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The digital leader: What one needs to master today's organisational challenges

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The Digital Leader

What One Needs to Master Today's Organisational Challenges

Milan Frederik Klus/Julia Müller

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The Digital Leader

What One Needs to Master Today's Organisational Challenges

Milan Frederik Klus /Julia Müller

Abstract

Executives are increasingly facing various challenges associated with digitalisation, ranging from digitally mapping their existing business processes to fundamentally changing their business models. In this context, however, few studies have investigated which skills and traits executives need to successfully master digitalisation-related challenges. While some contributions suggest and systematise leadership skills, we go one step further and conduct a survey to investigate the connection between selected skills and executives' abilities to cope with specific challenges. Based on our results, executives that are well equipped to cope with these challenges tend to think and act entrepreneurially, have strong (self-)organisation and IT skills, a profound ability to motivate others, and a high degree of flexibility, commitment, and creativity. Surprisingly, being a strong team player does not seem to be necessarily advantageous. Moreover, many executives desire more calmness, which suggests that being able to decelerate is important in the digital age.

JEL Codes: M12, M15, M50, O33

Die digitale Führungskraft

Was man benötigt, um die heutigen organisatorischen Herausforderungen zu meistern

Zusammenfassung

Führungskräfte stehen zunehmend vor verschiedenen Herausforderungen im Zusammenhang mit der Digitalisierung, die von der digitalen Abbildung bestehender Geschäftsprozesse bis hin zur grundlegenden Veränderung von Geschäftsmodellen reichen. In diesem Zusammenhang haben jedoch nur wenige Studien untersucht, welche Fähigkeiten und Eigenschaften Führungskräfte benötigen, um die Herausforderungen der Digitalisierung erfolgreich zu meistern. Während einige Beiträge Führungsfähigkeiten vorschlagen und systematisieren, gehen wir einen Schritt weiter und führen eine Umfrage durch, um den Zusammenhang zwischen ausgewählten Skills und der Bewältigungskompetenz spezifischer Herausforderungen zu untersuchen. Nach unseren Ergebnissen denken und handeln Führungskräfte, die für die Bewältigung dieser Herausforderungen gut gerüstet sind, in der Regel unternehmerisch und verfügen über starke (Selbst-)Organisations- und IT-Fähigkeiten, eine ausgeprägte Motivationsfähigkeit sowie ein hohes Maß an Flexibilität, Einsatzbereitschaft und Kreativität. Überraschenderweise scheint es im Kontext ausgewählter Herausforderungen nicht unbedingt vorteilhaft zu sein, eine stark ausgeprägte Teamfähigkeit zu besitzen. Darüber hinaus wünschen sich viele Führungskräfte mehr Gelassenheit, was darauf hindeutet, dass die Fähigkeit zur Entschleunigung im digitalen Zeitalter besonders relevant ist.

Im Internet unter:

http://www.wiwi.uni-muenster.de/io/forschen/downloads/DP-IO_11_2019

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The Digital Leader

What One Needs to Master Today's Organisational Challenges

1. Introduction

Work environments and occupations are undergoing significant changes, with progressive digitalisation playing a pivotal role. The internet, high performance computing, and ubiquitous mobile technologies offer new opportunities to capture and analyse trends and behaviour (George, Osinga, Lavie, & Scott, 2016) and to shape collaboration within and between organisations. The human resource management (HRM) of today's organisations is already infused with information technology (Bondarouk & Ruël, 2009), with the driving factors being the spread of ever more sophisticated software for enterprise resource planning (ERP) and internet-based systems for the automation of activities and processes (Marler & Parry, 2016). While many middle-skill jobs involve tasks that can be automated with the help of modern technologies today or in the near future (Autor, 2015), even jobs with complex tasks and correspondingly high demands on the abilities of the job holder are affected by increasing technologisation. Overall, executives and employees of contemporary organisations can communicate and interact via digital channels (Phelps, 2014), can work remotely and according to flexible working time models (Tarafdar, 2016), and have access to a wealth of data (Colbert, Yee, & George, 2016).

Executives are increasingly facing the challenge of adequately incorporating new technological developments into their organisations while at the same time shaping the process of change in their own operations. According to Avolio and Kahai (2003), the changes in the work environment are driving executives to rethink their approaches and behaviour. In this context, particularly relevant questions include how to manage locally dispersed teams, how to handle different technology preferences, and how to design a functioning knowledge transfer (Gratton, 2016). At the top management level, executives must rethink the design of the corporate strategy and business model and adapt it to modern requirements (El Sawy, Kræmmergaard, Amsinck, & Vinther, 2016).

So far, however, many companies use digital technologies only to a limited extent (Colbert et al., 2016). In this context, executives play an essential role in implementing appropriate structures and processes as well as in encouraging employees to have a positive attitude towards the topic of digitalisation (Wipulanusat, Panuwatwanich, & Stewart, 2017). Executives thus lay the foundation for digital transformation (Hunt, 2015) while at the same time acting as

role models and pioneers (Day, Fleenor, Atwater, Sturm, & McKee, 2014). This leads to new challenges for executives, which can be managed only with proper leadership skills.

The existing literature has already coined terms such as *digital leadership* (Ahlquist, 2014; El Sawy et al., 2016; Sheninger, 2019; Wilson III, Goethals, Sorenson, & Burns, 2004), *e-leadership* (Avolio, Kahai, & Dodge, 2000; Avolio & Kahai, 2003; Cascio & Shurygailo, 2003) and *e-HRM* (Bondarouk & Ruël, 2009; Marler & Parry, 2016; Ruël, Bondarouk, & Looise, 2004; Ruël, Bondarouk, & Van der Velde, 2007; Strohmeier, 2007). Furthermore, some contributions have addressed the identification and systematisation of relevant leadership skills in an increasingly digitalised work environment (Khan & Ahmad, 2012; Klus & Müller, 2018; Phelps, 2014; Tarafdar, 2016; Zeike, Bradbury, Lindert, & Pfaff, 2019). So far, however, researchers have not focussed on the relationship between selected leadership skills and the ability to cope with specific digitalisation-related challenges. We bridge this gap and address this question using a survey-study that is based on the current state of knowledge in the literature and provides new insights and contributions in two ways:

1. The questionnaire design allows us to empirically analyse the links between selected leadership skills and executives' abilities to cope with different digitalisation-related challenges, also considering personal traits as well as relevant control variables (age, gender, management level, leadership experience, and number of supervised employees).
2. Through open questions, we generate new insights into leadership skills and personal traits which are particularly needed today; these insights partly confirm the findings from previous studies but also expand the current state of research.

The remainder of this paper is structured as follows: We provide an overview of the literature on leadership in the digital context in Section 2, followed by our methodology and data in Section 3. We present our findings in Section 4 and discuss them in Section 5, thereby also considering theoretical and practical implications as well as limitations of the study. Finally, we conclude in Section 6.

2. Literature Review

While advanced technologies are enabling increasing automation of many middle-skill jobs, employees are likely to have a long-term advantage over machines in complex operations that require a variety of different skills (Autor, 2015). Executives' jobs provide a good example of such a diverse set of activities, with the superordinate dimensions being personnel supervi-

sion, project management, and strategic planning (Friedman, Fleishman, & Fletcher, 1992). In a recent interview-study, we found that personnel supervision involves the core activities of personnel development and talent management, personnel recruitment, strategic workforce planning and staff meetings, whereas project management was found to involve managerial accounting, communication (via various channels), customer relationship management, and administrative tasks (Klus & Müller, 2018). Within the category of strategic planning, today's executives seem primarily concerned with the development of a future-ready and sustainable business strategy, organisational development (including the corporate culture), and product development (Klus & Müller, 2018).

An additional activity executives take on is managing virtual teams (Townsend, DeMarie, & Hendrickson, 1998), which involves far more than simply technically connecting team members (Townsend et al., 1998); it also requires getting to know each other, clarifying mutual expectations and agreeing on work styles (Phelps, 2014). Managing virtually instead of face-to-face is a complex and challenging task that requires highly skilled executives, and their skills and management practices will likely be increasingly influenced by technology in the coming years (Gratton, 2016). In this context, human interaction should not be neglected, as both staff and executives try out different behaviours over time and evolve with the help of feedback and observation (Ibarra, 1999). Further, as one of the major challenges in the context of digitalisation will be achieving relationship-orientated leadership (Schwarzmüller, Brosi, Duman, & Welpe, 2018), leadership styles will need to become more individual and consider teams and networks.

While the task areas mentioned above do make up executives' main activities, they are too superficial to derive concrete needs for leadership skills. To do this, it is worth taking a look at the challenges that executives face in their day-to-day work.

2.1. Leadership Challenges

With regard to organisational challenges, key issues that arise include managing intergenerational teams (Gratton, 2016), ensuring the adequate use of modern technologies, and establishing suitable boundaries between work and non-work contexts (Tarafdar, 2016). The aspect of age is not only a challenge in terms of the composition of workforces or teams, but also for executives themselves. Although most young managers grew up with modern technologies and thus bring valuable know-how to companies, they are oftentimes perceived as less prototypical and are accorded a lower status by employees (Buengeler, Homan, & Voelpel, 2016).

