].

2.5. Leadership Focused on 'the Other' (1970s)

Servant leadership emphasizes that "leaders must serve first and not lead first" [34] (p. 150). Such leaders have the best interests of their followers in mind and support them to grow both professionally and personally. Ultimately, the shift in focus from the needs of the organization to the needs of the employee benefits the entire organization [38].

Despite significant digital technology development during the last decade, current leadership theories do not encompass the implications of digitalization on leadership.

3. Method

An exploratory approach to examining the topics of digital transformation and leadership was used, inspired by the PRISMA protocol [39]. The PRISMA protocol describes four steps to conducting systematic literature reviews—identification, selection, synthesis and summary. For identification, we ran several queries in online databases, using combinations of keywords (Table 1). Peer-reviewed sources and grey literature from 2015 (digital transformation) and 2014 (leadership and transformation) onward were included. Results were sorted according to relevance, and only the first 20 results were considered.

Table 1. Overview of identification and selection.

Step	Digital Transformation	Leadership and Digital Transformation
Step 1: Identification Search for peer-reviewed articles and grey literature in several databases	Databases included: Google Scholar Search keywords included: ‘digital business’, ‘digital transformation’, ‘digitalization’, ‘digital strategy’, ‘organizational transformation’, ‘organizational change’ Search using keywords and Boolean operators: ‘digital business’ AND ‘digitalization’ ‘digital strategy’ AND ‘digitalization’ ‘organizational transformation’ AND ‘digitalization’ ‘organizational change’ AND ‘digitalization’	Databases included: Google, Google Scholar Google Scholar—Search keywords included: ‘Leadership’, ‘digital leadership’, ‘digitalization’, ‘skills’, ‘management’ Search using keywords and Boolean operators: ‘digitalization’ AND ‘leadership’ ‘leadership’ AND ‘skills’ ‘digital leadership’ AND ‘skills’ AND ‘management’ ‘digitalization’ AND ‘leadership’ AND ‘management’ ‘digitalization’ AND ‘skills’ Google—Search keywords included ‘leadership’, ‘digital age’, ‘future of work’, ‘digitalization’ Search using keywords and Boolean operators: ‘leadership’ AND ‘digital age’ ‘digitalization’ AND ‘leadership’
	Criteria used to refine search results: <ol style="list-style-type: none"> 1. Articles should be written in English or Dutch 2. Articles published during 2015 or later 3. Articles include at least one keyword from step 1 in title or abstract 	Criteria used to refine search results: <ol style="list-style-type: none"> 1. Articles published in English or Dutch 2. Articles published during 2014 or later 3. Articles include at least one keyword from step 1 in the abstract
Step 2: Selection Selection criteria were chosen and used to refine results		

After reading abstracts, we conducted an initial selection. Based on expected suitability articles were either included for further reading or rejected. The next step of selection involved reading the articles. The content of the articles was analyzed using an inductive thematic analysis approach [40] based on the themes of digital transformation and leadership skills and behaviors in combination with digital transformation. The targeted context was middle management, but as this yielded only few results, the general management context was included. Top and senior management contexts were excluded. Again, several articles were rejected because they did not match the exploratory character, context or content of the study (Figure 1). Since topics in the literature overlap, we found two articles during the search for digital transformation papers that fit the leadership and digital transformation context better, and one article that fit both topics. These articles were then assigned to the leadership and digital transformation results. While reading the articles, nine additional papers were identified and included (snowball effect). Eventually, 10 sources on digital transformation (9 peer reviewed articles and 1 book) and 23 sources on leadership in combination with digitalization (13 peer reviewed, 8 grey literature and 2 books) were selected for inclusion. In the subsequent sections, findings are presented and discussed (Steps 3 and 4).

