



THESES OF THE DOCTORAL DISSERTATIONS

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Head of the Doctoral (PhD) School:
Prof. Dr. IMRE FERTŐ DSc

Supervisor:
Prof. Dr. JÓZSEF VARGA

LEADERSHIP AND HUMAN RESOURCES MANAGEMENT IN SMALL
AND MEDIUM-SIZED ENTERPRISES IN THE CONTEXT OF THE
GERMAN ELECTRICAL AND INFORMATION TECHNOLOGY CRAFT
SECTOR

Written by
GEORG THOMAS

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1.1 Guidance and relevance

The term *digital transformation* describes the systematic reorganisation of companies, organisations, and institutions as well as society as a whole (cf. Bouwman, Nikou & de Reuver, 2019; Lucas, Agarwal, Clemons, El Sawy & Weber, 2013). Digitalisation and the digital transformation itself are described by authors such as Bharadwaj, El-Sawy, Pavlou and Venkatraman (2013) as shaping contemporary business life in many ways: They influence not only individual work processes, but also business models and management practices (Mithas, Tafti & Mitchell, 2013). In the context of this research work, the focus will be on the latter in particular by looking at human resource management in the context of digitalisation. Thus, the aim here is to look at it from different perspectives. On the one hand, this work will show that the digitalisation of other business areas and a changing set of necessary competences of employees requires that human resource management (HRM) also initiates its own digitalisation process. On the other hand, it is also clear that HRM must succeed in accompanying and supporting a digital or digitising organisation in the best possible way in order to fulfil its strategic role (Ulrich, 1987). The fact that this only seems to work efficiently to a limited extent - especially in the context of SMEs in selected sectors, as they will be differentiated in more detail in the context of this work - will be shown below.

For entrepreneurial organisations, reorganisation as a result of digitalisation brings possibilities and opportunities that manifest themselves in new business models and changed business processes (incremental, disruptive, or radical) (cf. Frank, Mendes, Ayala & Ghezzi, 2019; Kotarba, 2018; Lucas et al., 2013). As a result, the trend of progressive digitalisation towards and digital transformation can be observed in most industries, as Priyono, Moin and Putri (2020) show, for example.

In addition, disruptive changes in markets as well as in the environment of companies make change inevitable. As of the first half of 2020, the COVID 19 pandemic has led to companies now relying (even) more on digital business models and ways of working than before. For example, they were forced to implement teleworking or digital distribution models as quickly as possible.

Small and medium-sized enterprises (SMEs) from the trades, construction or industry are sometimes perceived as less progressive regarding digitalisation or the process of digital transformation. Ulas (2019) and Hamidi, Aziz, Shuhidan, Aziz and Mokhsin (2018) explain this by the coincidence of two factors that have a fundamentally unfavourable impact on digital

transformation: In industries that, firstly, are inherently less characterised by digital technologies and their application and, secondly, have a small average company size, barriers to digitalisation exist from the outset. In this context, Li, Su, Zhang, and Mao (2017) also show that little is known overall about SME digitisation. The research literature also provides insufficient explanations as to why these companies often lag behind the megatrend of digitisation. Ale Ebrahim, Ahmed and Taha (2010) add that despite their role as major contributors to a country's economic power, SMEs receive very little attention in studies, especially in contrast to multinational corporations. According to Li et al. (2017), this lack of research interest in SMEs is particularly surprising considering the findings of Chen, Jaw, and Wu (2016): they were able to show that digitalisation creates new opportunities for SMEs in particular and offers opportunities for entrepreneurial success and growth. This is also emphasised by Galbraith (2014), who notes that digitalisation offers various opportunities for SMEs, particularly around internationalisation and globalisation.

Various studies show that companies that significantly digitise their business and work processes and are increasingly data-driven tend to be more successful than those that have not yet fully implemented these trends (cf. LaValle, Lesser, Shockley, Hopkins & Kruschwitz, 2011; Wamba, Akter, Edwards, Chopin & Gnanzou, 2015). Nevertheless, authors such as Thomas (2020a) point out that SMEs have so far made little use of these advantages. This problem seems to be more pronounced in companies that are not fundamentally IT-driven. Internal processes are particularly affected (cf. Thomas, 2020a; Hammermann & Stettes, 2016). This deficit is associated with a lack of expertise within companies and a reluctance to invest in the deployment of acceptable solutions. In addition, Thomas (2020a; 2020b) emphasises that in many areas there is simply a lack of the necessary resources for successful digitalisation. This concerns financial and time resources, but also leadership resources.

