

Abstract

Digitalisation is an essential factor for doing business in the 21st century to stay competitive and be efficient. Leadership is recognised as a central factor for success in many organisations already. Therefore, this thesis investigates the influence of digitalisation on leadership in the 21st century. The concepts of leading by empowerment, shared leadership as well as visionary leadership are researched on in detail.

The literature on digitalisation, leadership and the changes in leadership towards digitalisation are examined and the central factors digital competence, openness for innovation, social and emotional intelligence, teamwork and collaboration and empowerment together with shared leadership are worked out.

The industry analysis, taking the DAX 30 companies into account, demonstrates which extend the factors, named above, influence prevailing leadership styles. For this purpose, profiles of the companies regarding their digitalisation in leadership are compiled and the companies are classified by their degree of digitalisation in leadership. AS a result, the number of employees and the age of a company have a weak negative correlation with the company's degree of digitalisation in leadership. The EBIT and the spending on R&D however, show a positive correlation with the degree of leadership digitalisation. Generally, most analysed companies are not highly digitalised yet.

Keywords: Digitalisation, Digital leadership, Leadership, Leadership digitalisation, DAX 30

JEL classification: L25, M12, M14, O32

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III LIST OF ABBREVIATIONS

BMW	Bayrische Motoren Werke
DAX	Deutscher Aktien Index (German stock market index)
EBIT	Earnings before interest and taxes
FMC	Fresenius Medical Care
HR	Human resources
R&D	Research and development
VUCA	Volatile, uncertain, complex, ambiguous

1 Introduction

1.1 Research problem

Digitalisation is the process of adopting new technologies to generate innovations and implement digital tools within organisations (used interchangeably with companies). This has an influence on all areas of an organisation – its efficiency, internal processes and culture including the prevailing leadership style. In the last years, digitalisation became of importance to stay competitive with regard to customers and employees' demands.

Leadership involves the guidance, inspiration and influence on others along with decision-taking. Hereby, the focus lies on a common goal to be reached. Modern leadership refers to elements and characteristics that became of importance over the last years by practicing leadership in companies.

Representing the German economy the German stock market index (DAX) is an auspicious starting point for such an analysis. This index lists the 30 organisations with the highest turnover and the largest stock being located in Germany.

This thesis aims to provide an analysis of the influence the elements and characteristics of modern leadership, developing through digitalisation, have on the practices in the DAX 30 companies. The focus lies on in how far these characteristics, evolving from theory, affect the leadership practices in these organisations. With regard to that, possible influencing factors on the degree of digitising the prevailing leadership style are examined.

1.2 Course of investigation

Based upon the research question possessed in chapter 1.1 this thesis focuses on digitalisation and leadership.

Chapter 2 reviews the literature on digitalisation and leadership in the 21st century. First, digitalisation is defined and delimited in chapter 2.1. Further, the evolving changes through digitalisation are assessed. The next chapter, 2.2, gives a definition and delimitation on leadership and additionally presents details of modern leadership in the 21st century. Following, Chapter 2.3 combines the aspects of digitalisation and leadership and gives a final conclusion regarding digital leadership.

The third chapter provides an industry analysis. First, the used method as well as the companies being analysed are described in chapter 3.1. Afterwards, a profile of every company is constructed with regard to its degree of leadership digitalisation. Last, influencing factors are analysed and the results are given in chapter 3.3.

Finally, chapter 4 provides a conclusion of this thesis. A recapitulation of the findings as well as a clarification of the research question is dealt with in the summary in chapter 4.1. The ensuing chapter critically acclaims the present thesis and finally an outlook of the topic concerning digital leadership and its implication in practice is provided.

2 Digitalisation and leadership in the 21st century

2.1 Digitalisation

2.1.1 Definition, terminology and delimitation

Digitalisation is defined differently in the literature. Bengler and Schmauder (2016) evaluate two definitions: In a narrow sense digitalisation is about digitalising information from an analogue to a digital storage of data. Out of this evolves the broader sense which is eligible to individuals, organisations and the society. For *individuals* digitalisation influences the procedures and working methods not only in a business but also a private context. *Organisations* try to use the digitalisation for increasing efficiency and better networking – internal as well as external. Hence, it is necessary to modify instruments and equipment for leaders to use digitalisation as an advantage (Bendel 2018b). Technological innovations and IT solutions lead to a more connected and digital environment and make it possible to get in contact and exchange with co-workers, customers, suppliers and other stakeholders even over geographical distances (Westerman et al. 2017, p. 4). Through the process of digitalisation, the *society* experiences new services and networking opportunities, which lead to dynamic processes in interaction and the regular exchange of information (Bengler & Schmauder 2016, p. 75ff.).

Looking closer on the influence digitalisation has on organisations there are two sides to it. It is not only about digitalising tools or innovating and using new technologies but rather influences all areas of an organisation (Krause 2016, p. 37; Bouée 2015). A successful digitalisation influences the organisation's culture, its mind-set and its

prevailing leadership (Krause 2016, p. 37; Bouée 2015; Buhse 2012, p. 238). Such a new culture should promote and create opportunities for digitalisation on all levels (Krause 2016, p. 37). It changes the way how, when and with whom to share information, the interaction and relationship building between employees of all hierarchical levels and the design of the workplaces (Bouée 2015).

For the present thesis, the main focus does not lie on the technological developments but rather on the influence of digitalisation on organisational level - more specific on its influence on the prevailing leadership style.

2.1.2 Changes in the world towards digitalisation

The process of digitalisation exposes companies to new challenges, such as the need for new technologies and innovations, to keep up with the increasing diversity in consumer needs, wishes and requirements and through this secure competitive advantages (Wildemann 2015, p. 43ff.). Additionally, constant changes in the environment as well as disruptive innovations and business models ask for reaction from organisations. Details on this are further explained in the following paragraphs.

Digital technologies develop fast and lead to increasing connectivity on a business and a private level by using for instance social media and provide new tools for analysis as well as data storage and sharing via cloud based software (Berman & Marshall 2014, p. 9ff.). The sharing of information, being connected to and interacting with consumers by using fast developed technologies for communication has become essential for organisations to be successful (Dess & Picken 2000, p. 18). These opportunities provide the chance to understand the consumer better, predict its wants and needs and act accordingly – giving room for but also demanding customisation to secure the organisation's competitiveness (Berman & Marshall 2014, p. 9ff.; Wildemann 2015, p. 43ff.). But not only do new technologies help serving the customer better. Additionally, they keep organisations attractive for potential employees with digital skills and understanding, who are willing to use this competencies at work (Buhse 2012).

Aside from the increasing complexity and digitalisation the business world is yet exposed to constant changes (Berman & Marshall 2014, p. 9). The theory of the VUCA world describes the environment in the economy of the 21st century as volatile,

uncertain, complex and ambiguous (VUCA) (Codreanu 2016, p. 31). Volatility refers to the changes in the economy, which make it harder to predict and identify changes by experience value. Not being able to predict the future, the environment becomes clearly uncertain, which leads to difficulties in decision making processes. The ability of almost free international movement pushes the complexity as several nationalities take influence on national markets. Big data additionally adds on to the complexity. This term is used when speaking of a huge amount of data to be saved and evaluated with specialised tools (Bendel 2018a). Big data facilitates to understand the new customer demands but also challenges organisations to collect and understand this data (quoted after: Codreanu 2016, p. 31ff.; Mack 2015, p. 17). Understanding the complete set of factors having influence on a situation or decision becomes almost impossible (Yarger 2006, p. 18). Permanent and schematic solutions no longer work out but rather have to be adjusted and modified each time a problem occurs (Yarger 2006, p. 18; Codreanu 2016, p. 31ff.). Consequently, the environment becomes ambiguous. Multifactor analysis and scenario thinking become necessary to grasp at least some of the possible alternatives (quoted after: Codreanu 2016, p. 31ff.; Buhse 2012, p. 244). Organisations have to react to the VUCA world by being flexible, taking quick decisions and prioritise (Bakshi 2017, p. 15). Especially leaders take an important and strategic part in managing this VUCA environment (Codreanu 2016, p. 37). They are to “influence [...] the volatility, manage the uncertainty, simplify the complexity and resolve the ambiguity [...]” (Yarger 2006, p. 37).

Since the beginning of the 21st century digitalisation influences not only the networking and efficiency of processes within organisations but also leads to disruptive innovations from the outside, for instance in form of new technologies or innovative business models. Disruptive innovations completely displace other technics or methods by challenging established businesses while serving the customers that are demanding most (Buhse 2012, p. 241). These disruptive innovations impact on existing business models and value chains (Berman & Marshall 2014, p. 10). Disruptive innovations do not necessarily come from the outside of an organisation. Rather they can also evolve from the inside as a result of innovative problem solving and solution finding (Velten et al. 2015, p. 8). However, when using this term regularly the disruption from outside is referred to

(Buhse 2012, p. 241). An Example for a disruptive innovation would be the streaming platform Netflix, which highly impacted the film industry (Buhse 2012).

2.2 Leadership

2.2.1 Definition, terminology and delimitation

Before defining leadership as such, it is helpful to take a look at competencies needed by leaders in the 21st century and from there try to define leadership in this very century.

Leaders regularly have to make decisions which affect and impact numerous individuals (Rhode & Packel 2011, p. 3). Therefore, leaders are needed that understand the new economy and the changing environment. Leaders that have a vision to follow, that have a certain degree of influence, that are being innovative, that are able to make decisions and that have the technical competencies to understand the digitalisation and its processes not to miss out the importance of emotional intelligence of a successful leader (Rhode & Packel 2011, p. 3ff.; Goleman 2011, p. 1ff.; Weathersby 1999, 5). To reach higher organisational goals, leaders need to exude confidence as well as the support of their employees or team. This can be achieved by focusing on team processes and the special capabilities of every individual (DuBrin 2010, p. 501; Weathersby 1999, p. 5). Different from many assumptions, leadership does not only happen in the top level management. Rather does leadership take place on every level and in every situation (Bryman 1996, p. 282).

In the literature, there is no clear opinion or consensus whether leadership is part of management (Robinson 1999, p. 21) or vis versa (Weathersby 1999; U.S. Army, quoted after: Murphy & Murphy 2018, p. 42). However, leadership is not equal to management (Murphy & Murphy 2018, p. 42). Scientists worked out differences between leading and managing. The following table 1 comprises some of these differences.

Table 1: Differences between management and leadership

Management	Leadership
thinking of organisation	thinking of organisation & global trends
rational and tangibles	intangibles (vision, values & motivation)
control and command	persuade with a vision, low hierarchies
roles and responsibilities	inspire and embrace
system & structure oriented	people oriented
performance development	talent development
given hierarchical power	having voluntary followers
'need-to-know' basis	open communication
hierarchical information structure	transparency
manage within bureaucratic boundaries	lead beyond boundaries
maintaining	innovative
stability	change

Source: own table based on Gardner 19990; Murphy & Murphy 2018, p. 41ff.; Weathersby 1999, p. 5; Robinson 1999, p. 20ff.; Kumle & Kelly 2000, p. 9ff.; Voigt & Guariglia 2015, p. 15; Trends Insight 2017

Apparently as to be seen in table 1 a central point of difference is the focus of managers on the organisation, whereby leaders focus on the people and teams working in the organisation. Managers are more rational and controlling, they think in clear structures, roles and responsibilities. In contrast, leaders try to create a vision, follow it with values and use it to motivate and empower their employees. Managers distribute information on a hierarchical structure to the person who needs these in order to complete their tasks. Leaders on the other hand, try to communicate transparent and make information available to everyone. One of the main differences from leadership to management is the willingness of others to follow the executive. While managers are followed because the organisational structure demands it, leaders are followed voluntarily without a hierarchical force. Leaders do not need to be given power by the organisation but for sure can. Especially in view of the unstable environment and the constant changes it becomes even more important to lead instead of manage (Murphy & Murphy 2018, p. 41ff.).

Concluding, leadership is about guiding and inspiring others but also about decision-making (Bass 1985, p. 34ff.; Rhode & Packel 2011, p. 3). It is about taking influence – on other employees or even the organisation (Bürgi & Schmid 2007, p. 3) -

to aim for and finally reach a common goal (Pfaff et al. 2009, p. 188) and further about people and innovation (see table 1).

2.2.2 Leadership in the 21st century

As already evaluated in the chapter 2.1.2 “changes in the world towards digitalisation” the changing environment requests for adjustments, modifications and regular updates in the organisational leadership style. The main goals of an organisation are no longer only stability, efficiency and performance and the tools centralised decisions, hierarchical structures and number-oriented control systems. Rather, innovation, creativity, adaptability to change and responsibility become key factors of leadership. Whereby hierarchical structures lose their importance (Dess & Picken 2000, p. 19). The new leadership styles need to be able to handle constant changes in the economy wherefore more flexibility is needed (Alimo-Metcalfe & Alban-Metcalfe 2005). Leaders that can fulfil these new claims – being more flexible, innovative, inspiring and challenging than before – are indispensable (Bennis 1989, p. 6ff.). Traditional structures tend to be outdated in the 21st century. Instead, empowering, motivating and sharing of knowledge attain great importance (Dess & Picken 2000, p. 19). In praxis, a development from hierarchical management to leadership with voluntary followers can be perceived (Murphy & Murphy 2018, p. 42ff.).