Technically apt executives have to reconcile employees with different degrees of technological aptitude, thereby focussing on those who tend to oppose the adaptation of new technology or lack knowledge (Dimitrov, 2018). When managing digitalisation-induced change processes, executives have to strive for a balance between the old and the new and bring all of their employees on board (Colbert et al., 2016).

Having a multitude of (digital) communication channels and devices opens up opportunities for working in virtual teams and requires executives to lead a decentralised group, a form of leadership often referred to as remote leadership (Colbert et al., 2016; Kane, Phillips, Copulsky, & Andrus, 2019). Along with the rise of virtual teams, several issues have also been identified. Specifically, Hambley, O'Neill, and Kline (2007) found that while task performance does not differ between teams using different types of communication, team cohesion and interaction may be compromised in virtual teams using solely chat for interaction. Another issue regarding remote leadership pertains to individuals feeling isolated in their work, as face-to-face interactions are decreasing despite an increase in communication means (Pulley & Sessa, 2001). This changing way of communicating seems to negatively affect the trust-building between leader and follower (Savolainen, 2014). It is, therefore, the leaders' responsibility to actively form stable relationships in virtual teams to overcome these difficulties (Roy, 2012).

Through the extensive use of mobile devices and email, executives and employees alike may experience work content encroaching on their personal life and, thereby, have heightened levels of stress (Barley, Meyerson, & Grodal, 2011; Schwarzmüller et al., 2018). This can be further aggravated for executives, as they encounter large amounts of information to sift through and must deal with an increasingly diverse range of topics (Schwarzmüller et al., 2018). Moreover, due to a business environment which is developing fast as a result of digitalisation, people's workloads are increasing and tasks must be fulfilled swiftly; the accelerating pace that accompanies digitalisation is a recurring theme in contemporary literature (Gordon & Martin, 2019; Kane et al., 2019; Kohnke, 2017; Schwarzmüller et al., 2018). For example, Kane et al. (2019) identify the speed of change as the single most defining characteristic of the digital business environment. The fast-paced digital era requires executives to make quick decisions that cannot be entirely habitual but need to include some element of innovation (Pulley & Sessa, 2001). While the speed of change is challenging for executives themselves, they also need to address the fear and insecurity of their employees who may feel equally overwhelmed (Schwarzmüller et al., 2018).

Closely related to this is the need for personnel development. Digitalisation calls for employees with a digital skill set, and it is the executive's task to promote this (Kohnke, 2017). Identifying the skills needed and spreading them within the workforce through adequate personnel development is a major new challenge for executives.

In addition, digitalisation exposes contemporary organisations to new risks, which executives have to cope with. In this context, IT security has been identified as a particularly pressing challenge for leaders (Kappelman, McLean, Luftman, & Johnson, 2013). Moreover, the issue of data privacy has to be taken into account (Abowd, Schmutte, Sexton, & Vilhuber, 2019; Zhang, 2018), with the challenge of protecting data inside and outside of the organisation.

To expand the literature with novel insights into leadership challenges in the digital age, we first evaluate the relevance of different challenges discussed in recent studies and formulate the following research question:

RQ1.1: *How relevant do executives in the field rate digitalisation-related challenges which have been discussed in recent literature?*

The digital age is characterised by a fast pace of change and a multitude of new issues (Kane et al., 2019; Kohnke, 2017; Schwarzmüller et al., 2018). Therefore, we assume that previous studies have not yet fully covered all relevant leadership challenges and we thus examine the following research question:

RQ1.2: *In the context of an increasingly digitalised work environment, are there relevant leadership challenges that are not or only weakly anchored in the existing literature?*

2.2. Leadership Skills

To cope with organisational challenges, executives need an adequate skill set, which, according to Katz (1974), should include technical skills, human skills and conceptual skills. Skills may also be different between novice leaders, intermediate leaders, and expert leaders, where, as mentioned by Lord and Hall (2005), leadership skills tend to be more self-centred in case of novice leaders and, with increasing experience, they more and more converge into an expert leader's ability to develop other employees (Lord & Hall, 2005). We used these dimensions in a recent study to develop a conceptual framework systematising leadership skills, thereby also considering personal traits (Klus & Müller, 2018). Based on interviews with executives and an analysis of job advertisements for leadership positions, we found that particularly relevant leadership skills in times of rapid technological change are the ability to com-

municate effectively via different channels, organisation skills, subject-specific knowledge (increasingly IT skills) and the ability to reflect on oneself (Klus & Müller, 2018). In addition, key personal traits were also considered crucial, such as empathy and an open-mindedness towards the new.

Other literature also stresses the importance of technological affinity and computer knowledge for leaders. Executives need to stay informed about and understand new technologies (Sousa & Rocha, 2019) and develop a range of technical skills to ultimately achieve some sort of digital literacy (Kane et al., 2019; Phelps, 2014). As digitalisation comes along with a broad range of technological solutions and innovations, executives need to continuously update their knowledge (Schwarzmüller et al., 2018). This may result in an information overload, such that executives need to be able to use or leverage relevant technical knowledge in order to make decisions effectively (Sousa & Rocha, 2019).

Apart from gaining IT knowledge themselves, executives also need to ensure that this knowledge gets integrated and spread within the organisation. For this, Phelps (2014) suggests that executives require organisation skills, especially when it comes to managing virtual teams. Furthermore, strong communication skills seem necessary for passing on IT knowledge and spreading the word regarding digitalisation-induced changes (Giles, 2016; Iordanoglou, 2018; Phelps, 2014; Roy, 2012; Sousa & Rocha, 2019). As digitalisation alters the means of communication, communication skills need to be extended to a range of communication channels and platforms (Gordon & Martin, 2019).

Motivational skills are highlighted on a number of occasions in contemporary leadership literature (Gordon & Martin, 2019; Iordanoglou, 2018; Schwarzmüller et al., 2018; Sousa & Rocha, 2019). With regards to digitalisation, Osburg and Lohrmann (2017) indicate that the ability to motivate others could be relevant when encouraging employees in their acquisition of IT skills. To achieve this both at the company's own location and in globally dispersed (virtual) teams, foreign language skills (especially English) seem relevant (Klus & Müller, 2018; Osburg & Lohrmann, 2017; Schwarzmüller et al., 2018).

In addition to what skills are deemed to equip executives for the 21st century, the literature also highlights a range of desired personal traits. Most prevalent are traits associated with facilitating change, such as flexibility (Iordanoglou, 2018; Phelps, 2014) and the willingness to change (Sousa & Rocha, 2019), which may require a certain degree of courage by the leader to overcome resisting forces inside the organisation (Crossan et al., 2017; Seijts & Gandz,

2018). Furthermore, creativity allows executives to change their organisation in new ways and solve problems (Mumford, Todd, Higgs, & McIntosh, 2017; Sternberg, 2017). In times of crisis, executives benefit from higher levels of empathy, as this allows them to better understand and consider their employees while maintaining a certain degree of goal orientation (Iordanoglou, 2018).

Overall, the existing literature has concentrated particularly on identifying relevant skills and traits for executives, with digitalisation only gradually being taken into account. As far as we know, however, there is little empirical evidence to date of direct links between leadership skills/traits and executives' abilities to cope with specific digitalisation-related challenges. This is where the present study comes in, thereby focussing on connections between high levels of coping competence for selected leadership challenges and executives' strengths of different skills and traits. Accordingly, we formulate the following research question:

RQ2.1: *How is an executive's ability to cope with relevant digitalisation-related leadership challenges associated with the strengths of his or her different skills and traits?*

Again, as we suspect that the range of relevant skills and traits is not yet fully explored, we formulate our fourth research question:

RQ2.2: *Are there any leadership skills and personal traits gaining relevance in an increasingly digitalised work environment that are not well anchored in the existing literature?*

The challenges that executives face combined with what they need to successfully master these challenges influence and shape modern leadership, thus making research in this field a critical part of the further development of the literature. Additionally, such research lays a solid foundation for designing needs-oriented leadership development programs. Accordingly, our study aims to expand the literature with new insights into digitalisation-related leadership challenges and their connection to relevant skills and personal traits, while also deriving practical implications that can be used by executives.

3. Methodology and Data

The results of the present study are based on the responses of 148 executives in northwest Germany who took part in an online survey specifically designed for the study. In order to avoid biased responses, the survey was conducted anonymously using the software *Survey Monkey*. Using an online survey allowed for fast data collection, and, as is advantageous for

all electronic questionnaires as compared to paper-based ones, the process of transforming responses into a machine-readable format occurred during collection, obviating the need for post-collection processing activities (Franklin & Walker, 2003).

We focussed our study on industrial companies in northwest Germany, as this sector provides a fertile field for studying digitalisation-related phenomena, and a regional focus increases the comparability of the results. Before the survey period, we collected information about the target companies and their executives (company name, names of executives, position, telephone number, email address etc.) from the company websites. All companies were phoned before they were sent the link to increase response-rate.[1] The link to the questionnaire was sent out from a university email address between the end of December 2018 and May 2019.

The questionnaire included statements that participants were asked to evaluate according to a 5-point Likert-type scale (Likert, 1974) and open questions, similar to a survey conducted by Creţu and Iova (2015). A Likert-type scale has already been used successfully for this purpose in several studies conducted, for example, by Guillén, Mayo, and Korotov (2015) and Mumford, Campion, and Morgeson (2007).