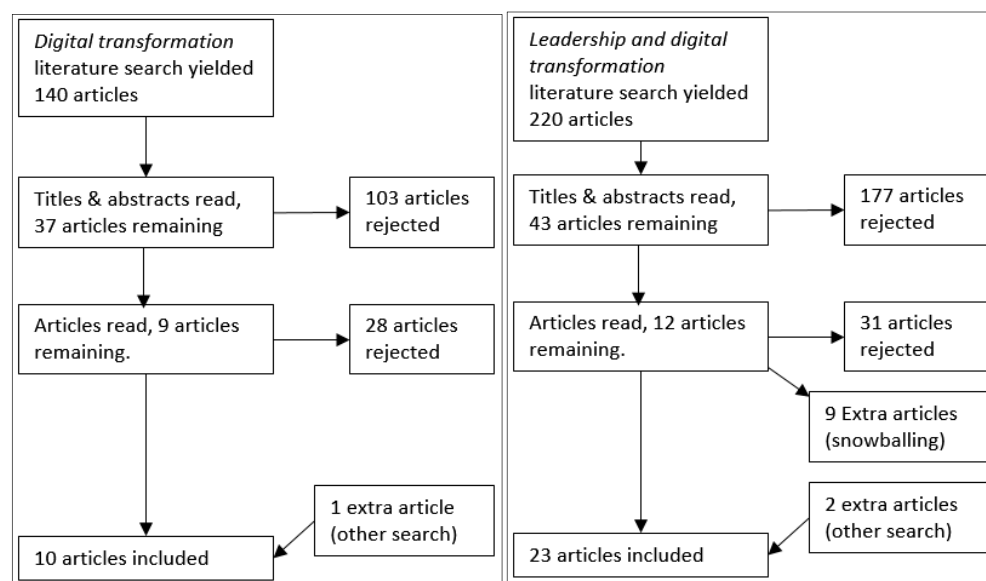


Figure 1. Results of ‘digital transformation’ and ‘leadership and digital transformation’ searches.

4. Findings

4.1. Digital Transformation

Before investigating the influence of digital transformation on leadership skills and behaviors, we explored digital transformation itself as a phenomenon, developing a general understanding of the concept. We found nine articles and one book that helped us establish an overall outline (Table 2). Digital transformation, also called digitalization, can be described as a technology-enabled disruptive change process that affects every aspect of the organization [1,2,6]. New, emerging technologies are adopted to enhance internal processes and operations, satisfy customer needs and ultimately increase competitive advantage; it has the power to completely change the way organizations operate and create value [2,41]. Digitalization in organizations began with the rise of computers and evolved into the automation of business processes, ultimately leading to changes to business models, fueled and supported by emerging digital technologies, especially Internet technologies [1,5,12]. During the last decade, access to big data, combined with improved algorithms and expansion of computer capacities, allowed increases in artificial-intelligence-driven transformations [41,42]. Artificial intelligence is the ability of a machine to simulate human intelligence and execute human-like tasks; in some cases, it can also learn from experience and adjust to new inputs [41,42].

Over the past several years, unique definitions of digital transformation emerged in the literature, each capturing part of its essence but not capturing all of its essential characteristics [22]. Using 23 definitions of digital transformation, Vial defined digital transformation as “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies” [22] (p. 122). After reviewing 282 studies related to digital transformation, Vial constructed a digitalization framework encompassing 8 building blocks that define digitalization as a process and identifies the broad influences digitalization has on organizations and other areas [22] (p. 122). The use of digital technologies, such as the Internet of Things, social media and big data (block 1), fuels disruptions (block 2) and triggers strategic responses (block 3), which in turn rely on the use of digital technologies (block 1). The use of digital technologies (block 1) subsequently triggers changes in value creation paths (block 4) and thus also in the structure of the organization, its culture, employee roles and skills and its leadership (block 5). Organizational barriers (block 6) might affect changes to value creation paths negatively, and changes to value creation paths generate positive (block 7) or negative influences (block 8). The broad influences of digitalization are underlined by Verhoef et al., who argued that “digital transformation is

multi-disciplinary by nature, as it involves changes in strategy, organization, information technology, supply chains and marketing” [5] (p. 890).

Table 2. Overview of selected articles on digital transformation (alphabetical order by source).

Source	Title	Content
[7]	Stages in digital business transformation: Results of an empirical maturity study	Obtaining insights into the development stages and process of the digital transformation
[6]	The shape of digital transformation: A systematic literature review	Description of the concept of digital transformation and suggestions for future research
[1]	Digital transformation challenges	Obtaining insights into the impact of digital transformation on the organization and its accompanying challenges
[42]	Competing in the age of AI: Strategy and leadership when algorithms and networks run the world.	Book about the transforming potential of AI, the implications of this regarding the nature of organizations and strategy and leadership aimed at managers and entrepreneurs
[12]	The future of robotics. Human work in digital transformation	Discussion of the future of work and robotics. Future trends in digitalization are evaluated, and the influences and challenges of digital transformation are analyzed
[41]	Artificial Intelligence and Business Strategy towards Digital Transformation: A Research Agenda	Obtaining insights into AI technology and digital transformation research to identify gaps in the literature and propose future research
[2]	Conceptualizing digital transformation in business organizations: A systematic review of the literature	Discussion of the current state of the literature, description and definition of the concept of digital transformation and suggestions for future research
[21]	Digital transformation. A literature review and guidelines for future research	Obtaining insights into the state of the art of digital transformation, description of the concept of digital transformation and suggestions for future research
[10]	Digital transformation: A multidisciplinary reflection and research agenda	Identifying stages of digital transformation and its influence on the organization; future research topics are proposed
[22]	Understanding digital transformation: A review and a research agenda	Defining digital transformation based on an extensive literature review, and building a framework that captures the process; future research topics derived from the framework