These new requirements lead to new concepts of leadership in organisations. Three of them are examined closer in the following:

- Leading by empowerment
- Visionary leadership
- Shared leadership

Leading by empowerment

In times of change and digitalisation with new aspects of leadership, empowerment becomes a key element to lead successfully. According to Randolph (1995) there are three key factors to empower successfully: the sharing of information (1), creating autonomy by establishing structure (2) and setting up teams and networks instead of hierarchical structures (3). Employees start to bring in their full potential to help the organisation to succeed, if they understand how it performs relatively to the market

and if they have trust in the organisation and its management. This intrinsic motivation can only be activated by giving insights to employees “by opening the books” (Randolph 1995, p. 22). If given access to information and the freedom to work and decide self-responsible in a certain frame, it becomes unavoidable for employees to use their knowledge, experience and motivation independently. These clear structures and boundaries in a time of freedom and self-responsibility build a culture of empowerment within an organisation. Complex situations require starting from different points of thinking and innovative ways for solution finding. To entice employees coming up with these, empowerment is necessary. Following, flat hierarchical structures where empowered or rather self-directed teams take over responsibilities and decision-making are necessary and of advantage in a complex environment (Randolph 1995, p. 27ff.). Self-directed teams are teams with decision-making power to a certain degree which is mostly only granted to executives and the accompanying responsibility (Davis et al. 2004, p. 180; Codreanu 2016, p. 34ff.). Self-directed teams use all available knowledge and distribute tasks optimally. This leads to faster and more efficient processes and consequently often to time and money savings (Yang & Guy 2011, p. 539). Through information sharing and autonomy the organisation empowers their employees (Dess & Picken 2000, p. 18; Randolph 1995, p. 22). Additionally, employees become more effective and motivated by being empowered and given responsibilities (Bass 2014, p. 42). Asking such working conditions to bring good results, self-directed teams and employees have to be held liable and responsible for their given freedom and resulting decisions and actions (Codreanu 2016, p. 34ff.).

Visionary leadership

As mentioned earlier creating a vision is quite important to lead successfully. Missing a vision can lead to inefficiency and aimlessness of the team’s work (Stoner et al. 2007, p. 21ff.), whereby a vision can give a purpose of work and the opportunity to fulfil tasks with own creativity by finding innovative solutions (Dess & Picken 2000, p. 19; Bucata & Rizescu 2016, p. 160ff.). Leaders, by formulating a vision, predefine a higher goal to aim for but do not stipulate the way to get there (Bucata & Rizescu 2016, p. 160ff.). To make this concept successful employees need to understand the vision and fully support it. It can be helpful to design and develop this vision together as a team. After successful implementation leaders can empower their employees as

they understood their contribution to the higher goals of the team or even the organisation and will act according to this without strict supervision (Stoner et al. 2007, p. 21ff.). Logically, the leaders act accordingly to this vision too - it serves as a goal to keep aiming for even after fall-backs (Bennis 1989, p. 6ff.). A vision can additionally help to increase the employee's self-motivation, which leaders need to rely on, if not being on-site. The more the employees back the vision and support it, the more decision-making power can be delegated to them. Furthermore, employees start to take self-initiative for their learning and future and are enabled to be creative and innovative, which serves the complete organisation (Stoner et al. 2007, p. 21ff.).

Shared leadership

Different situations do not only ask for different leadership styles of one leader but may also ask for another person from the team taking over the role of leadership (shared leadership). Shared leadership evolved, as organisations can no longer rely only on their leaders but need to rely on every employee's talent as well as their capabilities and experiences (Dess & Picken 2000, p. 18ff.). Furthermore, leaders are no longer omniscient but experience knowledge-gaps in comparison to the subject matter experts (Fowler et al. 2007, p. 104). Being able to rely on this experience and knowledge of all individuals and experts in a team requires leaders to be flexible within the role they are taking - being a coach vs. a teacher or an information provider vs. a decision maker. Leaders are becoming enablers instead of being omniscient (Dess & Picken 2000, p. 18ff.) and the employees on the other hand are taking over leadership in situations they are subject matter experts at. Consequently, every team member can take over the job-specific leadership (Carew Don et al. 2007, p. 183; Yukl 2014, p. 267ff.).

2.3 Changes in leadership through digitalisation

2.3.1 Factors impacting leadership

Digital leaders need to have additional skills (Jakubik & Berazhny 2017, p. 478) to react to the challenges and changes named in the chapters above. Hence, flexibility within the organisation and room for reaction is needed which can be achieved through revising and if necessary updating the leadership tools and culture (Reddy 2018, p. 467ff.). Leaders that are open for innovative problem solving solutions and to break new grounds push forward the digitalisation process in organisations

(Hofmann & Krieger, p. 19). Essential skills and traits leaders are required to have are named and explained below (Westerman et al. 2014):

- Digital competence
- Openness for innovation
- Social and emotional intelligence
- Teamwork and collaboration
- Empowerment and shared leadership
- Provision and support of a vision

Digital competence

To successfully keep up with the digital transformation, organisations need employees and leaders that are skilled in digital tools and new technologies as well as being aware of thereby arising opportunities (Berman 2012, p. 22). Additionally, the leaders should engage others in digitising their processes. Facing this challenge, it is essential for leaders to use evolving technologies and implement them in their own and the team's daily working life (Velten et al. 2015, p. 23). Social networking not only with externs but also internally enables the organisation to fulfil the digitalisation process also on a leadership level and create opportunities for an innovative mind-set and business growth (Stehr 2016, p. 25; Berman 2012, p. 22). The usage of social networks should be promoted internally with other employees as well as externally with customers, suppliers and other stakeholders. Leaders should be role models by using online communities and digital tools and encourage their employees to do the same (Berman 2012, p. 22).

Openness for innovation

Innovation in general, no matter if meant in terms of leadership or on a technical level, is essential to stay competitive on the market (Porter 1990, p. 74). Innovation in teams can embed new ideas and working methods in an organisation. Through a higher level of innovations, better performance and success can be achieved (Fathurrahim et al. 2018, p. 63). For successful leadership in times of change and digitalisation, leaders need to be dynamic and open for new innovations – on all levels (Reddy 2018, p. 467ff.). Additionally, they have to be motivated to execute innovations and push them forward (Şen & Eren 2012, p. 11; Velten et al. 2015, p.

9ff.). Especially in the 21st century, innovations are essential to every organisation and form of business, as the environment changes constantly and therefore requests for new solutions. Many innovations and new software solutions are rolled out on the market every day. Especially new IT-solutions need to be checked on their usability and adding value and correspondingly be implemented and pushed forward internally (Buhse 2012, p. 243; Velten et al. 2015, p. 25). This should be positively assessed by leaders (Buhse 2012, p. 243). Through openness for innovations on all levels, the digital transformation within an organisation can be positively influenced and accelerated (Buhse 2014). Further, an open culture for mistakes is necessary to comfort employees making mistakes and thus feel comfortable to be innovative, to try out new and experiment (Semle 2012, p. 194).

Social and emotional intelligence

As already mentioned above, social and emotional intelligence is essential for leadership in the 21st century. Emotional intelligence is the ability to control and recognise others and own emotions, using this to take influence and direct the actions and thoughts of others (Mayer & Salovey 1993). Only with this ability to control and influence emotions a leader can guide its followers without hierarchical structures (Weathersby 1999). Having social intelligence means “to understand others and to act rationally and emotionally in relations with others” (Herzig et al. 2017). This ability can be used to build self-directed teams with decision-making power. Hereto, leaders need to be inspiring and motivating for their followers to ensure they follow the higher goals, which are often defined by a vision (Bass 1985, p. 35; Bucata & Rizescu 2016, p. 160ff.). Additionally, a strong network and good relations to the IT-department are essential for a digital leader. To build such contacts and hold them up, social and emotional intelligence is of advantage (Westerman et al. 2014, p. 156ff.). As mentioned earlier, self-directed teams are important in times of change and digitalisation (Randolph 1995; Bass 1985, p. 35), as the leader is not always on-site (Southers et al. 2009, p. 4) and has to trust in the self-motivation of the team (Stoner et al. 2007, p. 21ff.). In this situation trust from both sides – from the leader to the team and vice versa – is necessary (Carew Don et al. 2007, p. 175; Randolph 1995, p. 22ff.; Southers et al. 2009, p. 10ff.). This situation for sure requests for leaders instead of managers (Murphy & Murphy 2018, p. 41ff.). Through the dissolving hierarchical structures in organisations (Dess & Picken 2000, p. 19),

leaders with high social and emotional intelligence find voluntary followers more easily (Weathersby 1999).

Teamwork and collaboration

According to BusinessDictionary.com (n.d.), if two or more people work together and are aiming for a common goal but nevertheless have differentiated tasks they practise teamwork. In the 21st century, leadership does no longer only take place face-to-face in the office but also on distance, which means that some leaders see their team rarely or not at all (Fowler et al. 2007, p. 103). New technologies provide the opportunity to exchange information very fast and on eye-level even over geographical distance (Lipkowski 2016, p. 20) as well as having dispersed teams working effectively together from all over the world (virtual teams) (Southers et al. 2009, p. 1ff.). Especially these virtual teams need and use new technologies and software solutions for their communication (Jakubik & Berazhny 2017, p. 478). To do so, hardware equipment like laptops and cell phones is essential and should be provided by the employer (Braun-Görtz 2012, p. 11). A fundamental factor for leadership and successful teamwork is trust, wherefore regularly personal contact is needed (Carew Don et al. 2007, p. 175; 2009, p. 110; Stehr 2016, p. 25). Through communicating with the help of digital tools and the fact that leadership and teamwork no longer take place on-site necessarily, some parts of communication, regularly delivered via facial expressions and gestures, are lost (Southers et al. 2009, p. 4ff.). However, it is not impossible to communicate effectively and be productive even without staying in face-to-face contact (Carew Don et al. 2007, p. 167). Further, the named factors above make it nearly impossible to lead in the traditional, hierarchical way (Fowler et al. 2007, p. 103ff.), which is in accordance to the general trend towards networks instead of hierarchically built teams (Stehr 2016, p. 25). Additionally, networks and a dismantling of hierarchies help to create new, innovative ideas and to implement the digitalisation in the workforce. Furthermore, flatter hierarchies create impulses from the bottom instead of top-down, which can help to motivate employees to back these changes and pushing the transformation self-motivated forward. Advantages of networking and interconnectedness can be efficiently exploited in practice (Buhse 2012, p. 246). An improvement in communication and cooperation within the organisation is one of the main benefits of digitalisation (Velten et al. 2015, p. 32). It allows collaborating across regional

borders and to achieve best results. Collaboration means to voluntarily work and develop ideas together no matter the field of expertise or hierarchical position (Appley & Winder 1977; Buhse 2012, p. 237ff.). Collaboration is essential as employees are used to the possibility to network and connect with experts from all over the world from their private live and therefore expect the same possibilities in their business live. Implementing a social media platform on the intranet can support collaboration among the workforce. Such a technical update and modernisation supports the employee's need to work creative, independent and efficient. An essential factor for such a platform is the possibility to use it not only across regional but also across hierarchical borders (Buhse 2012, p. 237ff.).

Empowerment and shared leadership

As already stated above, empowerment becomes a central tool for leadership in the 21st century. Not only through entrusting every employee or setting up self-directed teams with autonomy but also through sharing the job-specific leadership rather than retaining alleged omniscient leaders (Jakubik & Berazhny 2017, p. 474; Salicru 2015, p. 159). Leaders take over the role of moderators, bridge builders and organisers together with paving the way for their team. Hereby, many impulses are generated bottom up and no longer only top-down (Buhse 2012, p. 237ff.). Empowerment additionally triggers the innovations within an organisation and is therefore a key factor for digitalisation (Fathurrahim et al. 2018, p. 63). Further, empowerment takes place by sharing the leadership and handing over decision-making responsibility to employees and team members (Carew Don et al. 2007, p. 170). The faster exchange of information (Mack 2015, p. 10) through digitalisation and more flat hierarchies (Berman & Marshall 2014; Carew Don et al. 2007, p. 165ff.; Buhse 2014) triggers the need for this faster decision making processes (Westerman et al. 2014, p. 103, 112, 137). Shared leadership is an expression of trusting employees, which is essential for digital leadership (Southers et al. 2009, p. 4ff., p. 10ff.), as they are endowed with decision-making power and responsibility (Boies et al. 2010, p. 196; Dess & Picken 2000, p. 18; Carew Don et al. 2007, p. 170). Furthermore, shared leadership opens up opportunities for reverse-mentoring programs. In such a program an employee with high digital knowledge and competencies can offer (top management) executives insights to this topic. To enable all employees to keep up with the digital transformation such a program can assist and push the digitalisation. Preconditions

are flat hierarchical structures and shared leadership (Westerman et al. 2014, p. 226ff.). On the other hand, shared leadership is a necessary instrument to fulfil effective team work (Bergman et al. 2012, p. 34; Yukl 2014, p. 265ff.) and needs elements such as a shared vision and open communication instead of command-and-control to work out well (Fowler et al. 2007, p. 103; Harwood 2008, p. 66; Hinrichs et al. 2008, p. 131ff.).

Providing and supporting a vision

The visionary leadership poses employees a guideline and helps them to be autonomous in work and thus be more successful and efficient. It is useful, to implement the digital mind-set into this vision to ensure that digitalisation is lived and the process of change is pushed forward. Employees then internalise this important thinking and take it into account in every decision they are taking (Buhse 2012, p. 237ff.; see p. 8).