The questionnaire consisted of two main parts and a final part with demographic questions. A short introductory page welcomed the participants, introduced them to the topic, and ensured confidentiality. Executives were first asked to evaluate the strength of given skills and traits in relation to their own person. The information was given on a 5-point Likert scale, which ranged from 0 = weak to 4 = strong. In addition, a response option "no information" was offered in order not to force an evaluation. All skills and traits were listed following a random order (different for each participant) to prevent biased results stemming from a fixed order. Moreover, an open question was asked as to what other skills and traits the managers would like to have in order to cope with digitalisation-related challenges, which allowed for covering further relevant aspects.

In the next step, the relevance of different challenges was queried using a 5-point Likert scale ranging from 0 = irrelevant to 4 = relevant. The selected challenges were chosen from academic studies already dealing with the digital age (see Section 2). At the end of this step, an

[1] At the beginning of our study, we emailed the survey link to 80 executives whose personal email addresses were publicly available (without phoning them in advance). However, due to a response rate below ten percent we decided to change our procedure.

open question was asked about further digitalisation-related challenges to generate additional findings.

Furthermore, the respondents were asked to evaluate how easy it is for them to cope with the predefined challenges. For this, a 5-point Likert scale was used ranging from 0 = hard to 4 = easy. Finally, the concluding part consisted of questions focussing on demographic and company-specific data (Guillén et al., 2015), comprising the respondents' gender, age, management level, leadership experience, number of supervised employees, and company size.

In total, we considered 11 leadership challenges, 13 skills, and 10 personal traits. Table A1 in the Appendix provides descriptions of the challenges, and an overview of the skills and traits included in the questionnaire is presented in Table A2.

An essential component in evaluating the results was to examine the connection between an executive's perceived ability to cope with different challenges and the strengths of his or her different skills and personal traits. To assess this connection, a regression analysis was used.

3.1. Data Analysis

We used the Gioia method (Gioia, Corley, & Hamilton, 2013), which can be understood as a data compression process generating overarching themes and superordinate dimensions of similar statements, to evaluate the free response fields. Using this approach, 54 of 67 statements regarding further relevant digitalisation-related challenges could be compressed into 13 overarching themes (see Figure 1). The remaining 13 statements showed no similarities with each other or with the other statements and were therefore not considered further in the analysis. With regard to (further) leadership skills that the survey participants would like to have in the context of increasing digitalisation, 59 of 82 statements could be condensed into 11 overarching themes (see Figure 2). In addition, 42 of 52 statements regarding further relevant traits could be summarised in six superordinate themes, also depicted in Figure 2. We decided not to build overarching dimensions of the themes, since their numbers are relatively small and we did not want to provoke any loss of information.

To investigate links between executives' strengths of different skills/traits and their ability to cope with digitalisation-related challenges, we applied ordered probit regressions. For each model, we used the ability to cope with a specific challenge as the ordinal dependent variable and the strength of skills and traits as the explanatory variables.

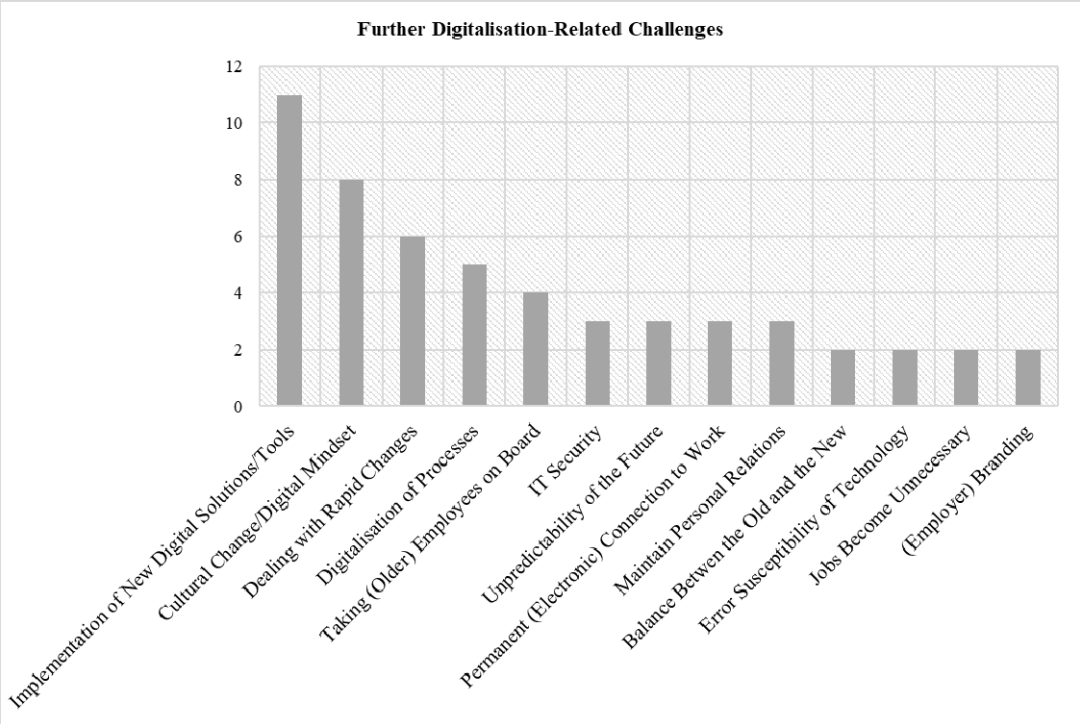

Figure 1: (Further) Digitalisation-Related Challenges

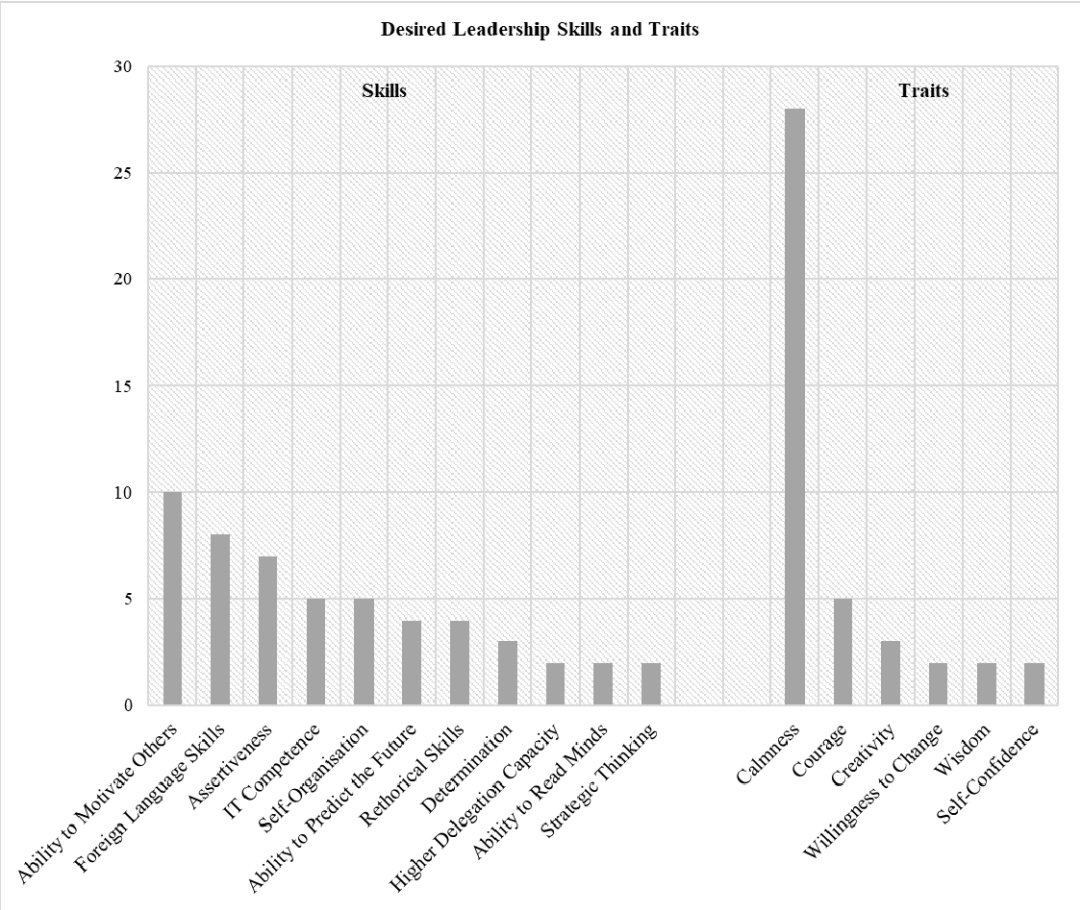

Figure 2: Desired Skills and Traits

We controlled for the individual-specific parameters age, gender, management level, leadership experience, and number of supervised employees.

3.2. Sample

In total, we contacted 519 companies and received 156 completed questionnaires. Since eight participants took part in a pre-study of the online survey, which led to minor modifications of the questionnaire, our empirical analysis is based on a final sample of 148 executives from predominantly medium-sized industrial companies in northwest Germany.

Of the 139 respondents who indicated their gender, 99 (71%) were male and 40 (29%) female. 140 executives answered the question about their age. The age category of 50-59 year olds was most strongly represented with 53 (38%) executives, followed by 40 (29%) 40-49 year olds and 35 (25%) 30-39 year olds. Only 6 (4%) of respondents fell into the > 59 category and 5 (4%) into the < 30 category.