Using a quantitative approach to map the maturity stages of digital transformation, Berghaus and Back found that most organizations are at the beginning of the transformation [7]. Taking dimensions of the digital maturity model as a starting point, in combination with survey data from 547 respondents from 417 organizations in Switzerland and Germany, they developed a maturity model that consists of 5 stages. Stage 1 focuses on promoting digital transformation and garnering support for and creating awareness in the organization. During Stage 2, the strategic importance of digital innovation is stressed, and the

focus of digital innovation is determined. Essential players during these first two stages are identified at strategic levels of the organization. Stage 3 affects the organization's structure and culture profoundly; employee roles and responsibilities are redefined, including the nature of leadership and management, from this stage onwards. Redefining these latter roles is increasingly important to reach Stages 4 and 5, during which organizations create user-centered and data-driven processes for goal setting and decision making, supported by the most advanced technologies.

Human capital represents a primary attribute that advances digital transformation [2,22]. Employees should be supported to develop skills that enable them to work during all maturity stages and in the future organization after that [7]. The influence of digital transformation alters the foundation of an organization at its core, resulting in new forms of working and doing business. Therefore, a different approach to managing and leading a digitally capable workforce is necessary at all levels of the organization [12,21,22].

4.2. Leadership and Digital Transformation

Zeike et al. described two dimensions when referring to competencies related to leadership and digital transformation [43]. The first dimension entails attitudes, skills, and behaviors that managers need during and after a digital transformation, and the second dimension entails attitudes, skills, and behaviors that initiate and shape the transformation. To date, most leadership studies of digital transformation focus on the second dimension (i.e., senior strategic leadership), the kind of leadership that is particularly important during initial stages of digital transformation [7]. However, at some point during the transformation, management levels below senior strategic management must be able to support and lead a digitally transformed workplace [12,21,22], and thus we focus on the first dimension. The article search focused on sources that assessed leadership skills and behaviors in combination with digital transformation that were not specifically aimed at top or senior strategic leadership. A combination of the current literature search, articles found during previous searches and articles identified using the snowball technique resulted in 21 articles and 2 books that offered an understanding of the influence that digital transformation has on future leadership skills, behaviors and management practices (Table 3).

Table 3. Overview of selected studies concerning leadership and digital transformation (alphabetical order by source).

Source	Title	Content
[44]	What works for you might not work for (Gen) Me: Limitations of present leadership theories for the new generation	Facilitating understanding of digital intelligence in the era of digital transformation. A research agenda proposed for digital intelligence from several perspectives.
[45]	AI@Work Global Study 2019	Comprehensive study on use of artificial intelligence in the workplace and the attitudes and behaviors of all employees regarding this new technology.
[46]	Understanding how digital intelligence contributes to digital creativity and digital transformation: A systematic literature review	Systematic literature review of digital intelligence in the era of digital transformation. Based on results, several future research topics are proposed.
[47]	Beyond digitalization: "My boss is artificial"	Research proposal that explores the digital future in the domain of leadership.

Table 3. Cont.