2.3.2 Digital leadership

Scientists have not yet agreed on a common definition of digital leadership. For sure it is about leadership as defined in chapter 2.2.1. But, digital leadership has something in addition to it: old leadership principles need to be abstracted and connected with the new models for success, such as openness, transparency, interconnectedness and sharing (Buhse 2012, p. 243). Reedy (2018) defines digital leadership differently to Buhse stating that it is the “strategic use of a company’s digital assets to achieve business goals” (Reddy 2018, p. 467ff.). For Velten et al. (2015) digital leadership requires fundamental, technological knowledge as well as a high level of participation and innovation. All of these definitions state in common that digital leadership has an impact on the individual as well as the organisational level. The conjointly developed vision as part of digital leadership attains that every individual is more aware of the subordinate goals of the organisation and has a good understanding how he or she contributes to them with his or her work. The organisation as such can take advantage of their own assets and through this create and strengthen competitive advantage on the market (Reddy 2018, p. 467ff.). However, digital leadership is not only about implementing the process of digitalisation in the employees work and hereby within the organisation. It is also about using new digitalised tools to lead (Westerman et al. 2014, p. 156ff.).

3 Industry analysis

3.1 Method and companies

This industry analysis investigates the DAX 30 companies and analyses their implementation of digital leadership. The DAX is an index which lists the 30 organisations with highest turnover and largest stock located in Germany (Heldt 2018). The following table 2 comprises these organisations after the last adjustment in March 2018. The table is sorted after number of employees.

Table 2: DAX 30 companies

Company	Employees	Industry
Deutsche Börse AG	5.640	Finance
Vonovia SE	8.448	Others
Volkswagen AG	13.955	Engineering, traffic, logistic
Covestro AG	16.176	Others
Beiersdorf AG	18.934	Trade and consumption
Infineon Technologies AG	37.479	Electronic, hard- and software
Munich Re	42.410	Finance
E.ON SE	42.699	Energy, raw materials
Commerzbank AG	49.417	Finance
Merck KGaA	52.941	Chemical, Pharma, biology - and medical technology
Henkel AG & Co. KGaA	53.700	Chemical, Pharma, biology - and medical technology
Adidas AG	56.888	Trade and consumption
Linde AG	57.605	Engineering, traffic, logistic
HeidelbergCement AG	59.054	Others
RWE AG	59.547	Energy, raw materials
SAP SE	88.543	Electronic, hard- and software
Deutsche Bank AG	97.535	Finance
Bayer AG	99.592	Chemical, Pharma, biology - and medical technology
Fresenius Medical Care AG & Co. KGaA	114.000	Chemical, Pharma, biology - and medical technology
BASF SE	115.490	Chemical, Pharma, biology - and medical technology
Deutsche Lufthansa AG	129.424	Engineering, traffic, logistic

Bayrische Motoren Werke AG	129.932	Engineering, traffic, logistic
Allianz SE	140.553	Finance
ThyssenKrupp AG	158.739	Conglomerate
Deutsche Telekom AG	216.000	Electronic, hard- and software
Continental AG	235.473	Engineering, traffic, logistic
Fresenius SE & Co. KGaA	273.249	Chemical, Pharma, biology - and medical technology
Daimler AG	289.321	Engineering, traffic, logistic
Siemens AG	372.000	Electronic, hard- and software
Deutsche Post AG	519.544	Engineering, traffic, logistic

Source: Own table based on Boerse ARD 2018; Boerse.de 2018; Annual Reports 2017

The number of employees is recorded a bit different in the annual reports – some state the number of employees including the apprentices, others exclude them; some list the average amount of 2017, some the number at reporting date. However, these differences do not lead to huge deviations, wherefore they are not considered further.

For this analysis online available data from the listed companies that give indications for the practiced leadership style are used as the primary source. This includes leadership principles, the human resources (HR) strategy, the annual report - especially, but not limited to, the combined management report and the combined non-financial report - as well as information and documents being accessible on the companies' websites giving insights to the prevailing leadership style. Material which was published before 2010 is not taken into consideration as there is a high probability that they are updated already or not in the favour of leadership digitalisation. Further, to make use of the original documents, most materials considered are in German language.

First, the analysis of the material is used to construct a profile of every company regarding their digitalisation in leadership. This profile is then aligned to the theoretical background presented in chapter 2 (Appendix, p. 1ff.). Afterwards, in chapter 3.3 the results are summed up by building four categories regarding the level of digitalisation in leadership. This overview is illustrated in table 3. Based on these four categories, possible influencing factors and correlations on the different degrees of digitalisation of leadership are evaluated.

3.2 Companies' leadership profiles

The following analysis is based on the annual reports as of 31.12.2017 and the organisations' websites together with online available documents. The company names are shortened in the text with no use of the legal form. The profile is used to rank the companies regarding their degree of digitalisation in leadership (table 3) and examine on influencing factors.

Deutsche Börse AG

The *Deutsche Börse* has with 5.640 employees the smallest workforce of all DAX 30 companies. The lived culture sets responsibility, motivation, flexibility and team spirit into focus. To simplify collaboration for employees, modern working environment solutions are implemented by installing for instance Sharepoint, Skype for Business and Good Work. Additionally, spaces are designed where flexible work environment is available and usable depending on the specific task. Further, *Deutsche Börse* requests social and emotional intelligence from their employees to ensure their ability to take over leadership roles at an early career stage.

Digital competence is necessary but not trained to use the newly introduced tools for collaboration. Although, teamwork is made attractive through open working spaces, further development is needed as it is only applicable at one location so far. Establishing virtual software increases virtual teamwork possibilities for employees. These new chances let assume the availability of hardware. Together, these factors show the focus on teamwork and collaboration at *Deutsche Börse* and the opportunity to shape and manage this virtually. Social and emotional competence is an essential characteristic to pursue a career at Deutsche Börse.

Vonovia SE

Vonovia established a vision and mission statement which was developed together with executives in 2016. Thereof, values such as commitment, pragmatism, responsibility, customer orientation, innovativeness, appreciation and team spirit evolve. These values are used as a basis for the leadership principles. *Vonovia* states in their annual report the importance of teamwork to finish projects successfully in time and the contribution of every employee.

There are indicators for teamwork, vision, empowerment and innovation at *Vonovio*. However, the information is not precise enough for a more detailed analysis.

Volkswagen AG

In their goal dimensions *Volkswagen* presents the willingness to become an excellent employer by providing equal opportunities and a modern working environment. Additionally, they affirm the importance of a good leadership and organisation culture to attract and retain talents. On the website a vision and mission as part of the *Together 2025* strategy are stated. Additionally, *Volkswagen* established Chief Digital Officers in all brands to enhance the digitalisation in all processes and to stronger interface with the IT-department. Further, they released a *digitalisation offensive 2020* and want to establish a network connecting the organisation.

Volkswagen is still updating their new leadership and has not released enough detailed information yet for a further analysis.

Covestro AG

Covestro has a defined vision and mission including values and guidelines applicable organisation-wide and being released top-down. The values are curiosity, courage and colourful and the guidelines value adding, sustainability, innovation, health security, environment and energy & quality. Curiosity is considered here with regard to support the progress and flexibility of the organisation. *Covestro* wants courageously try out new path and solutions. Colourfulness is established in using creative ideas to come up with innovative solutions for customers. In order to exchange innovative ideas besides other information more easily and faster an intranet and an online community are established. To support this exchange, events are organised and teams are set up on a network structure. Employees are desired that bring in new ideas, collaborate and express critical thoughts. Developing own ideas and for this purpose setting up teams is appreciated. Further, structures are flat and hierarchies are dismantled. Leaders are asked to trust in their teams, hand over responsibilities and allow freedom.

At *Covestro* the vision and mission are put into practice and are applicable organisation-wide. Innovation is a central focus point and therefore highly appreciated - not only for customer satisfaction but also for internal processes. Collaboration between single employees and teams is supported through tools, events and software solutions. Using these introduced tools, a certain digital competence is necessary. The dismantling hierarchical structures support the collaboration as well as the empowerment of employees. They are to take own

decisions and responsibilities, build self-directed teams and take over the leadership whenever they are subject matter experts. Teamwork is supported through the requirement of coming together to develop ideas and the existing network structure. Coming together on a voluntary, self-organised basis requires social and emotional intelligence not only from leaders but also every other employee.

Beiersdorf AG

In their strategy, *Beiersdorf* delineates the importance of innovation power, digitising the operative business and people. Innovation is mainly focused on new products and innovative product solutions. Digitalisation is pushed once to increase the customer dialog and using online platforms for distribution and second to provide e-learning opportunities and develop employees' digital skills. 'People' puts the employees and their engagement in focus. At *Beiersdorf*, dialog on eye level and participation are important. Besides, the exchange of employees on a national and international level is supported through centrally organised events and the introduction of an intranet platform called *BluePlanet*. Additionally, four values are described: care for colleagues, customers and brands as well as society & environment (1); simplicity in decision-making processes & a focus on the essential (2); courage by seeing change as a chance & taking the initiative (3); trust in made promises and by respect (4).

Innovation is a focus point at *Beiersdorf* and employees are asked to take the initiative. Therefore openness for innovation is important. Digitalisation in general also seems to be a focus point for overall business success instead of an aim for internal leadership. Nonetheless, together with the installation of e-learning opportunities for digital competences it requires digital competence. Empowerment takes place by appreciating participation. Collaboration is supported at *Beiersdorf* on a face-to-face and a virtual level by events and an intranet.

Infineon Technologies AG

To bundle all activities done for employees three pillars are established at *Infineon*. First, excellent leadership is defined at *Infineon* through a bilateral feedback process and management development programs. Second, talent promotion includes talent marketing and management, promoting diversity, cooperating with universities as well as qualifying and educating the employees. The third pillar 'our workforce' puts the focus on health management, specialist skills development and employee

expenses. In addition to these pillars, *Infineon* developed a model to create behaviour aiming for high performance. Displaying commitment, innovation, partnering and performance in the centre and trust & respect, financial success, customer orientation, innovations, risk management, high quality, top performance and care for talents on the outer circle. The personnel report states the importance of excellent leadership at *Infineon*. Therefore, it is essential to create a purpose for work, setting clear goals and taking over responsibility. To meet these requirements as a leader, the central HR department provides them with tools at hand.

Infineon entrusts leaders with responsibility to lead visionary by for example creating a vision together with their team. Additionally, decision-making power and responsibility for results are handed over to the leaders and their team, which is a first step to empower them. Stating values such as partnering, trust and respect indicates a collaborative culture at *Infineon*.

Münchener Rückversicherungs-Gesellschaft (Munich Re)

Munich Re does not state anything regarding their leadership culture and style in their annual report. On the website however, they present an intranet platform to ease their employees' communication and networking. Additionally, at *Munich Re* there is a constant interchange between executives and employees. A mission and vision are available organisation-wide.

Collaboration is supported at *Munich Re*; for once through the intranet but also through the approach of constant exchange. A vision is provided.

E.ON SE

E.ON describes three people strategy focus point in their annual report: to prepare their employees for the future, creating new possibilities and recognise performance. These exist since 2014 and are put into practice with new initiatives every year. For example a new development program was implemented in 2017 and runs on a cloud-based platform. Further, the 'YES!-Award' was introduced to appreciate remarkable success of employees. Additionally, *E.ON* rolled-out twelve fundamental principles that are applicable organisation-wide. However, each location is required to adopt these in a suitable way regarding their needs and regulations on site. There is no further detail available on these principles. The vision of *E.ON* follows the same pattern: it is designed top-down but to be adjusted at every location. Supplementary to the principles, *E.ON* has values established in the organisation: customer

orientation, trust & respect, encouraging new ideas & creative thinking and using the chance of global interconnectedness. Working together with trust and respect, it is imperative to give feedback, allocate decision-making power and to take over responsibility. Global interconnectedness is used to receive better access to talents, know-how and goods.

The wish to prepare employees for the future, the value to encourage new ideas and creative thinking as well as the usage of a cloud-based platform is an indicator for general expectation of openness for innovation at *E.ON*. Detecting the advantage global interconnectedness brings across as well as the values trust and respect a collaborating culture is indicated. Employees and their performance are appreciated and supported at *E.ON*. They are to take over decision-making and the accompanying responsibilities. Locations are able to adapt the vision and fundamental principles to local needs. These factors fulfil the criteria of empowerment. Additionally, visionary leadership can be carried out by adapting the vision for each team.

Commerzbank AG

The *Commerzbank* referred to the strategic agenda for the HR work for 2020 in their annual report. This includes the claim that leaders and employees contribute to and shape the digital change. Therefore, they are attending trainings regarding digitalisation and resulting competences are expected. By recruiting new talents there is a focus on their digital knowledge and interest. At *Commerzbank* five main values are newly defined: customer orientation, performance, integrity, team spirit and courage, whereby courage is meant as being open for innovations and taking over responsibilities. Working in a team includes respectful and cooperative interaction with one another. The strategy *Commerzbank 4.0* concentrates on focused growth, digital transformation and an increase in efficiency.

For *Commerzbank* the digital competence of their employees is crucial as they aim for a successful digital transformation. Teamwork and collaboration are indicated within the values. Courage refers to openness for innovations. Taking over responsibilities of made decisions implies empowerment. In general, the strategy 2020 seems to be focus on the culture but not centralising leadership in the process of digitalisation.

Merck KGaA

At *Merck*, networking with different departments and divisions is considered as important. It is supported on a national as well as international level. Additionally, innovative thinking and acting is appreciated. Leaders are obliged to motivate their employees and promote as well as show innovative strength. Additionally, they are supposed to behave as role models by acting innovative, collaborative, creative and trustfully together. This can be supported by conjointly developing a vision. General values applicable at *Merck* are responsibility, respect, performance, transparency and courage. Leaders are offered trainings to be able to perform such a leadership style and touching upon individual needs.