Of 140 executives who indicated their management level, 75 (54%) were middle managers, followed by 38 (27%) top managers, and 19 (14%) who described their position as being in lower management. The remaining executives either did not provide any information or were unable to assign their position to a specific management level.

The number of supervised employees (N=139) ranged from < 10 to > 29 individuals, with 68 (49%) of the surveyed executives being responsible for fewer than 10 employees. However, 31 (22%) executives responded that they lead more than 29 employees. The categories between (executives with > 10 supervised employees but < 29) were somewhat less represented, with 26 (19%) executives being responsible for 10-19 employees and 12 executives (9%) for 20-29 employees.

An overview of the summary statistics of our data can be found in Table 1. Descriptions of the challenges considered in our study are presented in Table A1 in the Appendix.

4. Results

We provide our results in two subsections. In the first subsection, we start with the assessment and identification of digitalisation-related leadership challenges (RQ1.1, RQ1.2) and skills/traits (RQ2.2). In the second subsection, we present the results of the regression analysis to identify connections between the strength of specific skills/traits and the ability to cope with different challenges (RQ2.1).

	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variables					
Ability to Manage:					
Balancing Change	139	2.417	0.900	0	4
Data Privacy	138	2.417	1.064	0	4
Dealing with Many Topics	139	2.691	0.962	0	4
Information Overload	139	2.417	0.884	0	4
IT Aversion of Employees	139	2.086	1.025	0	4
IT Security	137	1.876	1.185	0	4
Pace of Change	139	2.633	0.886	0	4
Permanent Availability	139	2.281	1.155	0	4
Personnel Development	139	2.353	0.962	0	4
Remote Leadership	137	1.788	1.432	0	4
Uncertainty of Employees	138	2.442	0.888	0	4
Explanatory Variables					
Skills:					
Ability to Motivate Others	148	2.953	0.732	1	4
Ability to Work in a Team	148	3.250	0.781	1	4
Analytical and Strategic Thinking	148	3.240	0.674	1	4
Assertiveness	148	2.966	0.742	1	4
Communication Skills	148	3.176	0.780	0	4
Decision-Making Skills	148	3.392	0.624	2	4
English Skills	148	2.500	1.091	0	4
Entrepreneurial Thinking and Acting	147	3.361	0.561	2	4
IT Skills	148	2.331	0.914	0	4
Organisation Skills	147	3.252	0.810	0	4
Self-Organisation Skills	148	3.074	0.792	1	4
Self-Reflection Skills	146	3.034	0.756	1	4
Technical Skills	148	2.730	1.027	0	4
Traits:					
Calmness	148	2.209	0.971	0	4
Courage	148	2.831	0.768	1	4
Creativity	148	2.635	0.934	1	4
Empathy	148	2.635	0.934	1	4
Commitment	148	3.500	0.665	0	4
Flexibility	148	3.041	0.699	1	4
Goal Orientation	147	3.265	0.634	1	4
Independence	147	3.503	0.554	2	4
Openness Towards the New	148	3.149	0.713	0	4
Willingness to Change	148	2.926	0.809	0	4
Control Variables					
Age (1=<30; 2=30-39; 3=40-49; 4=50-59; 5=>59	140	3.164	0.994	1	6
Company Size (No. Employees) (1=<100; 2=100-299; 3=300-499; 4= 500-999; 5=>999	139	2.964	1.276	1	5
Gender (0 = Female; 1 = Male)	139	1.712	0.454	0	1
Management Level (1=Top; 2=Middle; 3=Lower)	132	1.856	0.644	1	3
Number of Supervised Employees (1=<10; 2=10-19; 3=20-29; 4=>29)	139	2.086	1.265	1	5
Years of Leadership Experience (1=<5; 2=5-9; 3=10-14; 4=15-19; 5>19)	140	3.171	1.473	1	5

Table 1: Summary Statistics

4.1. Assessment and Identification of Digitalisation-Related Challenges, Skills, and Traits

To ensure that the challenges selected for the questionnaire were relevant to the executives surveyed, participants were asked to assess the relevance of the predefined challenges (see Table A1 for the descriptions) on a 5-point Likert scale ranging from 0 = irrelevant to 4 =

relevant. Accordingly, the challenges of dealing with many topics, information overload, pace of change, and balancing change were ranked as the most relevant (in descending order), with all having a mean value above 3.0. The list continued with personnel development, uncertainty of employees, data privacy, permanent availability, IT security, and employees' aversion to IT (mean < 3.0 and > 2.0). Remote leadership was the lowest ranked, with a mean value of 1.90. Overall, this shows that none of the selected challenges were classified as irrelevant, which legitimises their use for further analysis.

In response to the open question as to which (further) digitisation-related challenges the executives considered relevant, they mentioned (in descending order) the implementation of new digital solutions and tools, the cultural change towards a digital mindset, the handling of rapid changes, the digitisation of processes and the task of taking the older workforce with them into the digital age (see Figure 1).

Other issues repeatedly mentioned in the context of digitisation-related challenges included IT security, the uncertainty of the future, the permanent (electronic) connection to work, and maintaining personal relationships.

An analysis of the self-assessed skills and traits of the survey participants shows that female participants rated their ability to (self-)organise higher than male participants. Regardless of gender, organisation skills were weakest among the under-30s, which indicates a high relevance of experience in this context. IT competence and technical understanding was higher among the male executives surveyed.

With an open question, we collected skills and traits that executives would like to have or to have strengthened. Several respondents expressed the wish to be able to motivate others better and to have better foreign language skills (especially English), followed by better assertiveness, higher IT competence and an increased ability to organise themselves (see Figure 2). Interestingly, the desire to predict the future was also expressed several times, indicating the difficulty of making informed strategic decisions in times of rapid change.

A surprising result is the high number of executives who wished to have more calmness (see Figure 2). The personal trait calmness is not well anchored in the leadership literature so far, which could indicate that calmness is gaining relevance in times of rapid technological progress. In addition, some leaders wished to strengthen their courage, creativity and willingness to change, wisdom, and self-confidence.

4.2. Regression Analysis

A central objective of the study was to answer the question of which skills and traits are significantly related to an executive's ability to cope with specific digitalisation-related challenges (RQ2.1). Ordered probit regressions were used for this purpose, the main results of which are summarised in Table 2 and detailed in Table A3 in the Appendix. The challenges in Table 2 are sorted in descending order according to their assessed relevance.

Overall, the results regarding the self-evaluation of the ability to cope with specific digitalisation-related challenges show that the executives surveyed found it comparatively difficult to deal with the issue of remote leadership, i.e., leading locally or even globally distributed teams. The coping competence around the topic of IT security was also rated relatively low, followed by competence surrounding their employees' aversion to IT.

On the skills side, the results of the regression analysis show that the ability to organise oneself and one's organisational environment as well as IT skills, the ability to motivate others, and entrepreneurial thinking and acting are significantly positively associated with more than one perceived coping competence, suggesting a particularly high relevance of these skills. The same applies to the personal traits of commitment, flexibility and creativity. Interestingly, we find several significant negative correlations between the ability to work in a team as well as analytical and strategic thinking and the perceived ability to cope with different challenges. This finding is reflected on more deeply in the discussion.

Our results show that the ability to deal with many topics, to cope with an information overload, and to manage fast-paced change is positively associated with the personal trait of flexibility. However, being a strong team player does not seem to help master the three challenges considered here, as indicated by significantly negative correlations.

With regard to the ability to deal with many topics, we also find a significantly positive connection with the ability to think and act entrepreneurially and a significantly negative link to executives' willingness to change. The ability to cope with an information overload is significantly positively correlated with organisation skills and the ability to motivate others. Interestingly, our results further show a negative link between the ability to cope with an information overload and independence as well as an open-minded attitude towards the new. Lastly, as indicated by the significant negative coefficient of the control variable age, younger executives feel more able to cope with an information overload compared to their older colleagues.

Ability to Cope with Specific Challenges	Skills	Personal Traits	Control Variables
Dealing with Many Topics	Ability to Work in a Team (-)** Entrepreneurial Thinking and Acting (+)*	Flexibility (+)* Willingness to Change (-)*	/
Information Overload	Organisation Skills (+)* Ability to Motivate Others (+)** Ability to Work in a Team (-)**	Openness Towards the New (-)* Flexibility (+)** Independence (-)*	Age (-)**
Pace of Change	Ability to Work in a Team (-)**	Flexibility (+)**	/
Balancing Change	Organisation Skills (+)* Ability to Motivate Others (+)*	Independence (-)*	Female (-)*
Personnel Development	IT Skills (+)* Decision-Making Skills (-)*	/	/
Uncertainty of Employees	/	Flexibility (+)*	Management Level (-)*
IT Security	Ability to Work in a Team (-)* IT Skills (+)** Analytical and Strategic Thinking (-)*	Creativity (+)** Commitment (+)** Willingness to Change (-)*	Female (-)*
Data Privacy	IT Skills (+)* Self-Organisation Skills (+)** Technical Skills (+)*	Commitment (+)**	/
Permanent Availability	Analytical and Strategic Thinking (-)* English Skills (+)* Self-Organisation Skills (+)**	/	Age (-)* Female (-)* Management Level (-)***
IT Aversion of Employees	IT Skills (+)**	Commitment (+)*	Female (-)*
Remote Leadership	Ability to Motivate Others (+)* Ability to Work in a Team (-)* Analytical and Strategic Thinking (-)* Entrepreneurial Thinking and Acting (+)*	Creativity (+)* Commitment (+)**	/

Notes: / = no significant correlations; (+) = significant positive correlation; (-) = significant negative correlation; * = 5% significance level, ** = 1% significance level, *** 0.1% significance level

Table 2: Overview of the Regression Results

While independence is negatively associated with the ability to find the right balance in change processes, this ability is facilitated by strong organisation skills and the ability to motivate others.