Source	Title	Content
[48]	The role of leadership in a digitalized world: A review	Literature review on leadership and digitalization that identifies patterns and findings across various disciplines, such as management and psychology, to clarify main theories and findings drawn from them.
[49]	A meta-analysis of different forms of shared leadership–team performance relations	A meta-analysis that underlines the importance of shared leadership in relation to enhancing team performance.
[50]	How hard will the robots make us work?	Feature article about the challenges and downsides of algorithmic management practices.
[51]	How LEGO built the foundations and enterprise capabilities for digital leadership	Case study about the meaning and implications of digital leadership. The study provides insights into building foundations that enhance enterprise capabilities during digital leadership.
[42]	Competing in the age of AI. Strategy and leadership when algorithms and networks run the world	Book about the transforming potential of AI, implications of it regarding the nature of organizations and strategy and leadership aimed at managers and entrepreneurs.
[52]	Rethinking leadership and its practices in the digital era	Theoretical and qualitative study about the shift of leadership style in the digital era from leader(ego)-centric to altro(other)-centric and how this changes leadership practices.
[53]	AI in management: Your boss could soon be a machine	Examples of several positive and negative algorithmic management practices and their implications for management.
[8]	Leadership characteristics in the era of digital transformation	A content analysis of the literature to identify characteristics of leadership in an era of digital transformation.
[54]	Identifying leadership skills required in the digital age	Development of a conceptual framework in which leadership skills are categorized and associated with respective tasks, management levels and leadership experience.
[55]	How to be a leader in the digital age	Editorial about the influence of digital transformation on leadership, why leaders should focus on opportunities that new technologies offer and why digital leadership traits are important.
[56]	Can an algorithm be your boss?	Editorial about awareness of algorithms and technology, generally, and what influence it has on people's lives.
[57]	Trends and new realities in the perspective of generation change	Theoretical paper about the new generation of leaders and the values, beliefs and challenges of next-generation leaders.

Table 3. *Cont.*

Source	Title	Content
[23]	Digital leadership	Theoretical paper about leadership challenges due to the digital transformation and the necessity for management to adapt competences to the new era.
[58]	The new leadership playbook for the digital age. Reimagine what it takes to lead	Research report about the future of leadership. Leaders should not hold on to leadership behaviors of the past but change their ways to succeed in a digital era.
[59]	Socio-materiality in the age of emerging information technologies: How big data analytics, blockchain and artificial intelligence affect organizations	Doctoral dissertation that addresses emerging information technologies and their influence on organizations.
[60]	The global leadership psychological contract model—Actionable to shape the future to 2050	An exploration of future leadership requirements by examining leadership failures of the past, leadership trends and current and expected leadership challenges.
[61]	How artificial intelligence is redefining the role of manager	Editorial about the influence artificial intelligence will have on work and the workforce.
[62]	Post-heroic leadership: Current trends and challenges in leadership Education	Theoretical article about the need for post-heroic leadership and challenges that exist in leadership education programs.
[63]	Leadership 2030: The six megatrends you need to understand to lead your company into the future	Book about the future of leadership from the perspective of six megatrends, including digital transformation.

4.2.1. Digital Intelligence

Every contemporary workplace is digitalized to a greater or lesser extent, but most organizations remain in early stages of digital transformations [8]. To do their jobs now and in the future, all employees, including managers, should develop digital intelligence (DI), which can be described as someone's ability to learn digital technologies, to deal with digital technologies appropriately and to be able to read, decode and manipulate digital information [46]. Employees with DI acquire and apply new knowledge and skills connected to digital technologies, going beyond mere use to address insights and openness regarding how such technologies improve operational efficiency and outcomes [46].

4.2.2. Leadership Skills and Behavior Related to Managing the Digitally Transformed Workplace

Managing a digital workplace now and in the future requires reshaping leadership in an age of digital transformation, also called a knowledge or networked society. According to Kluz and Firley, such societies are characterized by rapid and far-fetching technological changes, globalization that leads to the dynamic spread of information, a shift from physical attributes to knowledge, and more-dispersed, less-hierarchical organizational forms of organizations [55]. It is thus vital for managers to realize the revolutionary-enabling power of technology. Managers should be capable of identifying technological trends and have the knowledge and ability to use such resources effectively, and they should know their limits and how to acquire missing knowledge [55]. Networks and connections are essential because information is key in the digital age [23,55]. Managers should focus on empowering talent, inspiring employees, creating a cooperative workplace, and valuing partnerships and people [59]. In addition, they should be able to make data-driven decisions making optimal use of the available technology [48]. Data-driven decision making can be described

as “the ability to process high volumes of fast-paced incoming and outgoing data (e.g., Big data), in order to analyze it, prioritize and make sense of the relevant information for decision-making” [48] (p. 12).