At *Merck* innovation and an open mind-set are essential and highly appreciated. Developing a vision together and the duty to motivate employees is a strong indicator for visionary leadership. Therefore, social and emotional intelligence of leaders is necessary. Collaboration and teamwork is supported and intended. Doing this internationally indicates the availability of hard- and software to do so.

Henkel AG & Co. KGaA

Henkel presents a vision, mission and interrelated values in their annual report. These include the importance of every employee and their experience. Additionally, leading by example and assuming responsibility for taken decisions is appreciated. Further, Henkel declares their priorities until 2020. Mentioned are pushing forward the growth, speeding up the digitalisation, increasing agility and investing into growth. To create more efficient processes, *Henkel* builds self-directed teams and through this creates autonomy and low hierarchies.

Empowerment seems to play a key role at Henkel. This is shown by valuing every employee's opinion, giving decision-making power and the according responsibility as well as having self-directed teams. An increase in agility indicates openness for innovation. Digitalisation seems to be an important priority for Henkel. However, this is rather targeting the relationship to customers and consumers than the internal culture and leadership.

Adidas AG

Adidas depicted four focus areas in their annual report: recruiting & talent retention, leading by example, diversity & inclusion as well as culture. The leadership framework, worked out together with employees, includes factors such as creativity

and collaboration. To lead by example *Adidas* created two new management teams. Future workplace solutions are implemented step by step at different locations. For instance at one office building employees no longer have permanent desks but work and sit together with regard to the topic and accompanying tasks.

The workplace conditions and stating collaboration as a principle indicate the importance of teamwork and collaboration for *Adidas*. Additionally, the workplace conditions support teamwork, wherefore hard- and software needs to be provided. Creating new groups of management indicates a development of hierarchies instead of a dismantling.

Linde AG

Linde does not state anything in their annual report regarding their leadership style. On the website however, an organisation-wide mission is presented which is being implemented top-down. From their employees *Linde* expects ideas, creativity and engagement as well as an innovative mind-set and curiosity.

Besides a provided vision and a general appreciation towards openness for innovation nothing is published regarding *Linde's* leadership style.

HeidelbergCement AG

In 2014 *HeidelbergCement* released leadership principles. These include values such as teamwork, performance, customer orientation, sustainability, social competence, communication & information, personnel development and feedback. Additionally, they state in their annual report the importance of transparency, efficiency and rapid implementation. *HeidelbergCement* wants to rely on the experience and capabilities of all their employees.

Transparency regularly is an indicator for empowerment. Together with the elements communication & information from the leadership principles and the reliance on all employees *HeidelbergCement* seems to empower their employees. Moreover, the principles claim social intelligence of leaders.

RWE AG

RWE states they want to digitalise their plants but do not publish any further details. They lay their trust in employees. The provided information are insufficient for an evaluation on RWE's digitalisation in leadership.

SAP SE

At *SAP* an initiative called 'How we run' exists. It affirms the importance of keeping promises, building bridges, being curious, living diversity and speaking clear text. Additionally, flexibility and purpose giving are essential at *SAP*. Furthermore, innovation and change are supported through for instance an innovation round table where new ideas and solutions can be developed and discussed. The trust between employees and leaders is fundamental and seen as an important qualification for leaders. Trainings are available for all employees and are mostly running on a cloud-based platform.

SAP does not have a centrally defined vision. However, they offer guidelines which help teams to create their own vision. Openness for innovation is appreciated and supported. Leaders need to have social and emotional competence to maintain trust with their employees, which is valued at *SAP*. Digital competence and skills are necessary to attend trainings. The installation of a cloud can be classified as an indicator for collaboration.

Deutsche Bank AG

In the annual report, *Deutsche Bank* states investments in digitalisation as a core component for success. Therefore, personnel processes are automated and employees are encouraged to develop digital competences. To enable the digital transformation a library regarding trends, technology and digital challenges is established audio visual. The strategy 2020 (released in 2015) does not include a lot about leadership but *Deutsche Bank* affirms they want a more disciplined management with personal responsibility instead of committees. This is needed to support the targets of becoming more efficient and obtain savings. Further, employees and countries (regions) are encouraged to find out new possibilities to shape the central vision to a good local fit. *Deutsche Bank* releases tools for digital learning (Connect2Learn) and working (HR Connect).

Digital competence of employees is essential at *Deutsche Bank* and supported as well as needed for the daily working life. A vision is given and adjustable for applicable needs. A first step to loosen hierarchies and thereby towards empowerment is made by transferring decision-making power to countries (regions) regarding their vision.

Bayer AG

Innovation is a core competence at *Bayer*. Employees are trained in new methods and a central platform 'WeSolve' for innovations is established. Within this platform information about trends and current projects can be obtained and exchanged. By doing so networking takes place. Employees are asked to constantly question the status quo and be open for innovations. *Bayer* counts on every employee's competence and knowledge – not only on their leader's. The HR strategy is implemented top-down from a central department. *Bayer's* initiative 'Passion to Innovate | Power to change' is supposed to attract young talents and make the career start attractive.

At *Bayer* openness for innovation is a crucial factor for success and therefore strongly supported. The same counts for the employees' empowerment. Additionally, *Bayer* creates space for collaboration and teamwork. However, *Bayer* still has strong hierarchies and no indication of loosening them.

Fresenius Medical Care AG & Co. KGaA (FMC)

FMC appreciates personal strength, characteristics, interest, perspectives and ideas of their employees. These can be exploited for instance by attending HR competence-centres where new concepts, instruments and solutions are discussed and developed. Nonetheless, the HR strategy is developed centrally and from there rolled-out internationally. Hereby, room for regional requirements and adjustments is given. A similar concept is practiced to create opportunities for leaders at the same level to exchange with one another. *FMC* has one central vision with according values, namely: quality, honesty, integrity, innovation & progress and respect.

Appreciating and making use of individuality, providing the opportunity to contribute to the strategy and leaving room for adjustments are indicators for empowerment at *FMC*. The competence-centre additionally facilitates for innovation and new ways for solution findings. Collaboration is supported by promoting exchange. However, this opportunity is only given to leaders on the same level, which creates hierarchies and boundaries. An organisation-wide vision is implemented top-down.

BASF SE

At *BASF* an open leadership culture is lived - with trust, respect and motivation to perform. Leaders are supposed to act as role models for their team. They are not set up hierarchically only but rather are nominated by employees and team members for

the position. Leaders are elected by their voluntary followers. For the organisation the principles of innovation, ONE company, sustainability and best team are named. Internal values such as creativity, openness, responsibility and entrepreneurial thinking prevail. On the basis of these values every employee is asked to contribute and stand up for own ideas and initiatives.

The concept of elective leadership is a modern, innovate and barley used approach so far (Grabmeier 2017). It empowers employees and follows the trend of social leadership. Additionally, employees need to show social and emotional intelligence to become leaders and be successful. Using such a new model indicates openness for innovation at *BASF*.

Deutsche Lufthansa AG

Digitalisation is viewed as a strategic focus point at *Deutsche Lufthansa*. Additionally, it can be discerned from the annual report that responsibilities are to be bundled and hierarchies to be reduced. Instead of four there are only three hierarchical levels below the board of directors left and other changes in the management positioning are to follow. To stay competitive and attractive as an employer *Deutsche Lufthansa* practices shared leadership. Ideas, competence, passion, engagement and health of employees are assumed as main factors for success. Therefore, transparent structures and processes to support the satisfaction and innovative strength of employees are implemented. Additionally, trainings are offered to all employees. On *Deutsche Lufthansa's* website seven strategic action fields are presented: customer & quality, growth, innovation & digitalisation, organisation, culture & leadership, value-based management and continuous efficiency enhancement. Further, the importance of flexibility and trusting employees and leaders is stated.

At *Deutsche Lufthansa* there are many indicators for employees' empowerment - hierarchies are no longer as important, shared leadership is practiced and implemented in the organisation, transparency is given and employees are trusted. Describing digitalisation and innovation as a success factor and including it in strategic action fields implies the necessity of being open for innovations when working at *Deutsche Lufthansa*.

Bayrische Motoren Werke AG (BMW)

Neither in the annual report nor on the website detailed information on the leadership or the culture at *BMW* is available. The 'Strategy Number One > Next' is mentioned

but no further details are published. For the apprenticeship program new digital learning and teaching tools are available, which suggest the appreciation of digital competence at *BMW*.

BMW does not provide enough details on their leadership to further assess on the digitalisation of the prevailing leadership practices.

Allianz SE

To perform the code of conduct *Allianz* released internal guidelines. These are used as compendium to take own decisions within this frame. *Allianz* has three central performance indicators: customer orientation, digitalisation and performance. Digitalisation is supported by the initiative 'Digitalisation by Default' which includes for instance a cloud platform to perform projects. These performance indicators again appear among technical excellence, areas of growth and inclusion in the renewable agenda at *Allianz*. Additionally, *Allianz* is endeavoured to create a work environment where every employee is able and willing to try out new ways and approaches. The values at *Allianz* - responsible, caring, connected and excellent - are further explained as follows: responsible in the sense of respect and transparency; caring as trust and respect; connected in terms of international collaboration and exchange across boundaries; and excellent by means of ambiguity, purpose and continuous improvement.

Internal guidelines empower every employee to take own decisions and accompanying responsibility. Digitalisation and technical excellence show up several times in this analysis. Following, digital competence is required from employees and leaders. The way *Allianz* tries to create the work environment indicates an open mind-set for innovation. The values point out the importance of collaboration with dismantling hierarchies and a vision in the sense of creating purpose to work.

ThyssenKrupp AG

At *ThyssenKrupp* a multidimensional management structure is in place where responsibilities are defined. On the website *ThyssenKrupp* depicts the importance of fair and open communication, respect and the team as such. A mission statement was worked out together with the employees.

Following, indicators for teamwork and collaboration with a network structure can be found. Empowerment seems to become of importance. Hierarchies therefore are

probably dismantling. Self-directed teams are in place, trusted and endowed with responsibilities, for instance to work out a vision.

Deutsche Telekom AG

The *Deutsche Telekom* provides its employees with a vision being applicable organisation-wide. The 2015 released new leadership ambition 'Lead to Win' includes three principles of leadership: collaboration, innovation and empowering. At *Deutsche Telekom* collaboration describes the relevance of feedback, solution oriented dialogs and the importance of self-responsibility. Innovation is separable into a mistake culture, being open and standing up for new ideas. Last, empowering includes working in self-directed teams and creating own visions.

With this leadership ambition *Deutsche Telekom* fulfils the criterions openness for innovation, vision and teamwork as well as empowerment and shared leadership both indicate for dismantling hierarchies.

Continental AG

Continental provides an organisation-wide applicable vision in the annual report. Furthermore, seven areas of activity are worked out: increase in value, regional sales balance, leading market position, high degree of localisation, balanced customer portfolio, balance in technologies and a great people culture. The last area is about the leadership culture at *Continental*, where commitment, top performance, trust, autonomy, mistake culture and employee surveys are valued.

Consequently, *Continental* fulfils the characteristic of providing a vision but there is no evidence for adjustability. Establishing a mistake culture is an indicator for openness for innovation and autonomy an indicator for empowerment.

Fresenius SE & Co. KGaA

Fresenius does not publish a lot regarding their leadership culture in the annual report or on their website. Nonetheless, the annual report states that national and international collaboration is supported in the organisation. However, there is nothing declared in detail. Social competence is seen as an important skill at *Fresenius*.

Besides social and emotional intelligence and an indication of collaboration there is nothing to be found regarding the digitalisation of leadership at *Fresenius*.

Daimler AG

In the annual report *Daimler* states that leaders are supposed to bring their employees to top performance, motivate them and increase satisfaction. On their website *Daimler* presents a new image film expressing the following values: pioneer spirit, creativity, co-creation, swarm intelligence, openness for updates and seeing change as a chance. Additionally, there is material on the new leadership principles 'Change the game – Leadership 2020'. This concept delineates new leadership principles and the planned actions on how to implement them. The principles are: driven to win, agility, customer orientation, co-creation, empowerment, learning, pioneering and purpose; and the actions: feedback culture, performance management, best fit, digital transformation, swarm organisation, decision-making and start-up workshop. Besides these principles *Daimler* wants to collaborate and network across generations and hierarchies and supports concepts such as reverse-mentoring. *Daimler* has an organisation-wide valid vision which includes among others the importance of active participation of employees.

The support of leaders for the employees to find a way for good results instead of stating how to solve tasks step by step indicates an empowering culture. Building bridges and encouraging for participation as well as offering reverse-mentoring in a culture of low hierarchies are more indicators for empowerment and the possible practising of shared leadership. *Daimler's* values indicate the elements openness for innovation, e.g. by learning, pioneering, seeing change as a chance and being open for updates; working collaborative, e.g. by using swarm intelligence, working in networks, co-creation with other departments and having low hierarchies; and having a vision. The vision, however, is not to be adjusted or developed further by every team. Being agile enables to react more flexible to changes on the market and to meet the customer requirements better and faster than competitors (Fischer 2016; Fischer et al. 2017). Therefore agility supports the criterion of openness for innovation.