Being able to motivate others seems also advantageous when it comes to mastering remote leadership, thus managing employees working from different geographical locations. In addition, entrepreneurial thinking and acting as well as commitment and creativity appear to help leaders with handling remote leadership. However, analytical and strategic thinking is signifi-

cantly negatively correlated with remote leadership, as well as with the ability to master challenges around IT security and being permanently available.

Profound IT skills seem to be beneficial to executives in more than one challenge, namely the design of demand-oriented personnel development, dealing with issues of IT security and data privacy, and dealing with employees' aversion to IT. Our results further indicate that self-organisation skills are positively linked to the ability to manage data privacy and being permanently available. Regarding the challenge of permanent availability, we further find a significantly positive correlation with English skills and a negative connection to the age and management level (1 = top management, 2 = middle management, 3 = lower management), with the latter suggesting that older executives and those working in lower and middle management positions find it more difficult to deal with this challenge compared to younger and top management executives.

Finally, we find a significantly positive correlation between commitment and the ability to deal with the issues of IT security, data privacy, and an IT aversion of employees, with IT security also showing a significantly positive link to the personal trait of creativity. However, being a team player, as well as having a strong ability to think analytically and strategically and having a high willingness to change does not seem to be beneficial when it comes to managing IT security, as indicated by significantly negative correlations.

5. Discussion

The discussion section is subdivided into three subsections, starting with a discussion of our empirical findings, followed by limitations of the study, and, lastly, theoretical and practical implications.

5.1. Discussion of the Empirical Findings

One might wonder why a renewed exploration of leadership skills and traits is relevant, given that these have long been the subject of academic research. A major reason is that an increasingly digitalised work environment poses new challenges to executives, making it reasonable to ask what it takes to cope with these challenges in order to successfully navigate today's organisations through the digital age. Pulley and Sessa (2001) argue that fundamental skills such as communication skills and the ability to motivate others, which are traditionally associated with leadership, remain as important as ever, whereby adapting traditional leadership skills to a technologically-mediated work environment adds an unprecedented degree of com-

plexity. We argue that, in addition to changes within existing constructs, new skills and traits, such as IT competencies and calmness, are gaining relevance and thus require in-depth analysis.

In response to the open question in our survey as to which skills the executives would like to have or have strengthened, leading the list was a strong ability to motivate others. This is interesting, as this ability is traditionally linked to leadership and is therefore not a specific phenomenon of the digital age. It is consequently worth investigating in which contexts the ability to motivate others is particularly relevant today, as will be taken up later in this discussion. Second most frequently mentioned were foreign language skills (especially English), which indicates that executives increasingly need to be able to act internationally and coordinate activities with foreign business partners or geographically dispersed teams. An interesting finding is the desired ability to predict the future. Although Big Data increasingly helps to calculate the probability of future events (George, Haas, & Pentland, 2014), the desire for more predictability is an expression of a high degree of uncertainty, a typical characteristic of the digital age.

With regard to personal traits, by far the most exiting result is the frequently named desire for calmness, which far surpasses all other traits mentioned in response to the open question in our questionnaire. Ruderman, Hannum, Leslie, and Steed (2001) found that a leader's reaction under pressure or to challenges in terms of calmness largely determines how their leadership is perceived. With some exceptions, such as Seijts and Gandz (2018) as well as Cable and Judge (2003), the trait of calmness is not yet strongly anchored in the leadership literature and thus seems to build a relevant extension.

Our results show that particularly challenging to executives is the sheer amount of information and issues they must deal with. In this context, Schwarzmüller et al. (2018) emphasise electronic communication channels as the cause through which large amounts of information can be transmitted within the shortest possible time. Based on our results, strong organisation skills are significantly positively correlated with a high perceived ability to cope with information overload. Since it is almost impossible to prevent executives from encountering an increased amount of information via various (digital) channels, it is important to adequately organise the processing of information and distribute these tasks among a motivated workforce.

Another interesting result concerns the significantly negative correlation between a high openness towards the new and the ability to cope with a high volume of information. One possible explanation is that executives must filter the information they receive in order not to overstrain their employees. Executives with a comparatively lower openness towards the new may have an advantage in the process of selecting relevant information. At the same time, however, flexibility is significantly positively associated with a high ability to cope with a high volume of information, indicating that some degree of agility in dealing with the information is conducive.

A seemingly equal counterintuitive finding relates to the ability to handle many topics. We find that this ability is positively associated with flexibility, while it is negatively associated with a willingness to change. This, too, supports the above-mentioned explanation that a certain steadfastness can support the handling of many topics and information. This exemplifies what Pulley and Sessa (2001) describe as a dilemma of keeping focus during times of constant change, which is inherent to the digital age. It is therefore not necessarily a contradiction that while flexibility is positively associated with the ability to cope with different challenges, we find that a willingness to change is simultaneously negatively associated with being able to handle a multitude of topics. A high willingness to change could go along with a lack of direction, which impedes a leader's ability to multitask. Instead, having a strong ability to think and act entrepreneurially seems to help when tackling a multitude of topics, indicating that approaching many topics with a company perspective helps in the process of filtering and prioritising.

We find that being a strong team player does not necessarily help when it comes to dealing with many topics and high amounts information, as indicated by significant negative correlations. Dealing with many topics and excessive information probably requires quick decisions without many interfaces for coordination, which is easier for more self-determined executives.

Regarding all the results discussed so far, it should be emphasised that they relate only to analysing the connection between the perceived ability to cope with selected challenges and a self-evaluation of specific skills and traits. In other contexts, a high ability to work in a team (Iordanoglou, 2018), a high willingness to change (Sousa & Rocha, 2019), and other skills and traits that here are negatively related to coping with certain challenges can be very useful.

However, the ability to work in a team is conspicuous in the context of our study, as it is significantly negatively associated with several coping competences. Maccoby (2000) points out the paradox that despite the widespread call for teamwork skills amongst leaders, many contemporary leaders fall into the category of narcissistic leaders who might express that they enjoy working in a team but truly prefer not to: "*Indeed, perhaps one of the greatest paradoxes in this age of teamwork and partnering is that the best corporate leader in the contemporary world is the type of person who is emotionally isolated"* (Maccoby, 2000, p. 5). Based on the results of a meta-analysis, Grijalva, Harms, Newman, Gaddis, and Fraley (2015) suggest that narcissism is positively associated with leadership emergence. While we do not suggest that executives in our sample are in fact narcissistic leaders, the work of Maccoby (2000) shows that not all leaders would deem the skill of being able to work in a team as beneficial under all circumstances. Even if our interpretation of the results based on the available data is not yet commonly agreed upon, it is at least apparent that a pronounced ability to work in a team is not necessarily an advantage.

The next relevant challenges revolve around the topic of change, essentially regarding the high speed of change and finding a balance in change processes. Our results suggest that finding a balance in change processes is positively associated with strong organisation skills and the ability to motivate others, suggesting that resilient structures are important, and these must be supported not only by executives alone but by a motivated workforce. In accordance with this argumentation, we find that balancing change is significantly negatively associated with the personal trait of independence, indicating that a "lone fighter" nature seems to be less beneficial in facing this challenge than feeling connected to and dependent on one's organisation. Here, the challenge of finding a balance in change processes differs quite clearly from the challenge of mastering rapid change, which shows a negative connection to a pronounced ability to work in a team. In situations where it is a matter of making quick decisions, a "lone fighter" nature seems to be advantageous, similar to when handling a lot of information and topics. In addition, our results show a positive correlation between the ability to master rapid change and the personal trait of flexibility, indicating that executives need to be able to react to different requirements quickly.

Our results show that IT skills are positively associated with more than one coping competence. Leaders can actively use technology to increase their presence or interact with employees only if they possess the computer knowledge to do so (Phelps, 2014). In this context, Kitchin (2014) emphasises that while Big Data and new methods of data analysis make it pos-

sible to answer new questions in new ways, it is challenging to develop the skills needed to analyse the data appropriately and make sense of it. Many companies have started to use more and more data (George et al., 2014), meaning that given the plethora of technological solutions, leaders should at least have a good overview of different technologies and digital solutions (Sousa & Rocha, 2019). This equips them with a toolkit from which they can choose an appropriate tool on a case by case basis and it also allows them to assess which IT skills are advantageous for building within their employees. The fact that IT skills are positively associated with the ability to ensure needs-oriented personnel development further corroborate that IT skills play an important role in introducing employees to modern technologies and preparing them for work in increasingly digitalised work environments. The significant positive association between IT skills and an executive's ability to deal with employees' aversion to IT further indicates that IT-savvy executives find it easier to create an open-minded attitude towards new technologies in the workforce. Colbert et al. (2016) confirm that sound knowledge of IT systems and how to operate them is crucial for effectively harnessing technology and overcoming reservations to doing so.