Several framework conditions are identified which, from the perspective of the author - and his own entrepreneurial expertise as well as scientific knowledge - seem to be formative for the developments to be described here. Leadership and management in companies - according to one of the central assumptions of this research work, which will also be empirically verified - must succeed in reacting to these changing demands and challenges. The focus of the approach to be taken here is clearly on the specificities resulting from digitalisation: Although other developments such as the need for sustainable solutions (Collins, Steg & Koning, 2007), demographic change (Tyers & Shi, 2007), or migration (Farndale, Raghuram, Gully, Liu, Philipps & Vidovic, 2017) are also identified here as relevant for human resource management

agendas, they are outside the scope of the objective envisaged here, but are explicitly addressed when they overlap with the topic of digitalisation.

However, digitalisation itself also leads to far-reaching consequences that clearly go beyond technological aspects. On the one hand, the cooperation between companies and their customers seems to be affected, as Sharma (2005) can show: In particular, the concept of business model innovation is emphasised in the context of digitalisation as a relevant development that increasingly shapes the interaction between companies and customers. One example is service models that seem to be moving from classic ownership models to usage models (*product-as-a-service*), as developments in the media sector (Netflix, Spotify; Rayna & Striukova, 2016) or in the mobility sector (Uber, car sharing; Cannon & Summers, 2014) illustrate. On the other hand, changing innovation cycles must be addressed, which - as Verbeke, Dietz and Verwaal (2011) describe - are also increasingly changing the interaction between customers and companies. Consequently, customers increasingly expect companies not only to carry out innovation projects more quickly, but also to be able to communicate them adequately. According to the authors, this also leads to changing demands on employees, who are not only increasingly exposed to the growing pressure to innovate, but also must be able to present increasingly innovative and complex products and services as *knowledge brokers*. In general, there is also an intensifying *collaboration* between companies and their customers, which becomes clear in the context of so-called *co-creation approaches* (O'Hern & Rindfleisch, 2017).

North (2011) explains how society has developed into a knowledge society in recent decades, partly as a result of the digital revolution: knowledge, according to the basic assumption, is becoming an increasingly valuable resource for companies and people alike and is seen as essential for both economic and social development. Measures to develop, expand and manage knowledge are therefore seen as essential tasks for day-to-day management. Innovative workplaces are considered to be particularly difficult, as they often succeed in expanding existing knowledge and thus create the conditions for future success. Knowledge is becoming increasingly important as a corporate resource, say Reinhard and Abele, and three key factors are driving this trend (Reinhard & Abele, 2011) (a) The economy is undergoing structural change, which means that trade in information or knowledge-related material is becoming increasingly important. As a result, organisations need a new concept of roles and responsibilities that can represent the benefits of information in the context of the organisation. In addition, the ongoing process of globalisation (b) is leading to a shift in the division of labour, with production and similar activities being outsourced mainly to emerging and developing countries, transforming

highly developed industrialised countries into knowledge-based economies characterised primarily by intangible resources as the primary source of value creation. The increasing use and spread of the internet and communication technologies, which enable faster and more efficient knowledge exchange, also contributes to this. As a result, this technological basis is seen as one of the most important driving factors for the faster innovation cycles that are typical of the modern information society (North, 2011; Reinhard & Abele, 2011).

In the context of this knowledge society, the changes on the side of the employees must also be described: Increasingly, their expectations are shaped by digital lifeworlds, both in terms of their work and in terms of leadership and management activities, as Klaffke (2014), for example, describes them as shaping the next generations. Digital forms of collaboration are increasingly experienced as a basic requirement, which is becoming an even more significant trend in the context of the COVID 19 crisis and the accompanying *prescribed teleworking* (Waizenegger, McKenna, Cai & Bendz, 2020).

In summary, it is clear that modern human resource management, which increasingly seeks to assume a strategic role in companies (Paauwe & Boselie, 2003), must react to these changes accordingly. Optimally, as Caldwell (2001) describes it, it not only takes on a supporting but even a driving position in companies. As will be explained in the following sections, this research work will examine in particular how this relationship between human resource management and digital transformation is taking shape in the context of German SMEs in the (electrical) trades.

The focus is deliberately placed on the concept of human resource management: although the role of leadership - as is explained in section 2.5, for example - certainly seems to overlap with that of human resource management time and again, the decision was made here not to focus on digital *leadership*, but on the approach of digital HRM, as it is repeatedly described as the driving force of digital transformation in companies. Here, the research follows an assumption that emerges from industry experience: While it is acknowledged (see section 2.5) that leadership activity is formative for the interaction between companies and employees, it is primarily an individual approach. Significant differences can be observed between individual managers within a company. HRM, on the other hand, is perceived as a central approach, which seems to be more suitable for the approach chosen here due to its universality in the companies.

1.2 Research question and methodological approach

The central and thus guiding research question can be derived from the research gap outlined so far:

How are leadership and human resource management in German SMEs in the electrical trade sector handled regarding the requirements and specifics of increasing digitalisation?