Siemens AG

Siemens does not present anything regarding their leadership culture in the annual report. On the website however, it is stated that digital tools are used for talent acquisition processes. Additionally, Siemens released their 'Vision 2020' in 2014. Three central aspects are named in this vision statement: occupying attractive areas

of growth, sustainable strengthen the core competences as well as efficiency and performance. Further, the necessity of managing digital data and connecting real and virtual world with one another is presented. A strong pioneering culture is established to hand over responsibilities to all employees and support engagement. Through skipping hierarchical levels and downsizing structures, the ways of decision-making should become faster and shorter. Siemens additionally announces they want to locate the management more internationally in the next years. An open innovation culture is to be established until 2020. Further, a strong leadership culture is to be established. Hereof, no further material is available so far.

Due to the fact, that Siemens introduces digital tools and locates the management internationally, digital competence is necessary to lead. This competence is further needed to manage the digital data appropriately. By giving responsibilities to the employees and dismantling hierarchies, empowerment is established. Openness for innovation additionally becomes of importance at *Siemens*.

Deutsche Post AG

With more than 500.000 employees, *Deutsche Post* is the largest company of the DAX 30 by means of employees. In the annual report values such as team spirit, commitment, experience (of every employee) and curiosity are presented. On the website additional values are named: respect, feedback, active and open communication and mentioning own ideas. The annual report further refers to ten rules for working in networks and newly defined leadership attributes. However, these are neither further explained in the annual report nor on the website.

Including team spirit in the value system indicates an importance of teamwork for *Deutsche Post*. The criterion of empowerment is fulfilled by using employee's experiences and ideas for the organisation's success as well as creating an open atmosphere and appreciating employees taking influence. Being curious indicates an openness regarding innovations. Concerning the work in networks and the new leadership style no statement can be made.

3.3 Results and influencing factors

Regardless of the strength individual companies fulfil certain criterions, it is however clearly recognisable that most companies do not focus on social and emotional intelligence in their leadership. Only 23% of all DAX 30 companies provided relevant data for this criterion. Further conspicuous is the fact that only ten companies (33%) require digital competence from their leaders. Half of the company's provide a vision or require their leaders or teams to develop one. Openness for innovation (63%), teamwork & collaboration (67%) as well as empowerment & shared leadership (73%) are settled in most companies' prevailing leadership. Based on the analysis of available data the following classification of the DAX 30 companies can be extracted. The group '*limited data availability*' consists of organisations that did not publish enough material on their leadership style or culture to be evaluated on how digitalised the leadership is. In some cases, there are indicators for the performance of certain criterion but no details are available and therefore the strength of fulfilment cannot be assessed. The second group consists of companies that have a '*low degree*' of digitalisation in their leadership. They fulfil at least two criterions to a high degree or more criterions to a low degree. These companies made first steps towards digitising their leadership. The organisations placed in the category '*medium degree*' made good progress. They fulfil at least three criterions of digital leadership to a high degree or more of them partly. The last cluster has a '*high degree*' of digitalisation in leadership. These organisations fulfil at least four or more criterions strongly and therefore can be appraised as having successfully implemented digital leadership in their culture. An exact listing regarding the fulfilment of criterions of digital leadership for every organisation is provided in the appendix (Appendix, p. 1ff.).

Table 3: Classification regarding the degree of digitalisation in leadership

limited data availability (0)	low degree (1)	medium degree (2)	high degree (3)
BMW	Adidas	Allianz	Covestro
Fresenius	Continental	BASF	Daimler
Linde	Deutsche Bank	Bayer	Deutsche Telekom
Munich	Deutsche Lufthansa	Beiersdorf	E.ON
RWE	Deutsche Post	Commerzbank	Merck
Volkswagen	HeidelbergCement	Deutsche Börse	SAP
	Infineon	FMC	
	ThyssenKrupp	Henkel	
	Vonovia	Siemens	

Source: Own table based on the analysis in chapter 3.2

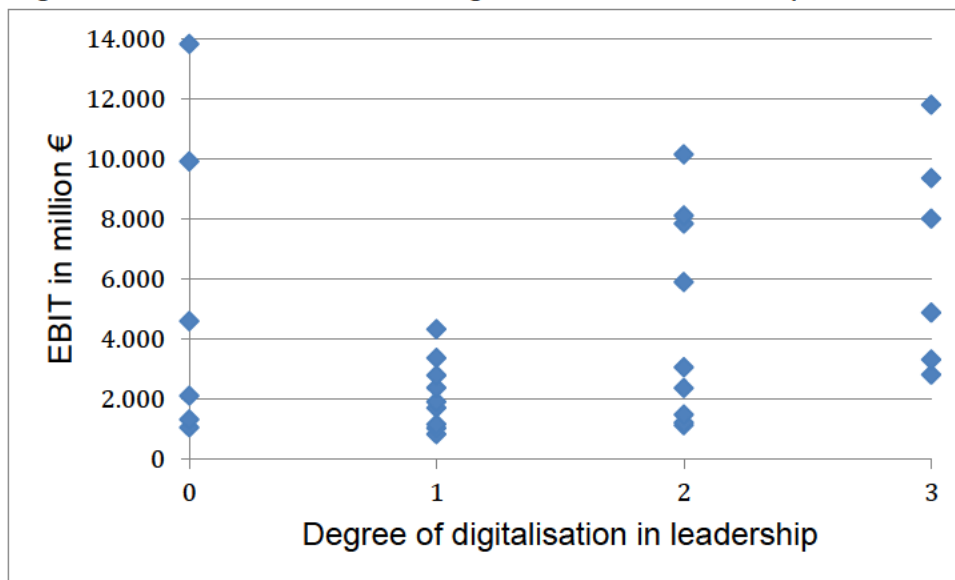
Looking at table 3, it can be ascertained that only 20% (six companies) of the examined companies accomplished a high degree. Respectively 30% (nine companies) of the companies reached a medium or low degree of digitalisation in leadership and for another 20% (six companies) there is limited data available. As a result, the DAX 30 companies do not seem to be highly digitalised in their leadership yet. However, certain companies can be taken as role models to follow when being in the process of digitising the prevailing leadership.

For the companies with limited data availability there are different reasons why data might not be available. Volkswagen for example is still updating their leadership principles and management composition after the scandals they have had in the last years (see: NDR 1 Niedersachsen 2018). The material is presumable not finalised yet. Others, however, might just not be willing to share these internal information and culture with all stakeholders and competitors.

In the following, the possible correlations between the degree of digitalisation with the earnings before interest and taxes (EBIT), the number of employees, the spending on research and development (R&D) and the age of an organisation is assessed. The groups regarding their leadership digitalisation are numbered from 0 (limited data availability) to 3 (high degree) for clarity reasons.

First, a possible correlation between the EBIT and the degree of leadership digitalisation is examined. The EBIT is a financial ratio that helps to compare the profitability of the operative business between companies (Pfitzer 2018). Within the underlying data there are no outliers or extreme values (Appendix, p. 7ff.). Figure 1 shows the degree of digitalisation on the X-axis and the EBIT as of 31.12.2017 (Annual Reports; Statista 2018a) on the Y-axis – ranging from 834 million € (Vonovia) up to 13,818 million € (Volkswagen).

Figure 1: Influence of EBIT on digitalisation in leadership I



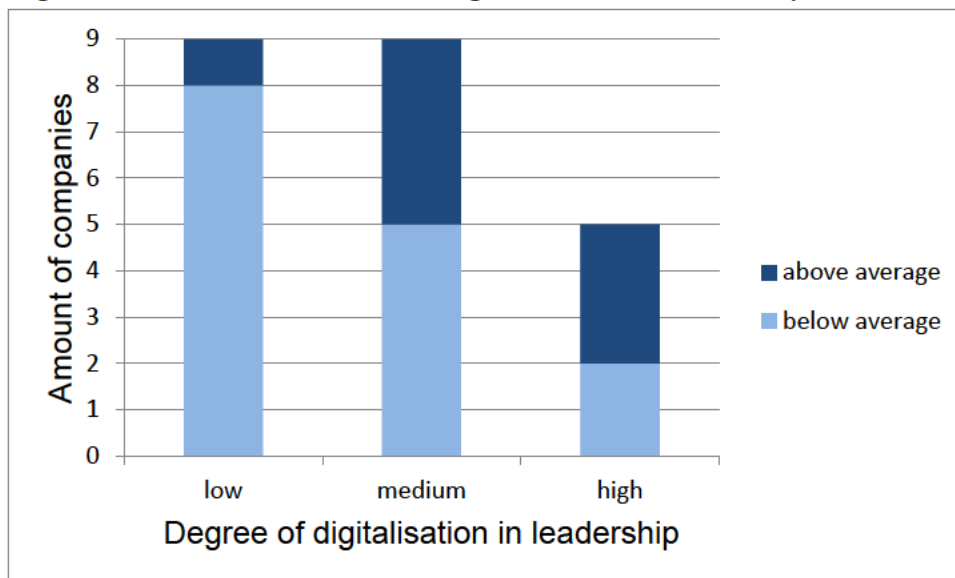
Source: Own figured based on the analysis above and the annual reports 2017

Looking at Figure 1, a positive correlation between the EBIT and the degree of digitalisation in leadership can be observed within the groups attaining a degree between 1 and 3 (Appendix, p. 8). The higher the EBIT, the higher is the degree of digitalisation regarding the leadership in an organisation. A reason might be that having a higher EBIT an organisation has more financial power to invest in modernising the leadership and starting initiatives to implement this in the workforce and the employee's mind-set. Whether enough data is available (1-3) or not (0) is not influenced by the EBIT of an organisation.

To have a closer look at this correlation, Figure 2 is constructed and analysed below. The companies with limited data availability are excluded as they are not influenced by the EBIT as mentioned above. The remaining 23 companies are divided into two classes based on the EBIT. The first class consist of the companies that have an EBIT below the average of 4,454 million € of all DAX 30 companies and following

includes 15 companies. The second class consists of all companies with an EBIT above the average and therefore includes eight companies (Appendix, p. 9). Through taking the average EBIT as the class divider, the EBIT is not further evaluated and assessed. As a result, there is not another factor taking influence on the analysis created and the results are kept lucid and objective. The figure again shows the degree of digitalisation in leadership on the X-axis. On the Y-axis the figure shows the amount of companies being placed in the specific class.

Figure 2: Influence of EBIT on digitalisation in leadership II



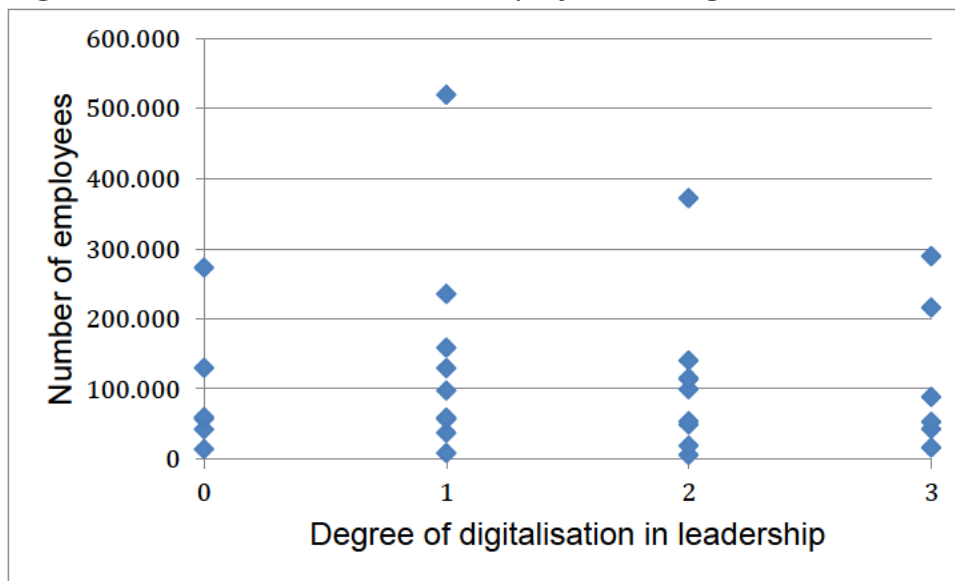
Source: Own figured based on the analysis above and the annual reports 2017

Figure 2 proves the correlation that can be depicted from Figure 1 already. It is visible that only one company (12.5%) with an EBIT above average has a low degree of leadership digitalisation. Four companies (50%) reached a medium degree and three (37.5%) even got the highest degree. Form the companies with an EBIT below average on the other hand only two companies (13.4%) achieved a high degree. The remaining 13 companies reached a low (53.3%) or medium (33.3%) degree of leadership digitalisation. This allocation emphasises the positive influence a higher EBIT takes on the degree of leadership digitalisation.

Next, it is analysed, whether there is a correlation between the size of an organisation by means of employees and the according degree of digitalisation in leadership. In the underlying data there are no outliers or extreme values (Appendix, p. 10ff.). As before, the X-axis shows the leadership digitalisation. The Y-axis

displays the number of employees – with a span from 5600 (Deutsche Börse) to 520,000 (Deutsche Post) employees.