In addition, we find a significantly positive connection between IT skills and an executive's ability to cope with the issues of IT security and data privacy, indicating that a profound understanding of IT helps executives assess different measures of coping with related threats. Interestingly, creativity seems to be even more advantageous in this context than analytical and strategic thinking, probably because in many cases relatively little data and few precedents are available. Coping with IT security issues becomes even more difficult when rapid changes occur, which might explain that a high willingness to change is significantly negatively correlated with the ability to manage IT security. Furthermore, commitment seems to be relevant for handling both IT security as well as data privacy, whereby we additionally find a significantly positive connection between the ability to manage data privacy and technical skills as well as self-organisation skills. The significant positive coefficient associated with self-organisation might indicate that data privacy is more within one's own sphere of influence than the topic of IT security. Accordingly, a strong ability to organise oneself could help executives adequately handle sensitive data and help maintain an overview.

Self-organisation skills are also significantly positively associated with the ability to manage the issue of being permanently available. Executives and oftentimes their employees are theoretically connected to work around the clock through mobile technology, which can negatively impact work-life-balance (Barley et al., 2011). In addition, given the multitude of commu-

nication channels available, networking within organisations is also increasing. A distinct ability to organise oneself seems to be useful for bringing one's own accessibility into a manageable level, for example by separating times for private and professional activities. Furthermore, our results indicate that middle and lower management executives find it more difficult to deal with the issue of permanent availability than top management executives. One explanation is that middle and lower management executives are closer to the workforce and act as contact persons for problems and questions that arise in everyday working life, while the top management's focus is on more long-term and less acute strategic issues. Also, older executives seem to find it more challenging than their younger peers to deal with the issue of being permanently available, which is interesting, as younger employees are less likely to hold top management positions. Even more surprising is the significantly negative correlation between analytical and strategic thinking and the ability to deal with being permanently available. One might have expected that analytical and strategic thinking helps in finding a way to establish a balanced accessibility. Maybe the opposite is true, for example because analytical and strategic thinking leads executives to consider incoming information and requests in more detail. A more context-specific view is needed to make reasonable assumptions about why profound English skills are significantly positively related to managing permanent availability. Assuming that more and more correspondence takes place in English, it could be assumed that executives with strong English skills need to spend less time and energy on communication than their colleagues with weaker English skills, who have to overcome language barriers in addition to managing the content. However, a more in-depth analysis based on context-specific data is needed to draw meaningful conclusions.

The challenge that was ranked as least relevant compared to the other predefined challenges relates to dealing with remote leadership. One possible explanation for the relatively low relevance could be that decentralised work has not yet been implemented in the majority of companies included in our analysis and is, therefore, only gradually gaining relevance. While this conclusion is based on assumptions, our results indicate that being particularly good at dealing with remote leadership is positively associated with committed and motivated executives with a strong ability to think and act entrepreneurially and a profound ability to motivate others. As digitalisation progresses, an increasing number of employees can do some or all of their work at a home office or even from any location. In such a situation, managing teams in which members work from different locations will require executives to rethink their leadership approaches, not least because they will have fewer opportunities to interact face-to-face with employees. Having fewer opportunities for direct interaction may explain why strong

team players find it particularly difficult to master remote leadership. One reason for the positive correlation between the ability to manage remote leadership and commitment as well as creativity might be that a high level of commitment is conducive or even necessary for enabling goal-oriented collaboration between locally dispersed employees and teams, where the ability to develop creative solutions offers an advantage over standard approaches.

5.2. Implications

Based on our results, we can formulate implications at the company level and with regard to the individual development of executives. Furthermore, we derive suggestions for future research directions.

Companies should take into account that the selection and development of executives is central to the management of digital change, in addition to or as a part of a suitable business strategy. When hiring new executives, particular attention should be paid to ensuring that they have strong (self-)organisation and IT skills, a strong ability to motivate others, and a profound ability to think and act entrepreneurially. Even if managers themselves are not in direct contact with the company's technology, IT skills are likely to help them deal with topics such as IT security, data privacy, employees' aversion to IT, and personnel development.

In addition, executives should bring personal traits such as commitment, creativity, and flexibility, whereas a high willingness to change and open-mindedness towards the new seem not particularly helpful for successfully dealing with selected digitalisation-related challenges. A context-specific view is central here, as a high willingness to change and openness to new ideas might be helpful in other situations, for example in corporate strategy issues. With regard to the challenges considered in this study, however, executives should offer a certain amount of steadfastness in order to keep the organisation on course and not overburden it with too many changes. This relates well to one's ability to find the right balance in change processes, which was considered relevant by the survey participants. Here, too, the traits of open-mindedness towards the new and a willingness to change are only beneficial to a certain extent. Based on our results, creativity can help executives deal with relevant challenges, making it an important personal trait as well. In contrast to skills, however, these personal traits are not readily trained, such that the qualities mentioned above cannot generally be incorporated into personnel development. Nonetheless, they are highly relevant for personnel selection.

On the skill side, we primarily recommend applying demand-oriented training measures in the areas of (self-)organisation and IT competences and management trainings on how to motivate others. In addition, we recommend responding to the desires stated by many executives for improving foreign language skills (especially English) and for displaying more assertiveness and stronger rhetorical skills with different training formats. With regard to personal traits, the wish of many executives for more calmness should be taken seriously, even if this falls into the category of personal traits and is therefore difficult to train. Nevertheless, offering various ways to promote relaxation, such as yoga classes, relaxation rooms, and massages, can be considered, as can psychological coaching on how to deal with stress.

In preparing (potential) executives for dealing with organisational challenges, not only companies but also universities and other educational institutions play an essential role. However, many of these institutions still rely on traditional methods such as face-to-face education (Phelps, 2014) and focus on the development of individual leaders. Thus, leadership education takes place in an isolated environment. However, leadership development requires the involvement of multiple individuals because leaders deal with employees and stakeholders on a daily basis (Day et al., 2014). The development of leadership skills involves considering cognitive, social, and behavioural skills, meaning that only focussing on behavioural styles is insufficient (Lord & Hall, 2005). Accordingly, it is crucial that not only practicing leaders become aware of the leadership skills needed today but also that educational institutions do so, as these institutions provide an important foundation for the development of future leaders.

Overall, our results show that digitalisation-related developments are accompanied by challenges for organisations, their executives, and employees, and these challenges can be associated with different implications. We recommend that the challenges discussed in this paper are first reflected upon in the respective company-specific context and then that companies identify their needs on this basis and define individualised measures for hiring and developing executives.

In addition, we encourage future research to build on the results presented in this study and to validate the correlations, for example on the basis of other industries. Furthermore, we recommend in-depth investigations into the role of calmness in the leadership context, as this personal trait is not yet well established in the existing literature. In addition, we encourage scholars to take up our findings of negative associations regarding the ability to work in a team and to conduct in-depth analyses on the role of these skills for the leadership context.

5.3. Limitations

The study has some limitations which must be considered in the interpretation of the results and should be addressed in future research.

First, the study is essentially based on an online survey answered by 148 executives. The sample size is appropriate for an explorative study aiming at generating initial insights, but it is too small to claim generalisability. In this context, our focus on medium-sized industrial companies in the northwest Germany should also be taken into account, which does allow a relatively high consistency of the sample and thus a high comparability of the answers but simultaneously limits the generalisability of the findings. Accordingly, larger studies considering other regions and further industries are needed to validate the results.

A further limitation concerns the measurement of the skills, traits, and coping competences, as these were based on self-assessments of the survey participants. Accordingly, an incorrect assessment by the respondents could lead to distortions of the results. In order to counteract this as best as possible, the survey was conducted anonymously and the executives always had the option of choosing "no answer" if they could not or did not want to provide an answer.

6. Conclusion

What skills and personal traits does a digital leader need to successfully master digitalisation-related challenges in contemporary organisations? In this paper, we addressed this research question using an online-survey with executives. Exceeding existing research on leadership skills and challenges, we focus on the connection between selected skills/traits needed in the digital age and specific challenges.

Our results reveal that executives find particularly challenging the amount of information and topics they must deal with, followed by challenges that revolve around the topic of (fast-paced) change. Interestingly, the challenge of mastering remote leadership was classified as the least relevant of the predefined challenges executives considered. With an open question and using the Gioia method, we were then able to identify other challenges mentioned by executives: the two most frequently named were the implementation of new digital solutions/tools and a cultural shift towards a digital mindset, followed by dealing with rapid changes, which was also included in the original list of predefined challenges. Creating a digi-

tal mindset and mastering rapid changes produce considerable tension, as cultural changes require a lot of time, and time is scarce in the digital age.

Regarding desired skills or traits, several executives mentioned that they wish to be able to predict the future, which coincides with the challenge of the unpredictability of the future. Another particularly striking finding in the context of (further) desired skills and traits, however, was the executives' desire for more calmness. As the construct of calmness is not yet strongly anchored in the existing leadership literature, it should be examined in greater depth in the future.