El Sawy et al. described best practices regarding digitalization at LEGO [51], arguing that digital leadership means “thinking differently about business strategy, business models, IT function, enterprise platforms, mindsets and skills sets and the workplace” (p. 141). Two essential components of digital transformation that relate to the workforce are (1) people with different mindsets and skill sets. All managers and employees need a different mindset, and they need to be open to experimentation and innovation and should not be afraid to fail. They need adaptive skills and digital know-how (DI). Employees should be flexible, dynamic and adaptable and be able to cope with changing tasks and positions. One mantra was “Hire for a career not a job.” Not all employees can be at the same level of digitalization readiness, and some will never achieve a high level, though such employees can be valuable in a digitalized workplace. It is essential to monitor the digital quotient of the workforce as a whole and find ways to improve it over time. (2) A different kind of workplace: A new generation of workers, in combination with digitalization, requires a different, more humanized environment in terms of location flexibility, work hours, digital access, information-sharing and interesting and meaningful work.

Behavioral leadership skills, such as motivational skills, team-building skills and emotional intelligence will remain core abilities of managers who produce desired results [55]. However, the digital age, and therefore managing the digital workplace, requires additional skills. Klus and Müller argued that managers should support flexibility, use and integrate digital tools and create mindful relationships with digital technologies [54]; they constructed a leadership skills framework, based on an extensive literature review (p. 10), which includes general leadership skills and traits at the level of middle and top managers, and three leadership experience levels as well as leadership skills and traits related to the digital age across those levels. Specifically, becoming digitally minded (e.g., DI), digital literacy skills, teambuilding skills, communication skills and the individual traits of adaptability and flexibility were found very important. Soft skills seem especially relevant in the digital age. These skills are particularly needed for interpersonal interactions and creating successful relations with employees [54]. Interview results suggested that crucial traits for managers who manage a digitalized workplace include empathy, open mindedness, patience and creativity; flexibility and adaptability were also mentioned as essential [54]. In addition, to keep up with and profit from continuous change due to the rapid digital and technological developments, learning, collaborating and sharing knowledge should become part of organizational culture [54,62].

4.2.3. “Other-Centred” Leadership Approach

Ready et al. suggest that leadership in the digital age is more horizontal, collaborative, and about teamwork, and that managers must be humble and able to admit what they do not know [58]. This argument is in line with a theoretical and qualitative study from Jakubik and Berazhny [52], who described the evolution of leadership from leader-focused (i.e., typically top-down and traditional) leadership during the industrial economy to altro-centric (i.e., post-heroic) leadership during the knowledge and creative economies. Altro-centric leaders are aware that they cannot be successful alone, they rely on collaboration and teamwork, they create and enable high-performing teams and communities and they are in constant connection with stakeholders. Altro-centric leaders create meaning in their organizations, delegate power and act with high maturity, integrity and empathy [52] (p. 474) [60]. They value relationships and social connections, can deal with ambiguity and are curious and empathic. Their leadership is about interaction, collectiveness and relationships [62].

According to Sobral and Furtado, altro-centric, or post-heroic, managers consider leadership a (1) relational process: it should build on social interactions and is found in interpersonal relationships and its social exchanges; (2) an other-centered process: it allows

room for free expression of others, and managers learn from social interactions with others and focus on empowering others; and (3) a collective process: it distributes leadership among individuals who have particular skills and expertise [62]. A meta-analysis found that shared leadership styles, such as *altro-centric*, enhance team performance [49]. Such leadership styles are beneficial of team task interdependence (i.e., when a team works toward a common goal or when rewards for results depend on team effort instead of the individual).

Jakubik and Berazhny demonstrated that managers in the digital age should possess social intelligence, passion, empathy and open mindedness [52]; critical thinking and creativity are also essential. Managers should support virtual teamwork, co-creation, collaborative learning and working toward shared goals. Delegating power, empowering others and providing a vision that anticipates the future were also crucial. A literature review of leadership in a digitalized world found that managers should have the skills to employ an inclusive style of leading; they should consider others' ideas, engage in two-way communication and interactions and motivate and support others [46], findings that align with the other-centeredness component of *altro-centric* leadership [62].