Figure 3: Influence of number of employees on digitalisation in leadership



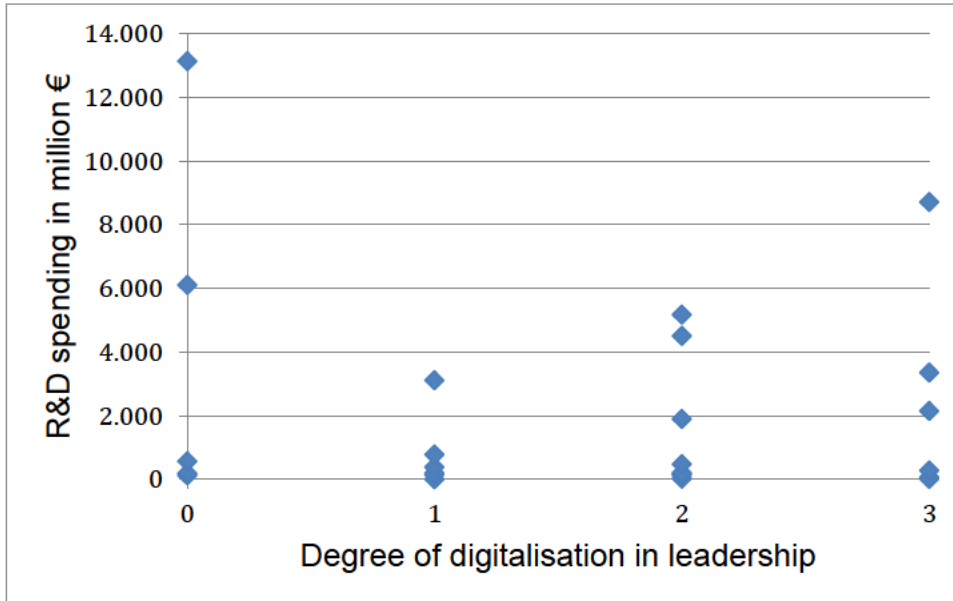
Source: own figure based on the analysis above

Figure 3 demonstrates that the number of employees has a weak negative influence on the degree of digitalisation in leadership in an organisation (Appendix, p. 11). Additionally, it can be observed that all organisations over 280,000 employees publish enough relevant data to be classified. As there are only three companies with more than 280,000 employees, no further results can be depicted from this observation. The reason for this correlation however, probably lies in the fact that a larger number of employees leads to the necessity of higher spending and effort on changing and updating the prevailing leadership culture and practices. Having fewer employees, changes can be implemented faster and more easily. It is not only harder to reach all employees in larger organisations with new initiatives and change their mind-set but additionally is it more expensive, wherefore this takes more time and financial power.

Another possible influencing factor on the degree of digital leadership could be the spending of an organisation for R&D. In the underlying data from 2017 there are no outliers or extreme values. However, Vonovia, Munich Re, Lufthansa, Commerzbank and Deutsche Bank are not included as they do not provide any data regarding their spending on R&D in the annual report for 2017. Consequently, 25 organisations are remaining and included in the analysis (Appendix, p. 12ff.). The results are shown

below in figure 4. The X-axis shows the leadership digitalisation and the Y-axis the spending for R&D in million € of each company. The R&D spending lies between 0 (Deutsche Post) and 13,135 million € (Volkswagen).

Figure 4: Influence of R&D spending on digitalisation in leadership



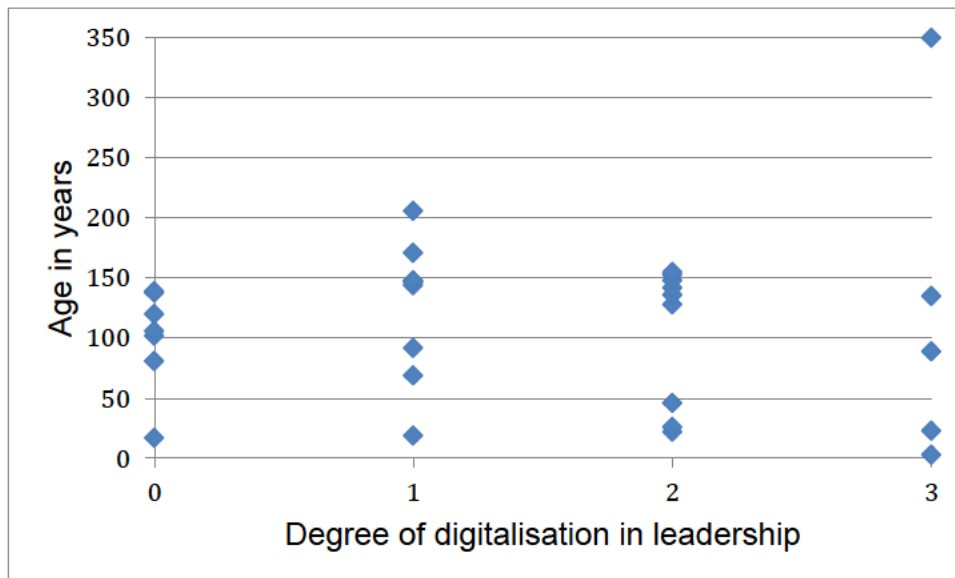
Source: own graphic based on the analysis in chapter 3.2

Figure 4 shows a positive correlation between the R&D spending of an organisation and its degree of digitalisation in leadership. The higher the spending on R&D, the higher is the degree of digitalisation (Appendix, p. 13). Regarding organisations with limited data availability no statement can be made as this shows up in a range between 115 million € and 13,200 million € R&D spending. The employee's mind-set can be assumed as a reason for this positive correlation. Companies with a high R&D spending often have innovation as part of their business and consequently need innovatively thinking employees. Following, these employees are probably open for changes in general and accordingly also in the culture and the included leadership. Additionally, they are willing to push the digitalisation forward within the organisation in their own interest.

Last, the influence the age of an organisation might or might not have on the degree of digitalisation in their leadership is evaluated. The analysis shows that three companies can be defined as outliers (under 88 and over 195) and eight as extreme values (under 47 and over 236). Following, 19 of the companies are not classified as either outliers or extreme values (Appendix, p. 14ff.). However, as this would exclude

all companies being younger than 88, the information value would be highly reduced and a statement regarding the influence the age might have on the degree of leadership digitalisation could not be made. Therefore, all outliers and extreme values are included anyhow into the analysis below. The reason for the high amount of outliers and extreme values lies in the fact, that many companies in the DAX 30 are rather old (average age: 113 years). The X-axis of figure 5 shows the degree of leadership digitalisation and the Y-axis the age of the companies in years – spanning between 3 (Covestro) and 350 (Merck).

Figure 5: Influence of the age of organisations on digitalisation in leadership



Source: own graphic based on the analysis in chapter 3.2 and Statista 2018b

Figure 5 shows a weak negative correlation between the age and the leadership digitalisation degree of an organisation (Appendix, p. 15). The older an organisation, the lower is the degree of digitalisation in leadership. A possible reason for this could be that older organisations need to attain a complete turnaround in their culture and the prevailing leadership style as they started their business when digitalisation was not a factor in the economy. Younger companies however, have the advantage that they started their business when digitalisation was already ongoing or at least made first steps in the economy and therefore at least a sense of digitalisation is implemented in their leadership style right from the start. Following, the older companies need to put in more effort and financial power to change the mind-set and behaviour of their employees than younger companies. Additionally, all organisations older than 140 years do provide enough relevant data to be analysed regarding their

leadership digitalisation. Based on the present data this cannot be explained further but it can be suggested that it relates to the experience and again the financial power of the individual company.

Concluding the analysed influence of the EBIT, the number of employees, the R&D spending and the age, it is recommendable for companies trying to digitise the prevailing leadership to invest more in the development of its style as well as the accompanying culture. A higher EBIT positively influences the degree of leadership digitalisation. Following, more investments coming from other sections would probably have the same effect. Therefore, even companies that are not able to increase their EBIT can improve their degree of digitalisation in leadership through investing other resources in its development. Additionally, more spending in R&D can help to develop a general, greater sense for digitalisation in the workforce and thus help implementing the needed mind-set in the prevailing leadership. The issue that digital competence and a general openness for innovation are no key competences leaders have to provide in many companies yet, can further be positively influenced by additional R&D investments and activities.

4 Conclusion

4.1 Summary

At a first step, influencing factors such as fast developing digital technologies, the VUCA world and disruptive innovations as well as diverse customer and employee demands, all having an influence on digitalisation in leadership, were compiled and described.

The importance of digitalisation for organisations in the 21st century is related to the environmental changes and necessary to stay competitive. Digitalisation however can be defined differently. Either it can be seen from a data and tool oriented view - meaning new possibilities for data storage and analysis as well as the opportunity to innovate new systems and tools - or digitalisation can be viewed at from an individual, organisational or societal point of view, influencing the way to work and live. Thus, digitalisation influences all areas of organisations and promotes as well as creates opportunities for digitalisation on all levels. This perspective of digitalisation and its influence on the prevailing leadership was focused on in the present thesis.

Leadership comprises numerous elements and characteristics that leaders need to fulfil. They are supposed to understand the environmental changes, provide and live according to a vision, have certain digital skills and understand digitalisation processes as well as show emotional intelligence and confidence. However, leadership does not only happen top-down from leaders to employees, but rather takes place on every level. Whether leadership is part of management or vice versa cannot be finally clarified. Three major concepts of modern leadership were delineated: leading by empowerment, visionary leadership and shared leadership.

Investigating the influence digitalisation has on leadership, six requirements and characteristics were developed being necessary to successfully implement digital leadership in an organisation. Digital competence and an openness for innovation are both essential to understand and enhance the digitalisation process in an organisation. Social and emotional intelligence is an essential factor to lead voluntary followers without strict hierarchical structures and hierarchically given power. To exploit the full potential of digitalisation teamwork and collaboration within an organisation is of great importance. In order to be able to contribute, employees need to be empowered and be provided with the opportunity to take over leadership if appropriate. Last, a vision is necessary to focus all engagement on a common goal with shared values.

Taking these characteristics as a basis, the DAX 30 companies were classified by evaluating published material with regard to their degree of digitalisation in leadership. As a result, only 20% of the examined companies accomplished a high degree. 60% of the companies reached a medium or low degree of digitalisation in leadership and 20% did not provide enough data. Taking the DAX 30 as a basis, it can be concluded, that German companies do not seem to be highly digitalised in their leadership so far but are making progress.

Further, different influencing factors were analysed. The size of a company by means of employees as well as the age of a company is weakly negatively correlated to their achieved degree of digitising their leadership. The EBIT and the R&D spending show positive correlations with the degree. Companies providing limited data are under the age of 140 years and have fewer than 280.000 employees.

4.2 Critical acclaim

Even though, this thesis attempts to provide a general and objective overview regarding the influence of digitalisation on leadership, some limitations have to be acknowledged. At first, there is more theory on leadership and especially on elements of modern leadership available. For instance feedback, enabling, agility and transformational leadership are key elements of modern leadership. However, this thesis focuses only on elements of modern leadership that are relevant for the digitalisation of leadership in an organisation. Further, especially transformational leadership and agility are already evaluated and analysed quite intensely and it would additionally go beyond the scope to evaluate these topics in detail. The demographic change, especially Generation Y and Z, probably has a huge influence on the development of modern leadership as these generations are natives in working and living digital and request appropriate tools at their work place to do so. For the present analysis, no consistent data could be found regarding the average age in the DAX 30 organisations or the number of employees being classified as members of Generation Y or Z. Therefore, a corresponding analysis is not feasible. A next step would be to collect relevant data and study the influence of the demographic change on the degree of leadership digitalisation.

The present industry analysis is limited to the 30 organisations with highest turnover and largest stock being located in Germany. Further, only data is considered that is freely available on the internet. Even if an organisation does not publish details regarding their leadership style this does not necessarily mean they are not practicing a digital leadership style. Some companies might be in an updating cycle right now and therefore are not considered as very digitalised in their leadership yet. However, they have to be further examined again after publishing their new principles. Moreover, a pure existence of leadership principles, statements and initiatives, often designed and rolled-out by HR or the board of directors, does not consequently mean that these are followed and practiced in the organisation and named values are truly followed. Nevertheless, these data provides an impression whether and to what extent the organisations are willing and trying to implement digital leadership. Additionally, the analysis is based on qualitative investigated company profiles with consideration of the worked out criterions. As mentioned earlier there are more elements that have an influence on leadership in an organisation. Possibly some

organisations might have a different degree if other or more criteria would have been considered, which however would have exceeded the scope of this thesis. A next step would be a data collection together with companies on their leadership style and a concomitant quantitative analysis - preferably, including more elements that influence the degree of digitalisation of leadership in organisations.

Besides the correlation between the EBIT and the leadership digitalisation, the correlations are rather weak. A larger reference quantity would give insights whether these presented correlations with the number of employees, the R&D spending and the age can be proven or falsified.

4.3 Outlook

Many organisations already detected the importance of good and modern leadership to create a productive and efficient culture and motivate employees to bring best results. Consequently, it can be expected that organisations will invest more in updating their leadership principles in the upcoming years. The digitalisation of leadership will become of great importance especially for young employees entering the job market. To stay competitive on the job market and attracting talents, updates on leadership culture and styles will take place regularly. Through further development of young employees towards more freedom and use of digital elements in all situations, a consequent focus on digitising the leadership will probably take place in many organisations. Through the fast changing environment as well as constantly changing requirements of employees and customers, new elements of modern leadership will be demanded from organisations in their style of leadership.

Volkswagen is currently updating their leadership principles. Therefore, there is not much data available at the moment. Volkswagen should be analysed again as soon as they have finished and published the new leadership principles.

E.ON and RWE are currently in the final phase of their takeover deal where E.ON acquires the RWE daughter Innogy and RWE in return receives 16.7% on E.ON (Schiffer & Ströder 2018). This merge will surely influence the leadership. Innogy has to be integrated into E.ON with its culture, values and principles. An alignment of RWE's and E.ON's leadership styles can be assumed.