This research question will be answered step by step by combining a theoretical and an empirical analysis. Chapter 2 first presents the current state of research on the topic. In the course of this, terms relevant to the study are to be introduced and defined. The multidisciplinary nature of the work already becomes clear here, as it brings together research work and approaches from different disciplines. In particular, the areas of employee or personnel management and HRM provide relevant and interesting perspectives that are considered here accordingly. Digitalisation is also considered from both a decidedly management-related and a technical perspective. Corresponding consequences - both of digitalisation and of the different management approaches - are explained in section 2.3, whereby the role of employees for entrepreneurial success is also addressed here.

These descriptions, derived from the relevant specialist and research literature, substantiate the research framework set out in Chapter 3. The description of the existing research gap is deepened here and transferred into a description of practical deficits in the electrical trade.

Both together guide the empirical study that follows in Chapter 4. A mixed-methods approach (cf. Greene, Caracelli & Graham, 1989; Kiessling & Harvey, 2005; Pole, 2007) is used to develop a comprehensive view of the complexity of the overall topic. Methodologists such as Sekaran and Bougie (2016) qualify such an approach, through which different perspectives can be used to work on a research topic and to clarify a research question, as particularly advantageous for working on practical business questions, which usually have a high level of complexity. Simplistic methods, such as experimental designs or purely observational studies, are only suitable to a limited extent for explaining changes in a complex structure of effects that is defined by a large number of relevant actors with a high degree of interconnectedness.

The mixed methods approach of this work combines two approaches accordingly. First, a qualitative method is chosen that is well suited as an explorative or hypothesis-generating instrument. Standardised expert interviews (cf. Bogner, Littig & Menz, 2009; Dorussen, Lenz

& Blavoukos, 2005) are suitable for gaining an overview of complex economic contexts and related changes (cf. Bogner, Littig & Menz, 2009; Dorussen, Lenz & Blavoukos, 2005). This qualitative method - just like the qualitative content analysis according to Mayring (2010) - is to serve as a basis for the following quantitative analysis.

In this second section of the empirical investigation part, a standardised questionnaire based on Likert scales is used for hypothesis testing of a sample of $n = 163$ employees with active experience in the electrical trade. This survey specifically addressed the relationship between perceived experiences with digital HR measures and employees' own attachment to the company. In the spirit of technology and data triangulation (cf. Perone & Tucker, 2003; Wilson, 2014), these results will be compared with the findings from the literature study as well as the expert interviews regarding the perception of digital HRM, resulting finally in a critical discussion of the overall results. Within the framework of the critical comparison, the focus will be placed in particular on the implementation and the associated framework conditions of HRM and the extent to which differences and similarities exist here between the perspectives (international literature, experts, employees).

1.3 Qualitative results

1.3.1 Category scheme

The category scheme used in this paper is presented in the appendix of this paper. It was developed in accordance with the recommendations of Mayring (2010) for the analysis of qualitative data. The aim was to create a basis that would allow the research question to be dealt with systematically and objectively. In the following, the results found are described based on the categories formed, thus forming the basis for answering the research question from the experts' perspective.

1.3.2 Employees and applicants

1.3.2.1 10-year forecast and comparison

Basically, the interviewees explain that the (electrical) trade is subject to constant change, in the course of which personnel work is also changing (cf. I1, line 17; I2, line 4; I7, line 21). In this context, reference is made, for example, to the consequences of digitalisation, which, among other things, applicants also demand accordingly (cf. I2, line 4).

However, this also has an impact on human resources management itself, as interviewee seven notes: "So this leap into digitalisation in the skilled trades sector simply also to see a job advertisement, let's stay with the very mundane example, I can place it via Facebook, for example, or ~~no~~ so via social media" (I7, line 21).

At the same time, the clear internationalisation of the workforce is mentioned as one of the most relevant developments in the context of the past and next ten years. The following statement, for example, is exemplary: "I have 60 per cent foreigners in the company" (I1, line 25). At the same time, this also results in administrative hurdles, some of which are difficult to overcome or should not be viewed only from a business perspective.

It is an entrepreneurial task to deal with these changes adequately, which can also be stated with reference to the development on the applicant side in general (cf. I4, line 21).

In this respect, contradictory assessments of the popularity of the sector from the applicant's point of view were given. For example, it was made clear that in many cases the industry is not seen as the first choice, which could have corresponding effects on the commitment of employees.

In this context, the COVID-19 pandemic is also understood as a challenge in the competition for qualified applicants (cf. I11, line 45; I1, line 23).

1.3.2.2 Changes in requirements - craft workers

Overall, it is not only the demands of employees and applicants on companies that are changing. Against the background of technology-driven changes, the industry is also making new demands on employees in terms of qualifications and skills.