4.2.4. Leadership Skills and Behavior Related to a Digitally Savvy Next Generation of Workers

In combination with digital transformation, there is also a new generation of workers entering the workforce [51], which means that in addition to dealing with, adapting to and leading digitalization in the workplace, managers also need to adapt behaviors to a new generation of digitally savvy workers. This new generation (i.e., millennials) is increasingly entering the workforce [44], seeking meaning in an organization and expecting to create a narrative collaboratively to build the organization's identity [63]. Millennials are more motivated to work for organizations that share their values and are places they feel they have added value and the ability to develop personally. Top-down leadership no longer matches this digitalized workforce [62]. *Altro-centric* managers know how to work with and through others, giving as much autonomy to employees as possible [63], and their humble, empathic and collaborative approach to managing suits this new generation of workers. Generally, the new generation of workers has had a different upbringing resulting in different attitudes and different expectations from work compared to previous generations [44]. To manage them, it is crucial—even more so than with present and past generations of workers—to challenge and reward them regularly for achieving goals [44] and motivate them by giving frequent feedback, giving them responsibilities, supporting self-directed improvements and empowering them [44,57,63]. Leadership should “particularly appeal to a new generation of employees while honoring the time-tested behaviors and attributes that serve to inspire trust, build a sense of community, and motivate employees to improve performance” [58] (p. 13). The results of a study of leadership behaviors in the past and future among 4394 managers identifies that some leadership behaviors lost their value (i.e., eroding), some behaviors were and will remain relevant (i.e., enduring) and other behaviors are valuable for the future (i.e., emerging).

Eroding behaviors match a leader-focused approach, such as micromanaging, top-down management and rigid protocols, and such behaviors are outdated and do not fit the needs of the current knowledge and creative economy [58]. Some behaviors important when managing past teams remain important in the new economy. By far, the most essential enduring behaviors are trust and integrity, and in a fast-changing digital world, in which technology has become powerful and has the potential to damage society, trust and integrity are even more crucial [58]. Typical *altro-centric* leadership behaviors which are crucial to success in the new digital economy are emerging. These emerging behaviors are generally related to soft skills and include collaborative and relationship skills, humility, empathy and passion [58]. This connects to Klus and Müller's findings, who also found that leadership behaviors considered vital, whether enduring or emerging in the digital age, are connected to soft skills [54].

As members of a leadership community, managers and employees should develop new mindsets (i.e., attitudes and beliefs) that fit the digital age and its workers, with the literature identifying four mindsets—producers, investors, connectors and explorers [58]. People with a producer mindset are customer-focused, digitally savvy, able to make disciplined decisions and excel at executing. Investors pursue a higher purpose, value sustainability, are community focused and develop continuously. Connectors initiate trusted partnerships, build relationships, develop networks and create a sense of belonging. People with an explorer mindset are curious, operate at the edge of chaos, seek input abroad and learn best when they can test, try, learn and repeat. Creating communities of managers and employees that possess these mindsets divided among their members facilitates effective collaboration toward a common goal. The need for disparate mindsets is evident [46], especially those that allow adapting faster to continuously changing organizational environments due to rapid digital developments, such as big data, blockchain technology and artificial intelligence (AI).

4.2.5. Next Level Management Practice—Algorithmic Management

Combined with extensive amounts of data (e.g., big data) and improved algorithms, AI offers a new level of digital transformation, and with that also comes leadership challenges [42,46,47]. AI challenges the importance of core competencies for employees and even makes some skills and talents obsolete [42]. It poses new threats, such as biases, fake news, ethics and privacy, which affect all employees and managers [41,59]. As “digital and analog worlds . . . becom[e] one,” a new kind of management practice emerges—algorithmic management [42] (p. 18).

Algorithmic or automated management represents the supervision of workers using algorithms and AI techniques [50]. Some companies such as Uber, Amazon and Deliveroo already use AI to direct, manage and monitor employees, with AI assigning jobs, including all necessary information and instructions, and monitoring progress [50,56]. At Amazon, algorithmic management determines which employees should be fired based on productivity data, with the system automatically sending out warnings and terminations without human input [50]. Apart from ethics, one question is whether the practice is legal. A court ruling in the case of employee versus freelance status of Deliveroo ‘riders’ (i.e., meal-delivery employees) suggested that AI can legally be regarded as a boss [56]. Deliveroo riders received all of their information, instructions and even bonuses from Frank, an algorithm, which indicated a relationship of authority. Deliveroo riders should thus be regarded as employees and not freelancers, with Frank as their algorithmic manager.

A study by Oracle and Future workplace during 2019 suggests that AI is increasingly being used in organizations and that it is here to stay [45]. The study assessed over 8000 respondents across 10 countries, finding that 50% of respondents use AI in some form at work, and 64% reporting that they trust AI more than their managers. Generally, respondents perceived that AI is unbiased and is therefore trusted more to provide truthful information, maintain fair work schedules and solve problems [61]. Respondents were, however, concerned about security and privacy problems regarding the use of AI [59,61].