IV GLOSSARY

Agility	Reacting more flexible to changes and meeting customer requirements better and faster.
Big data	A huge amount of data to be saved and evaluated with specialised tools.
Collaboration	People voluntarily work together but also develop ideas together no matter the field of expertise or hierarchical position.
DAX	An index which lists the 30 organisations with highest turnover and largest stock located in Germany.
Digital leadership	Abstract existing leadership principles and connect them with new models to strategically use the organisation's assets and make usage of digitalised tools to lead.
Digitalisation	Changes the sharing of information, the interaction and the workplace and through this taking influence on organisations.
Disruptive innovation	Completely displace other technics or methods by challenging established businesses while serving the customers that are demanding most.
EBIT	A financial ratio that helps to compare the profitability of the operative business between companies.
Emotional intelligence	Ability to control and recognise others and own emotions, using this to take influence and direct the actions and thoughts of others.
Empowerment	The sharing of information, giving autonomy and decision-making power as well as responsibilities to employees or teams to retrieve their full potential.

Leadership	Involves the guidance, inspiration and influence on others along with decision-taking and a focus on a common goal.
Modern leadership	Elements that became of importance over the last years by practicing leadership in organisations.
Reverse-mentoring programs	An employee with high knowledge and competencies with regard to a certain topic offers top management executives insights.
Self-directed teams	Teams with decision-making power to a certain degree which is mostly only granted to executives and the accompanying responsibility.
Shared leadership	Handing over the leadership to the subject matter expert within a team.
Social intelligence	Understanding as well as being rational and emotional while interacting with others.
Teamwork	Two or more people work together having a common goal in mind but all having assigned tasks.
Virtual teams	Teams that work effectively together across geographical distance by using technologies that provide the opportunity to exchange information very fast and on eye-level.
Visionary leadership	Leading by providing or developing and supporting a vision.

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VI APPENDIX

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III List of abbreviations

int.	International
LS	Leadership
P25	Percentile 25
P75	Percentile 75

1 Specification regarding the degree of digitalisation

Table 1: Degree of digitalisation

Company	Digital competence	Openness for innovation	social & emotional intelligence	teamwork & collaboration	Empowerment & shared leadership	Vision	neg. factor	Degree leadership digitalisation
Adidas AG				-future workplace conditions -hard- & software defined in principles			create new hierarchies	1
Allianz SE	- required	- being able and willing to try out new		-int. collaboration defined in values -collaboration across boundaries	- own decisions and responsibilities	- giving purpose to work		2
BASF SE		- elective leadership - stated in principles	- elective leadership		- elective leadership - contribution - own ideas			2
Bayer AG		- challenge status-quo - being open for new - WeSolve		- WeSolve	- employee's competence & knowledge - Challenge status-quo		strong hierarchies	2
Bayrische Motoren Werke AG	- new tools in apprenticeship program							0

Beiersdorf AG	- asked for to fulfil focus point and use e-learning	- focus point but more external		-supported face-to-face and virtually -BluePlanet	- appreciating participation			2
Commerzbank AG	- essential	- being courageous		-stated in values	- taking responsibility - decision-making power			2
Continental AG		- mistake culture as indicator			- autonomy as indicator	- organisation - wide		1
Covestro AG	- necessary to use new tools	- central focus point internal & external development of new ideas and prototypes	- teams build on voluntary basis	-essential to design new ideas -tools support collaboration -established in culture -dismantling hierarchies	- dismantling hierarchies - decision-making power - responsibilities & freedom - self-directed teams - shared leadership	- applicable organisation -wide		3
Daimler AG		- learning - pioneering - change as chance - open for updates - agility		-working in networks -swarm intelligence -networks -networking -co-creation -low hierarchies	- motivation and bridge-building - active participation - best fit - reverse mentoring - low hierarchies	- visionary - group-wide applicable		3
Deutsche Bank AG	- needed for daily work				- first steps	- available - adjustable (country)		1

Deutsche Börse AG	<ul style="list-style-type: none"> - necessary to use software and tools - no training 		<ul style="list-style-type: none"> - essential for career 	<ul style="list-style-type: none"> - software - open working space - hardware availability can be assumed 				2
Deutsche Lufthansa AG		<ul style="list-style-type: none"> - digitalisation & innovation as success factors 			<ul style="list-style-type: none"> - shared leadership - transparency - trust in employees 			1
Deutsche Post AG		<ul style="list-style-type: none"> - being curious 		<ul style="list-style-type: none"> -team spirit 	<ul style="list-style-type: none"> - Relying on employees experiences - active & open communication- - own ideas - taking influence 			1
Deutsche Telekom AG		<ul style="list-style-type: none"> - mistake culture - being open - standing up for ideas 		<ul style="list-style-type: none"> -self-directed teams 	<ul style="list-style-type: none"> - solution oriented dialogs - self-responsibility - self-directed teams 	<ul style="list-style-type: none"> - group-wide - creating own in team 		3
E.ON SE		<ul style="list-style-type: none"> - cloud-based platform - encouraging new ideas & creative thinking 		<ul style="list-style-type: none"> -detecting advantages of global interconnectedness -trust & respect 	<ul style="list-style-type: none"> - performance appreciation - decision-making power - responsibilities 	<ul style="list-style-type: none"> - provided - adjustable by location and / or team 		3

Fresenius Medical Care AG & Co. KGaA		- competence-centre		-room for exchange at events -only on same level	- individuality - opportunity to contribute - leaving room for adjustments -> decision-making power		creating hierarchies	2
Fresenius SE & Co. KGaA			- social competence important skill	-support of national & international collaboration				0
HeidelbergCement AG			- stated in values		- transparency - reliance on all employees - communication & information			1
Henkel AG & Co. KGaA		- agility		-building motivated and engaged teams	- valuing every opinion - decision-making power & responsibility - self-directed teams - autonomy			2
Infineon Technologies AG				-partnering -trust & respect	- decision-making power - responsibility	- giving purpose to work		1
Linde AG		- generally appreciated				- provided but not adjustable		0

Merck KGaA		- essential and appreciated	- needed to motivate employees	-hard- & software -support of collaboration & networking -trust	- transparency - responsibility - decision-making power	- developed together - leaders are to motivate employees		3
Münchener Rückversicherungsgesellschaft				-supported through intranet & wish to exchange				0
RWE AG								0
SAP SE	- needed for trainings	- appreciated and supported	- needed to maintain trust	-trust is valued -cloud may be used for collaboration	- leaders are supposed to be bridge-builder	- designed in teams - guidelines are given		3
Siemens AG	- digital tools for talent acquisition - managing int. - managing digital data	- to be implemented			- giving responsibilities - dismantling hierarchies	- Vision 2020 top down		2
ThyssenKrupp AG				-team is important -self-directed teams -network structure	- becoming important	- worked out by every team		1
Volkswagen AG	- Chief digital officers					- provided		0
Vonovia SE		- stated in values		- teamwork essential	- every employee is important	- provided		1
critierion filled	10 (33%)	19 (63%)	7 (23%)	20 (67%)	22 (73%)	15 (50%)		

2 Theory on used calculations

2.1 Outliner and extreme values

To calculate outlier and extreme values the percentile 75 (P75) and the percentile 25 (P25) need to be identified beforehand. Afterwards, the following formulas can be used (Akkerboom 2012, pp.118):

$$\begin{array}{l} \text{Above: Outlier: } P75 + 1,5 * (P75 - P25) \quad \text{Extreme value: } P75 + 3 * (P75 - P25) \\ \text{Below: Outlier: } P25 - 1,5 * (P75 - P25) \quad \text{Extreme value: } P25 - 3 * (P75 - P25) \end{array}$$

If a variable shows no data above the outlier value, consequently there are no extreme values either.

2.2 Correlation coefficient after Pearson

To check whether the correlations observed in the graphics are statistically correct, a correlation was calculated. It was chosen to take the correlation after Pearson, as this is regularly used for metric variables. This ranges from {-1; +1}, whereby -1 can be interpreted as a strong negative correlation, 0 as no correlation and +1 as a strong positive correlation. For all calculations of possible correlations the data sets with a degree of leadership digitalisation below 1 are excluded as they cannot be assessed regarding their leadership digitalisation and therefore cannot correlate with another variable. The Excel function '=Pearson' was used to calculate the correlation after Pearson. Following, the results are listed and evaluated (Akkerboom 2012, pp.108):

Table 2: Correlation coefficients

Variable	Pearson	Evaluation
1. LS digitalisation & EBIT	+ 0,553	→ pos. correlation
2. LS digitalisation & No. of employees	- 0,098	→ weak neg. correlation
3. LS digitalisation & R&D spending	+ 0,283	→ weak pos. correlation
4. LS digitalisation & Age	- 0,056	→ weak neg. correlation

3 Possible influencing factors

3.1 Influence of EBIT on digitalisation in leadership

Table 3: EBIT – Overview

Company	Degree of leadership digitalisation	EBIT in Mio €	cumulated EBIT
Vonovia SE	1	834	0.01
Infineon Technologies AG	1	1,029	0.01
Münchener Rückversicherungs-Gesellschaft	0	1,050	0.02
Beiersdorf AG	2	1,130	0.03
ThyssenKrupp AG	1	1,156	0.04
Deutsche Börse AG	2	1,208	0.05
RWE AG	0	1,318	0.06
Commerzbank AG	2	1,481	0.07
HeidelbergCement AG	1	1,701	0.08
Adidas AG	1	1,907	0.10
Linde AG	0	2,111	0.11
Fresenius Medical Care AG & Co. KGaA	2	2,362	0.13
Deutsche Bank AG	1	2,374	0.15
Deutsche Lufthansa AG	1	2,786	0.17
Covestro AG	3	2,808	0.19
Henkel AG & Co. KGaA	2	3,055	0.21
E.ON SE	3	3,311	0.24
Deutsche Post AG	1	3,365	0.26
Continental AG	1	4,324	0.29
Fresenius SE & Co. KGaA	0	4,589	0.33
SAP SE	3	4,877	0.36

Bayer AG	2	5,888	0.41
BASF SE	2	7,842	0.47
Merck KGaA	3	8,001	0.53
Siemens AG	2	8,105	0.59
Deutsche Telekom AG	3	9,351	0.66
Bayrische Motoren Werke AG	0	9,911	0.73
Allianz SE	2	10,148	0.81
Daimler AG	3	11,793	0.90
Volkswagen AG	0	13,818	1.00

	Sum:	133,633	
	Average:	4,454	

Table 4: EBIT - Outliner and extreme values

Outliner	
above	20322.5
below	-6809.5
no outlier -> no extreme values	

Figure 1: EBIT - Diagram with trend line

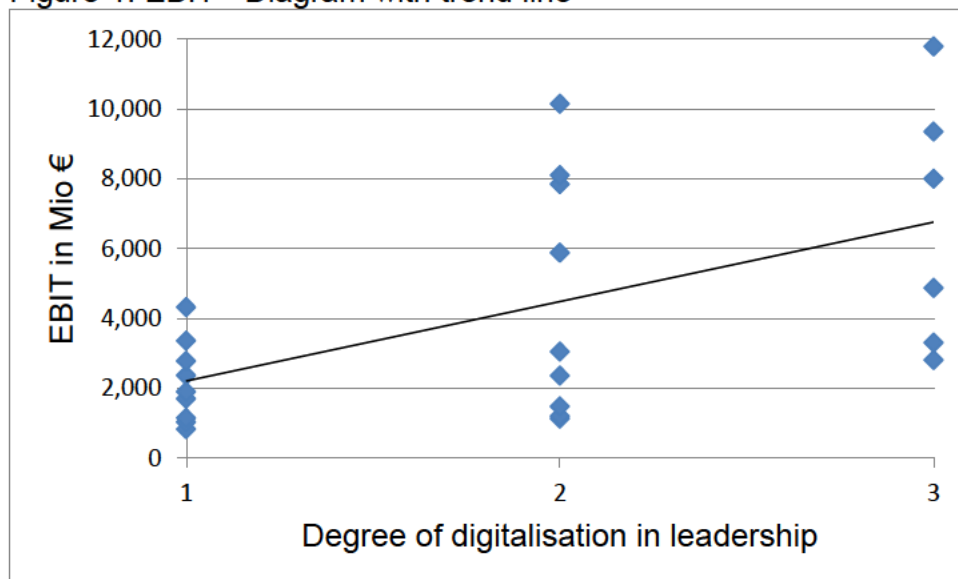
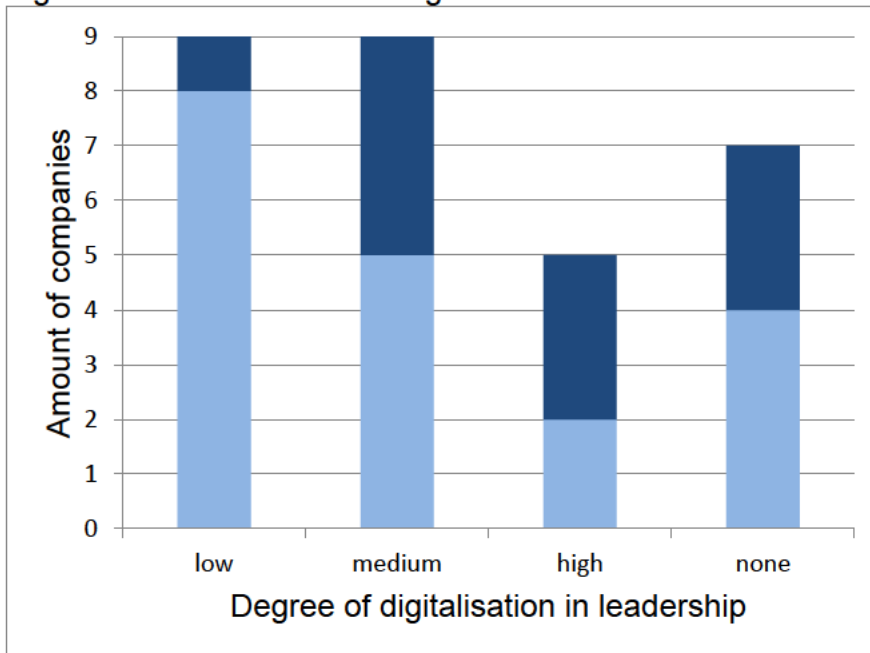