The results of our regression analysis show that a strong ability to organise oneself and one's environment are positively associated with multiple coping competences, as well as the ability to motivate others and the ability to think and act entrepreneurially. While organisation skills are positively associated with the ability to master an information overload and to find the right balance in change processes, a pronounced ability to self-organise is significantly positively correlated with managing the issues of being permanently available and data privacy. Moreover, another skill that is positively correlated with the ability to cope with the challenge of data privacy is IT skills, which are also positively associated with challenges related to managing IT security and employees' aversion to IT. Also from the regression analysis, one surprising result is the negative connection between a strong ability to work in a team and several coping competences, indicating that a good digital leader does not necessarily have to be a strong team player, at least with regard to selected challenges considered in this study. With regard to personal traits, executives in contemporary organisations seem to benefit from a high level of flexibility, commitment, and creativity, as these traits are significantly positively correlated with the ability to cope with various digitalisation-related challenges.

Our results contribute to the literature in two ways: First, our findings help to evaluate leadership skills, traits, and challenges discussed in the existing literature against the background of an increasingly digitalised work environment. In addition, using open-ended questions, we pinpoint new aspects that are not yet strongly anchored in the literature, highlighting new research areas to be explored in the future. Second, we identify connections between relevant skills/traits and executives' abilities to cope with specific digitalisation-related challenges, which can be used to derive implications for a future-oriented human resource management.

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Appendix

Variables	Definition	Relevance (Mean)	Std. Dev.	Obs.
Challenges				
Dealing with Many Topics	You have to deal with a variety of topics and keep track of them	3.606	0.684	142
Information Overload	You are confronted with a high volume of information from which you must filter the information that is important to you	3.296	0.890	142
Pace of Change	You have to identify suitable measures and make decisions in times of rapid change	3.204	0.804	142
Balancing Change	You need to find a balance between traditional and new processes as well as between older and younger employees	3.197	0.877	142
Personnel Development	You need to ensure that your employees receive needs-oriented training to enable them to cope with current and future challenges	2.889	1.014	142
Uncertainty of Employees	You have to familiarise employees with new developments and take away fears	2.838	1.008	142
Data Privacy	You must ensure that company-related data as well as data from your employees are protected	2.811	1.239	143
Permanent Availability	You and your employees are always available via mobile technology, which makes it difficult to distinguish between professional and private life	2.451	1.235	142
IT Security	You need to protect the organisation from IT threats	2.333	1.280	141
IT Aversion of Employees	You have to deal with a defensive attitude of employees towards learning and using digital tools	2.147	1.250	143
Remote Leadership	You have to manage employees who work from different geographical locations	1.901	1.592	142

Note: The relevance of the challenges was measured on a 5-point Likert scale with 0=irrelevant; 1=rather not relevant; 2=middle; 3=rather relevant; 4=relevant.

Table A1: Description of Leadership Challenges

Skills, Traits, and Challenges	Referring Literature
Skills	
Ability to Motivate Others	Gordon and Martin (2019); Iordanoglou (2018); Klus and Müller (2018); Schwarzmüller et al. (2018); Sousa and Rocha (2019)
Ability to Work in a Team	Iordanoglou (2018); Klus and Müller (2018); Nurmi (1996); Phelps (2014)
Analytical and Strategic Thinking	Haycock (2012); Iordanoglou (2018); Klus and Müller (2018)
Assertiveness	Ames (2009); Ames and Flynn (2007); Bacon and Severson (1986); Santora (2007)
Communication Skills	Giles (2016); Gordon and Martin (2019); Iordanoglou (2018); Khan and Ahmad (2012); Klus and Müller (2018); T. V. Mumford et al. (2007); Phelps (2014); Sousa and Rocha (2019)
Decision-Making Skills	Sousa and Rocha (2019)
Entrepreneurial Thinking and Acting	Klus and Müller (2018); Kuratko and Hornsby (1999); Sousa and Rocha (2019)
English Skills	Klus and Müller (2018); Schwarzmüller et al. (2018)
IT Skills	Colbert et al. (2016); M. D. Mumford et al. (2017); Phelps (2014); Sousa and Rocha (2019)
Organisation Skills	Giles (2016); Klus and Müller (2018); Phelps (2014)
Self-Organisation Skills	Haromszeki and Jarco (2017); Klus and Müller (2018)
Self-Reflection Skills	Brown and Posner (2001); Iordanoglou (2018); Klus and Müller (2018); Reichard and Johnson (2011); Sparrowe (2005)
Technical Skills	Kane et al. (2019); Schwarzmüller et al. (2018)
Traits	
Calmness, Composure	Klus and Müller (2018); Ruderman et al. (2001); Seijts and Gandz (2018)
Commitment	Drath et al. (2008); Klus and Müller (2018)
Courage	Crossan et al. (2017); Klus and Müller (2018); Seijts and Gandz (2018)
Creativity	Iordanoglou (2018); Klus and Müller (2018); M. D. Mumford et al. (2017); Reiter-Palmon and Illies (2004); Sternberg (2017)
Empathy	Holt and Marques (2012); Iordanoglou (2018); Klus and Müller (2018); Mahsud, Yukl, and Prussia (2010)
Flexibility	Iordanoglou (2018); Klus and Müller (2018); Phelps (2014); Reiter-Palmon (2003); Yukl and Mahsud (2010)
Goal Orientation	DeGeest and Brown (2011); Hendricks and Payne (2007); Iordanoglou (2018); Klus and Müller (2018)
Independence	Klus and Müller (2018)
Openness Towards the New	Giles (2016)
Willingness to change	Sousa and Rocha (2019)
Challenges	
Balancing Change	Colbert et al. (2016)
Data Privacy	Abowd et al. (2019); Zhang (2018)
Dealing with Many Topics	Klus and Müller (2018)
Information Overload	Klus and Müller (2018); Schwarzmüller et al. (2018)
IT Aversion of Employees	Dimitrov (2018)
IT Security	Kappelman et al. (2013)
Pace of Change	Kane et al. (2019); Klus and Müller (2018); Kohnke (2017); Schwarzmüller et al. (2018)
Permanent Availability	Barley et al. (2011); Golden and Geisler (2007); Kane et al. (2019); Schwarzmüller et al. (2018)
Personnel Development	Kohnke (2017); Schwarzmüller et al. (2018); Sousa and Rocha (2019)
Remote Leadership	Colbert et al. (2016); Kane et al. (2019); Klus and Müller (2018)
Uncertainty of Employees	Schwarzmüller et al. (2018)