Other than the disadvantages of algorithmic management, such as using it for surveillance (e.g., Amazon, Uber and Deliveroo), lack of transparency regarding how AI operates and perceptions of dehumanization due to lack of human contact, potential benefits are evident, depending on how the AI is deployed [59]. AI lowers costs if it takes over some managerial activities that take humans hours or even days. It also increases efficiency by allowing AI to help with tasks, such as scheduling and allocating resources, which results in greater productivity. AI supports data-driven decision making and therefore reduces or eliminates human bias and favoritism, assuming the algorithm does not contain biases [47]. An example of using algorithmic management that is beneficial to both employer and employee is found at IBM, whose AI identifies employees, with 95% accuracy, who want to leave their jobs and suggests actions for managers to keep such employees engaged. IBM’s AI is used to offer insights into the strengths of their employees by combining data

about, for example, tasks and education courses that employees have completed, which supports managers with guiding employees to develop themselves to overcome future challenges [53]. In this case, algorithmic management helps managers and employees become better at their jobs.

5. Conclusions

Leadership theories and approaches have adapted to changes and developments in society and organizations. Already reaching as far as algorithms increasingly finding their way into daily management practice, digital transformations call for reassessment of leadership paradigms as well as leadership skills and behaviors because their influences are felt throughout the entire organization. Most digital transformation and leadership literature focuses solely on the need for strong strategic leadership—top managers who recognize the importance of digital transformation and building a future strategy around it and senior managers responsible for leading digital transformations strategically [7,8,64–66], exposing knowledge gaps below senior management levels.

This study describes a first exploration of literature addressing future skills and behaviors needed by managers below the senior management level, more specifically middle managers, both during and after digital transformations. In order to understand the necessity of certain skills and behaviors in the context of digitalization, the phenomenon of digital transformation was first explored. This exploration revealed that it represents a disruptive process that changes the foundation of an organization, resulting in new forms of working [1,2,5,6,8,22]. Vial's digitalization framework defined digitalization as a process and illustrates its broad impact on organizations and beyond [22]. In addition, Berghaus and Back developed a model for identifying the digital maturity of an organization [7]. Both these models, each approaching digital transformation from a different angle—process and maturity—contribute to understanding the phenomenon of digital transformation.

The subsequent exploratory review of leadership and digitalization literature suggests that middle managers must become digitally intelligent; they need to understand and make use of the power of technology. Soft skills are also becoming increasingly important. In addition, a new generation of workers is entering the workforce, and it is thus apparent that the nature of leadership and management needs to be redefined and that a different approach to managing and leading the workforce is necessary [7,8,12,21,22,67]. The distinction between personal lives and jobs is disappearing, and jobs are progressively shaping workers' identities [63]. Work should have meaning, connect people and support learning [51]. The speed of development (e.g., digital transformations), combined with expanded globalization, with increased demands on creativity and flexibility, requires that all employees update their competencies regularly across their lives [64], including management. Future-proof managers must be people-oriented, technically minded and empowering, with lifelong learning attitudes regarding technology and digital skills, beyond just computer skills [46,51,54,63,68]. This calls for *altro-centric* leadership, an 'other-centered' leadership style. Future-proof managers value relationships and lead with empathy, humility, compassion, integrity and creativity in a collaborative, trusting and motivating way [48,52,54,58,62,69]. Managers and their employees must develop mindsets that fit a new generation of workers and the digital age [51,58]. The emergence of AI, increasingly leading to algorithmic management practices, emphasizes the need for soft skills even more. If AI is deployed responsibly and ethically, it has the potential of being of great added value. It could be used to handle quantifiable managerial tasks, such as planning, budget management and evaluating the quantifiable part of performance, while managers focus on the soft skills of management, such as coaching, motivating and empowering employees, adding a human–ethical sense of judgement to AI's data-driven information and judgments [61]. AI will not replace management jobs but supplement them; humans and machines can collaborate, benefitting from each other's strengths and compensating for weaknesses [47,59,61].