Table 5: EBIT – class formation

class formation on average basis	low (1)	medium (2)	high (3)	none (0)
below average	8	5	2	4
above average	1	4	3	3

Figure 2: EBIT - classified diagram



3.2 Influence of number of employees on digitalisation in leadership

Table 6: Number of employees - Overview

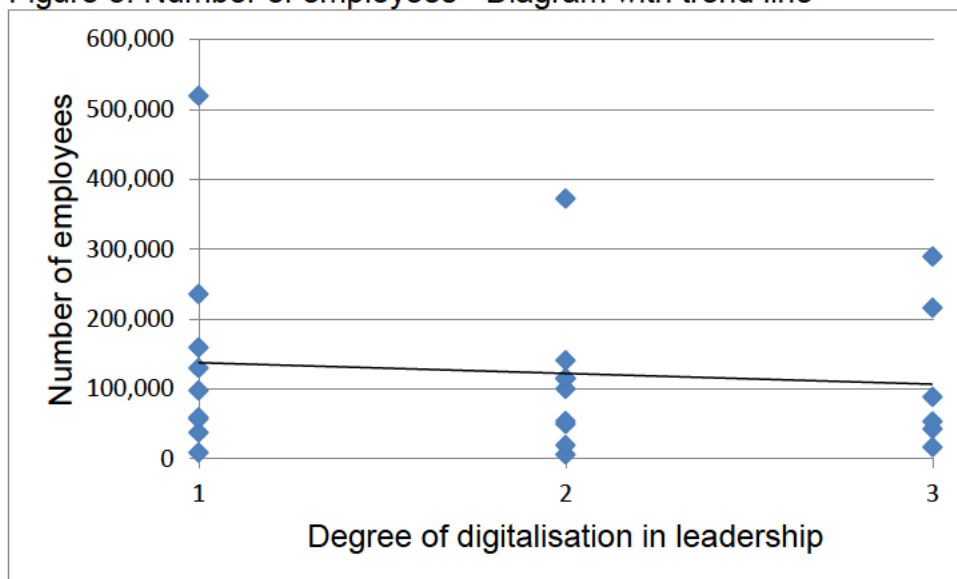
Company	Degree of leadership digitalisation	Number of employees	cumulated number of employees
Deutsche Börse AG	2	5,640	0.00
Vonovia SE	1	8,448	0.00
Volkswagen AG	0	13,955	0.01
Covestro AG	3	16,176	0.01
Beiersdorf AG	2	18,934	0.02
Infineon Technologies AG	1	37,479	0.03
Münchener Rückversicherungs-Gesellschaft	0	42,410	0.04
E.ON SE	3	42,699	0.05
Commerzbank AG	2	49,417	0.07
Merck KGaA	3	52,941	0.08
Henkel AG & Co. KGaA	2	53,700	0.10
Adidas AG	1	56,888	0.11
Linde AG	0	57,605	0.13
HeidelbergCement AG	1	59,054	0.14
RWE AG	0	59,547	0.16
SAP SE	3	88,543	0.19
Deutsche Bank AG	1	97,535	0.21
Bayer AG	2	99,592	0.24
Fresenius Medical Care AG & Co. KGaA	2	114,000	0.27
BASF SE	2	115,490	0.31
Deutsche Lufthansa AG	1	129,424	0.34
Bayrische Motoren	0	129,932	0.38

Werke AG			
Allianz SE	2	140,553	0.42
ThyssenKrupp AG	1	158,739	0.46
Deutsche Telekom AG	3	216,000	0.52
Continental AG	1	235,473	0.59
Fresenius SE & Co. KGaA	0	273,249	0.67
Daimler AG	3	289,321	0.75
Siemens AG	2	372,000	0.85
Deutsche Post AG	1	519,544	1.00
	Sum:	3,554,288	

Table 7: Number of employees - Outliner and extreme values

Outliner	
above	552,303
below	-148,982
no outlier -> no extreme values	

Figure 3: Number of employees - Diagram with trend line



3.3 Influence of R&D spending on digitalisation in leadership

Table 8: R&D spending - Overview

Company	Degree of leadership digitalisation	R&D spending in Mio €	cumulated R&D spending
Deutsche Post AG	1	0	0.00
E.ON SE	3	5	0.00
Allianz SE	2	13	0.00
Deutsche Telekom AG	3	58	0.00
Linde AG	0	115	0.00
Fresenius Medical Care AG & Co. KGaA	2	131	0.01
HeidelbergCement AG	1	141	0.01
Deutsche Börse AG	2	154	0.01
RWE AG	0	182	0.02
Adidas AG	1	187	0.02
Beiersdorf AG	2	196	0.02
Covestro AG	3	274	0.03
ThyssenKrupp AG	1	383	0.04
Henkel AG & Co. KGaA	2	469	0.04
Fresenius SE & Co. KGaA	0	558	0.06
Infineon Technologies AG	1	776	0.07
BASF SE	2	1,888	0.11
Merck KGaA	3	2,140	0.15
Continental AG	1	3,104	0.21
SAP SE	2	3,352	0.27
Bayer AG	2	4,504	0.36
Siemens AG	1	5,164	0.46

Bayrische Motoren Werke AG	0	6,108	0.58
Daimler AG	3	8,711	0.75
Volkswagen AG	0	13,135	1.00

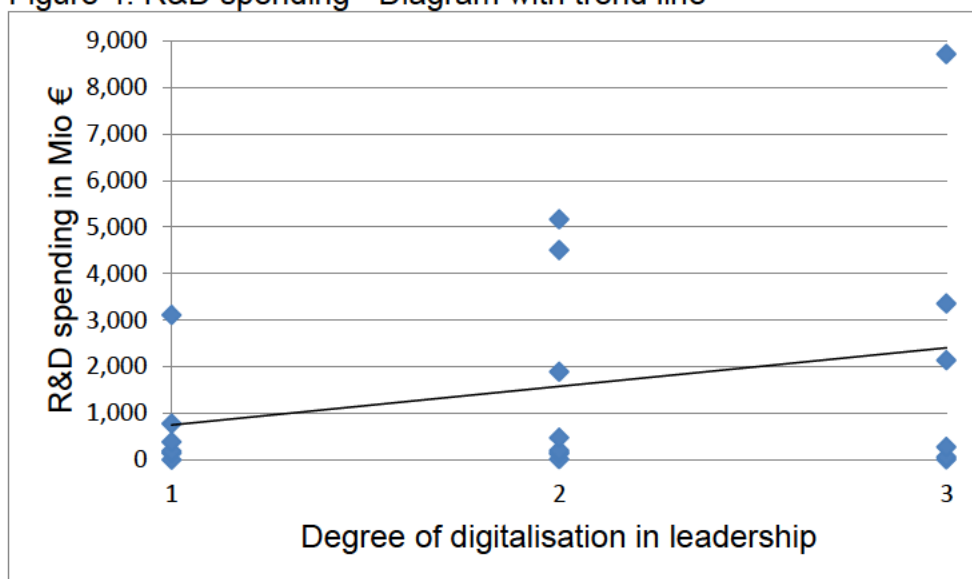
Vonovia SE	0	missing	
Münchener Rückversicherungs-Gesellschaft	0	missing	
Deutsche Lufthansa AG	1	missing	
Commerzbank AG	2	missing	
Deutsche Bank AG	1	missing	

	Sum:	51,748	
--	------	--------	--

Table 9: R&D spending - Outliner and extreme values

Outliners	
above	16,750
below	-4,687
no outliers -> no extreme values	

Figure 4: R&D spending - Diagram with trend line



3.4 Influence of the age of organisations on digitalisation in leadership

Table 10: Age of organisations - Overview

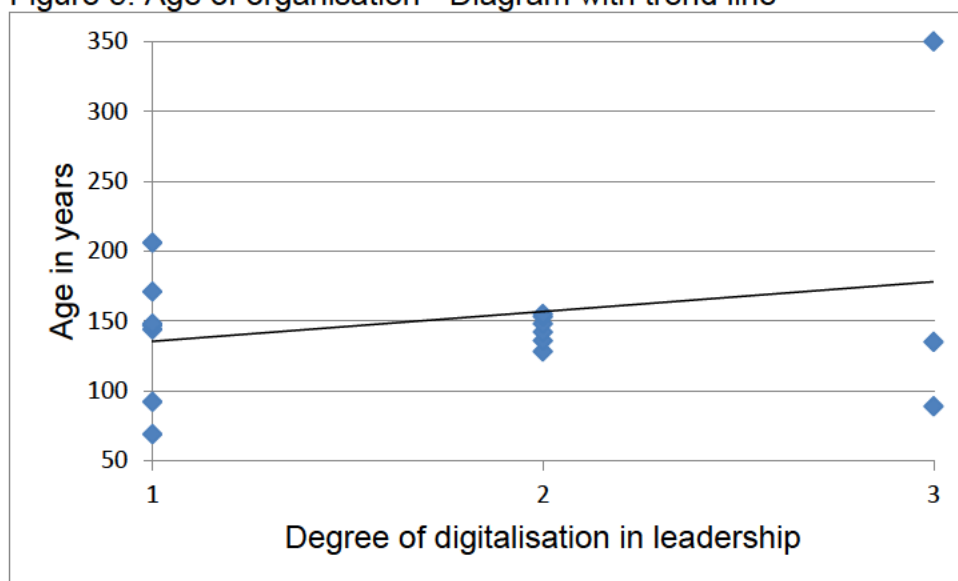
Company	Degree of leadership digitalisation	Age of companies	cumulated age of companies	Outliner / extreme value
Covestro AG	3	3	0.00	extreme values
Vonovia SE	0	17	0.01	
Infineon Technologies AG	1	19	0.01	
Fresenius Medical Care AG & Co. KGaA	2	22	0.02	
Deutsche Telekom AG	3	23	0.02	
Deutsche Börse AG	2	26	0.03	
SAP SE	2	46	0.05	
Adidas AG	1	69	0.07	
Volkswagen AG	0	81	0.09	
E.ON SE	3	89	0.12	19 companies
Deutsche Lufthansa AG	1	92	0.14	
Bayrische Motoren Werke AG	0	102	0.17	
Fresenius SE & Co. KGaA	0	106	0.20	
RWE AG	0	120	0.24	
Allianz SE	2	128	0.28	
Daimler AG	3	135	0.32	
Beiersdorf AG	2	136	0.36	
Münchener Rückversicherungs-Gesellschaft	0	138	0.40	
Linde AG	0	139	0.44	
Henkel AG & Co. KGaA	2	142	0.48	
HeidelbergCement AG	1	144	0.52	

Continental AG	1	147	0.57	
Deutsche Post AG	1	147	0.61	
Commerzbank AG	2	148	0.65	
Deutsche Bank AG	1	148	0.70	
BASF SE	2	153	0.74	
Bayer AG	2	155	0.79	
Siemens AG	1	171	0.84	
ThyssenKrupp AG	1	206	0.90	outlier
Merck KGaA	3	350	1.00	extreme value
	Sum:	3402		

Table 11: Age of organisations - Outliner and extreme values

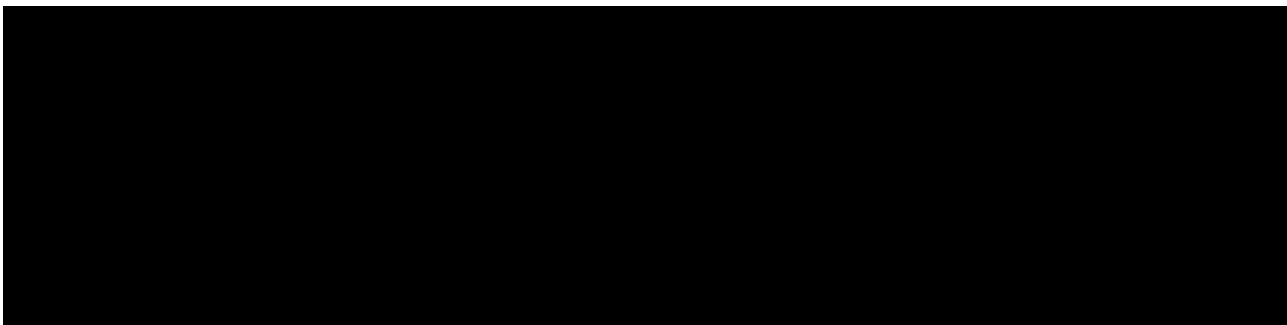
Outliner		Extreme values	
above	195.50	above	236
below	87.50	below	47
3 outlier		8 extreme values	

Figure 5: Age of organisation - Diagram with trend line



VII DECLARATION OF ORIGINALITY

Hereby I state, that the present edition of this paper has been written independently and without outside help. Only the given sources have been used as a reference for the content. All passages that are from direct or indirect sources are acknowledged as references.



VIII DECLARATION OF CONSENT

I agree that a copy of my Bachelor Thesis will be accommodated into the Library of the department; third-party rights will not be harmed thereby.