Table A2: Literature Review for Survey Items

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var.	**Information Overload**	**Dealing with Many Topics**	**Pace of Change**	**Balancing Change**	**Uncertainty of Employees**	**Remote Leadership**
Expl. Var.: Skills						
Ability to Motivate Others	0.560**	0.183	0.171	0.469*	0.240	0.213
	(0.189)	(0.184)	(0.185)	(0.184)	(0.185)	(0.190)
Ability to Work in a Team	-0.468**	-0.523**	-0.543**	-0.275	0.134	-0.412*
	(0.179)	(0.183)	(0.181)	(0.172)	(0.176)	(0.174)
Analytical and Strategic Thinking	-0.143	-0.047	-0.009	-0.110	-0.090	-0.414*
	(0.192)	(0.191)	(0.190)	(0.188)	(0.193)	(0.194)
Assertiveness	0.046	0.283	0.264	-0.124	0.116	0.002
	(0.183)	(0.182)	(0.183)	(0.179)	(0.179)	(0.184)
Communication Skills	0.220	0.237	0.088	0.069	-0.063	0.235
	(0.150)	(0.152)	(0.150)	(0.150)	(0.155)	(0.150)
Decision-Making Skills	0.001	-0.144	0.040	-0.011	0.190	0.089
	(0.189)	(0.188)	(0.185)	(0.183)	(0.189)	(0.191)
Entrepreneurial Thinking and Acting	0.394	0.500*	-0.140	-0.119	0.434	0.470*
	(0.233)	(0.232)	(0.228)	(0.225)	(0.232)	(0.234)
English Skills	0.086	0.149	0.046	-0.028	0.013	0.060
	(0.113)	(0.114)	(0.111)	(0.110)	(0.113)	(0.112)
IT Skills	-0.008	0.117	0.105	0.012	0.104	0.076
	(0.135)	(0.136)	(0.133)	(0.131)	(0.135)	(0.135)
Organisation Skills	0.421*	0.159	0.197	0.420*	-0.148	0.092
	(0.179)	(0.177)	(0.175)	(0.177)	(0.178)	(0.179)
Self-Organisation Skills	0.051	-0.009	-0.047	-0.033	0.108	-0.046
	(0.175)	(0.176)	(0.173)	(0.172)	(0.177)	(0.172)
Self-Reflection Skills	0.018	0.098	0.007	-0.053	0.057	0.013
	(0.178)	(0.175)	(0.175)	(0.173)	(0.178)	(0.177)
Technical Skills	0.113	0.004	-0.099	-0.035	-0.122	-0.167
	(0.132)	(0.134)	(0.131)	(0.129)	(0.134)	(0.131)
Expl. Var: Traits						
Calmness	0.192	0.059	0.073	-0.058	-0.018	-0.021
	(0.127)	(0.127)	(0.124)	(0.122)	(0.127)	(0.125)
Commitment	-0.130	0.120	0.091	-0.073	-0.126	0.564**
	(0.209)	(0.208)	(0.206)	(0.204)	(0.209)	(0.217)
Courage	-0.222	-0.026	0.292	0.270	-0.202	0.180
	(0.192)	(0.189)	(0.188)	(0.186)	(0.192)	(0.193)
Creativity	-0.0112	0.147	-0.090	-0.030	0.038	0.294*
	(0.139)	(0.139)	(0.137)	(0.134)	(0.138)	(0.136)
Empathy	0.149	0.171	-0.033	0.033	-0.250	-0.138
	(0.153)	(0.152)	(0.151)	(0.148)	(0.155)	(0.156)
Flexibility	0.520**	0.394*	0.525**	0.247	0.359*	-0.062
	(0.180)	(0.180)	(0.180)	(0.171)	(0.176)	(0.177)
Goal Orientation	0.219	0.237	-0.295	0.210	0.299	-0.145
	(0.232)	(0.231)	(0.230)	(0.226)	(0.234)	(0.232)
Independence	-0.525*	-0.091	-0.210	-0.527*	-0.111	-0.185
	(0.254)	(0.249)	(0.252)	(0.250)	(0.249)	(0.258)
Openness Towards the New	-0.350*	-0.332	-0.190	0.061	0.020	-0.068
	(0.171)	(0.175)	(0.162)	(0.160)	(0.166)	(0.163)
Willingness to Change	-0.263	-0.389*	0.011	-0.095	-0.098	0.127
	(0.153)	(0.156)	(0.150)	(0.148)	(0.148)	(0.148)
Controls						
Age	-0.502**	-0.193	-0.248	-0.106	0.035	-0.105
	(0.177)	(0.173)	(0.170)	(0.168)	(0.174)	(0.173)
Female	-0.268	-0.524	0.027	-0.550*	-0.329	-0.536
	(0.142)	(0.282)	(0.279)	(0.278)	(0.285)	(0.290)
Management Level	0.142	-0.307	-0.060	0.113	-0.444*	-0.153
	(0.213)	(0.210)	(0.211)	(0.209)	(0.218)	(0.224)
Number of Supervised Employees	0.083	-0.062	-0.156	0.146	0.038	-0.005
	(0.110)	(0.109)	(0.110)	(0.108)	(0.111)	(0.112)
Years of Experience as an Executive	0.047	-0.007	0.213	-0.006	-0.055	-0.053
	(0.128)	(0.128)	(0.128)	(0.125)	(0.130)	(0.132)
Intercept Cut 1	-1.306	-0.236	-2.662	-2.116	-0.102	0.704
	(1.599)	(1.585)	(1.595)	(1.590)	(1.625)	(1.575)
Intercept Cut 2	-0.198	0.736	-1.884	-0.902	0.526	1.043
	(1.582)	(1.553)	(1.572)	(1.546)	(1.607)	(1.576)
Intercept Cut 3	1.203	1.807	-0.534	0.521	1.747	1.653
	(1.579)	(1.555)	(1.562)	(1.540)	(1.609)	(1.579)
Intercept Cut 4	3.109	3.432*	1.047	1.831	3.777*	2.714
	(1.603)	(1.576)	(1.568)	(1.554)	(1.647)	(1.583)
N	124	124	124	124	123	122
Pseudo R-Squared	0.181	0.176	0.124	0.101	0.105	0.109
Prob > Chi2	0.001	0.001	0.090	0.268	0.311	0.059

Note: This table presents the results of ordered probit regressions. Standard errors are reported (in parentheses). * denotes significance at the 5% level, ** at the 1% level, and *** at the 0.1% level.

Table A3: Overview of the Regression Results (1)

	(7)	(8)	(9)	(10)	(11)
Dependent Variables	**IT Security**	**Data Privacy**	**Permanent Availability**	**IT Aversity of Employees**	**Personnel Development**
Expl. Var.: Skills					
Ability to Motivate Others	-0.170	0.135	0.127	-0.279	0.011
	(0.182)	(0.177)	(0.180)	(0.181)	(0.181)
Ability to Work in a Team	-0.408*	-0.241	-0.189	-0.193	-0.035
	(0.176)	(0.170)	(0.171)	(0.171)	(0.171)
Analytical and Strategic Thinking	-0.465*	-0.144	-0.411*	-0.048	0.174
	(0.191)	(0.186)	(0.189)	(0.186)	(0.189)
Assertiveness	0.259	0.104	0.282	0.164	0.099
	(0.181)	(0.176)	(0.179)	(0.179)	(0.179)
Communication Skills	0.043	0.136	-0.027	-0.007	0.174
	(0.143)	(0.144)	(0.147)	(0.147)	(0.148)
Decision Making Skills	0.266	0.091	-0.356	-0.217	-0.370*
	(0.183)	(0.181)	(0.185)	(0.184)	(0.186)
Entrepreneurial Thinking and Acting	0.034	0.026	0.191	0.321	0.186
	(0.224)	(0.222)	(0.223)	(0.224)	(0.226)
English Skills	0.164	0.003	0.234*	-0.112	0.097
	(0.110)	(0.110)	(0.110)	(0.110)	(0.110)
IT Skills	0.384**	0.294*	0.104	0.357**	0.341*
	(0.134)	(0.132)	(0.131)	(0.132)	(0.134)
Organisation Skills	-0.171	-0.091	-0.162	0.108	-0.046
	(0.173)	(0.171)	(0.173)	(0.173)	(0.174)
Self-Organisation Skills	0.171	0.495**	0.540**	-0.049	0.191
	(0.173)	(0.172)	(0.178)	(0.170)	(0.174)
Self Reflection Skills	0.147	-0.129	-0.202	-0.040	0.090
	(0.171)	(0.171)	(0.172)	(0.170)	(0.173)
Technical Skills	0.122	0.322*	0.183	-0.006	-0.116
	(0.131)	(0.130)	(0.130)	(0.129)	(0.130)
Expl. Var.: Traits					
Calmness	0.061	0.038	0.207	-0.015	-0.046
	(0.123)	(0.122)	(0.125)	(0.121)	(0.123)
Commitment	0.615**	0.623**	0.202	0.488*	0.405
	(0.213)	(0.206)	(0.205)	(0.210)	(0.208)
Courage	0.116	0.188	-0.272	0.265	0.226
	(0.186)	(0.183)	(0.185)	(0.186)	(0.186)
Creativity	0.414**	-0.090	0.218	0.113	0.100
	(0.137)	(0.133)	(0.134)	(0.135)	(0.136)
Empathy	0.182	0.204	-0.041	0.043	0.163
	(0.149)	(0.148)	(0.147)	(0.148)	(0.151)
Flexibility	0.036	-0.077	0.258	0.133	0.183
	(0.175)	(0.168)	(0.172)	(0.170)	(0.172)
Goal Orientation	-0.198	-0.379	-0.003	-0.386	0.238
	(0.228)	(0.223)	(0.227)	(0.226)	(0.226)
Independence	-0.225	0.154	-0.041	-0.201	-0.230
	(0.255)	(0.243)	(0.244)	(0.247)	(0.245)
Openness Towards the New	-0.055	-0.006	-0.155	0.293	0.103
	(0.158)	(0.157)	(0.159)	(0.160)	(0.160)
Willingness to Change	-0.311*	0.016	-0.269	-0.003	0.112
	(0.154)	(0.147)	(0.148)	(0.147)	(0.147)
Controls					
Age	-0.056	-0.036	-0.338*	0.030	-0.290
	(0.168)	(0.167)	(0.172)	(0.169)	(0.171)
Female	-0.652*	-0.307	-0.649*	-0.627*	-0.208
	(0.283)	(0.275)	(0.277)	(0.282)	(0.279)
Management Level	0.028	-0.025	-1.069***	-0.100	0.099
	(0.207)	(0.205)	(0.219)	(0.206)	(0.208)
Number of Supervised Employees	-0.044	-0.036	-0.214	0.079	0.052
	(0.107)	(0.106)	(0.109)	(0.107)	(0.108)
Years of Experience as an Executive	-0.038	0.062	0.068	-0.008	0.189
	(0.124)	(0.123)	(0.125)	(0.125)	(0.127)
Intercept Cut 1	0.759	3.044*	-4.566**	0.138	3.576*
	(1.524)	(1.551)	(1.575)	(1.537)	(1.593)
Intercept Cut 2	1.435	4.060**	-3.782*	0.985	4.671**
	(1.526)	(1.549)	(1.574)	(1.533)	(1.589)
Intercept Cut 3	2.669	5.032**	-2.737	2.476	6.081***
	(1.532)	(1.561)	(1.566)	(1.543)	(1.611)
Intercept Cut 4	3.578*	6.537***	-1.419	3.365*	7.592***
	(1.544)	(1.605)	(1.546)	(1.552)	(1.656)
N	122	124	124	124	124
Pseudo R-Squared	0.136	0.125	0.171	0.131	0.152
Prob > Chi2	0.006	0.024	0.000	0.017	0.007

Note: This table presents the results of ordered probit regressions. Standard errors are reported (in parentheses). * denotes significance at the 5% level, ** at the 1% level, and *** at the 0.1% level.

Table A3: Overview of the Regression Results (2)

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Seit Institutsgründung im Oktober 2010 erscheint monatlich ein Diskussionspapier. Im Folgenden werden die letzten zwölf aufgeführt. Eine vollständige Liste mit Downloadmöglichkeit findet sich unter http://www.wiwi.uni-muenster.de/io/de/forschen/diskussionspapiere.

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Founder-CEOs and Innovation
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Dezember 2018

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