Traditional leadership approaches do not suffice anymore due to the complexity of the modern digitalized world; leading, guiding and managing employees in this time of growing human–machine collaborations require new understandings of leadership [12,13]. Findings from this explorative study point toward person-centered collaborative leadership needs, with strong judicious and empathic foci to balance the increased influence of machines. “Other-centered” servant leadership approaches, combined with elements of relationship-based transformational and collaborative leadership styles, appear most fitting. However, these traditional leadership approaches address current and future leadership challenges only partially. Although more recent theories have developed from increasing changes in organizations, anticipating changing situations and personal needs, contemporary accelerating digital developments represent another order of complexity. Leadership is now about adapting, accepting, understanding and supporting—adapting to continuous organizational changes and circumstances, accepting employee participation during organizational decision making and the machine as a “work partner,” understanding the value and influence of digitalization and the needs of the new workforce and supporting employees’ individual needs.

The digitalization of society, and its accompanying complexities, has triggered new approaches to leadership. E-leadership, a fairly new leadership paradigm since the early 2000s, focuses on working with geographically dispersed employees and leading virtual teams [70]. E-leaders might never meet their employees face-to-face. Digital leadership, another recent leadership approach, centers on “use of digital assets of an organization to achieve business goals at both organizational and individual levels” [71] (p. 46). These approaches merely focus on one aspect (respectively, digital workforces and use of digital assets) that result from increased digital developments, and they therefore do not suffice as a comprehensive leadership approach for managers to use as a reference for future-proof management. These approaches also do not support the growing need for more humanistic, empathic approaches that counterbalance the increased involvement of machines in management.

Part of the answer may lie in a form of adaptive leadership, which suggests that leaders should use any leadership element that fits the circumstances best [72]. Adaptive leadership is not new, but it remains in theoretical infancy [73]. At the time of its emergence during the 1990s, the evolution of digital technology was not as advanced and complex as it is today, and thus adaptive leadership drew from prevalent traditional leadership theories of the time. Since then, other leadership-related awareness and approaches emerged, such as e-leadership and digital leadership, from which leaders can also draw as they see fit. Combining behaviors, styles and approaches from both traditional and emerging leadership paradigms might be imminent. The second part of the answer may lie in acknowledging and including a growing need for soft skills aimed at “the other” in a future-proof management approach that results in an empathic, adaptive leadership approach.

Limitations and Suggestions for Future Research

Firstly, the focus of this study was middle management because of its particular and complicated position in organizations, and due to the vital role, this management level plays in leading and supporting organizational change [74]. However, during identification and selection, it became apparent that most literature on digitalization and leadership was written from the perspective of senior managers initiating and leading digital transformations, or written from the perspective of general management, leaving room for interpretation of the intended management level. We therefore want to draw attention to the lack of research aimed at understanding digitalization and leadership from a middle-management perspective. Middle managers are generally the persons responsible for leading and managing the new digital organization that is emerging [8]. It would therefore be valuable as well as interesting to investigate the position of the middle manager in the context of digital transformation in practice and to further examine future leadership skills, behaviors and management practices. Secondly, in addition using Google Scholar as a

literature source, this study also used the Google search engine and included grey literature. When interpreting the results, this should be taken into consideration as it may affect the scientific face value of the findings. A future study should be limited to peer-reviewed articles from defined scientific sources. Lastly, the literature sample was small and had a very general character. Since this study was exploratory, aiming for a breadth rather than depth, this choice was acceptable. However future research should conduct a more comprehensive and focused literature review on digitalization and leadership in the context of middle management. Given recent digitalization developments, a computationally grounded theory study that combines human knowledge and skills with computational processing power and pattern recognition would be appropriate [75].

In conclusion, this review pooled literature on digital transformation and leadership to explore future-proof middle management, enhancing understanding of digital transformations and demonstrating a need to redefine leadership requirements in an increasingly digitalized work environment. Considering changes to leadership roles and styles necessary in the post-COVID-19 era is highly relevant as the pandemic accelerated the shift to remote or hybrid work formats [76]. For example, a study of academic leadership by Fernandez and Shaw [77] elaborated on leadership in (post-)COVID-19 times. They identified emotional intelligence and emotional stability and the ability to distribute leadership responsibilities to a network of team members throughout the organization as essential leadership skills and behaviors. Furthermore, a study about E-leadership in times of COVID-19 and beyond by Contreras, Baykal and Abid argues that managing and leading virtual and hybrid teams calls for a new kind of leadership that includes trustworthy relationships with employees and less hierarchical organizations [78]. This study contributes to assessing future-proof leadership skills, behaviors and management practices of middle managers and represents a starting point for future research into the topic to gain further insights and identify more opportunities, constraints and development needs.

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