The increasing digitalisation and the new requirements and work processes associated with it, which I7 (line 19) or I4 (line 9) also describe, are thus again explicitly addressed here.

1.3.3 Challenges of staff acquisition

In the context of the challenges around personnel acquisition, three basic topic areas could be identified that are relevant here: General challenges, general modernisation measures and employer branding measures.

Regarding staff acquisition, it is noted that the sector partly must struggle with an image problem: The sector and the demands on employees are described as challenging, which can make it difficult to acquire staff.

Accordingly, several interviewees (cf. I1, line 23; I2, line 8; I3, line 12; I11, line 45) report that only an insufficient number of applications are received and that the qualifications of some of the applicants also fall short of expectations.

In principle, a positive trend in the number of applications is recognised in some cases - for example, I1 (line 37) explains that an upward trend has become visible in the last few months - but the quality leaves something to be desired in some cases, which I8 also attributes to the applicants' parental homes.

At the same time, the answers show that aspects of human resource management are also seen as relevant. This includes the acquisition of employees, but also increasing their loyalty to the company.

At the same time, these statements also make it clear that the assessment process is not only important in the context of personnel acquisition, but that the company must make ongoing efforts here.

In principle, it is also necessary to react with modernisation measures, as many survey participants confirm (cf. I2, line 24; I6, line 34; I8, line 37; I12, line 39). Both internal and external solutions are sought to cover the personnel needs: "So whether it is really an external head-hunter, that is a possible way. But I believe that direct acquisition will increase, that there will perhaps also be messy ways, but companies do what is best for their company" (I12, Z.

39). These channels must be used to permanently align the talent pool and the number of employees with the company's needs, which is identified as one of the central tasks in the skilled crafts sector (cf. I1, Z, 35). A company must therefore succeed in actively approaching new employees in order to recruit them for the company (cf. I6, line 45).

At the same time, however, it is also clear that digital measures are not yet being implemented across the board in the companies. This can partly be attributed to a lack of resources: "Well, I am personally on LinkedIn, but otherwise not, no, as far as the company is concerned, because that has to be maintained. We are a bit too small for that. And a non-maintained presence somewhere is-, can be very damaging" (I4, line 35). The complexity of the topic and the breadth of digital offerings that could and should be used by companies is also mentioned as a reason.

Here, too, it becomes apparent that resources are sometimes not available or allocated to a sufficient extent to guarantee a professional appearance (cf. I1, line 33).

This is also discussed regarding the relevant aspect of employer branding. Although the approaches differ in part from those in other areas, the analysis of the interviews makes it clear that the industry experts are aware of the importance of this topic.

Both digital campaigns and various partnerships are used, such as those with educational institutions or in cooperation with the Federal Employment Office (BA), which are experienced as productive (cf. I8, line 63). In this way, the companies also try to keep up with larger competitors and position themselves accordingly in their market (cf. I9, line 35). Measuring the quality and efficiency of social media campaigns for employer branding is also experienced as challenging.

Employer branding is also perceived as an approach that focuses primarily on the aspects of human resources development and the extent to which employees are given opportunities for growth and promotion within the company.

1.3.4 Challenges of human resource development

Regarding personnel development, reference can be made in particular to the changing requirements (cf. I10, line 11; I11, line 77; I6, line 65). In this context, the interviewees again perceive the image of the sector and the usual work activities there as challenging.

For training, new approaches such as compensation, which would allow easier horizontal switching between different fields, are viewed critically by some interviewees.

Elsewhere, however, corresponding measures are already being implemented - partly in harmony with external education partners.

In addition to the technical challenges, soft skills are also mentioned here. These are recognised in principle, but in the assessment of the experts interviewed, their relevance lags the technical skills.

The employee perspective on development measures is also addressed. Once again, the linearity of CVs and the possibility of retraining, which I11 (line 77) and I4 (line 49) have already discussed from different perspectives, are addressed.

I3 (line 28) also addresses this aspect in an equivalent way. It is explained, for example, that people from industry repeatedly move to a craft enterprise where they can benefit from horizontal personnel development measures. The corresponding willingness to participate in such measures and to use them beneficially seems to be at least partially given, as I5 (line 41) or I10 (line 56) explain. Accordingly, the concept of personnel development is not only relevant for existing employees but is also addressed in the context of personnel selection (cf. also section 5.1.3), especially against the background of the fact that more and more applicants come to companies as lateral entrants.

1.3.5 Digital measures in acquisition and development

Finally, the advantages of digital measures around human resources were addressed, in addition to the contents presented above. Although these measures and the structural difficulties associated with them have already been mentioned in section 5.1.3, they will be discussed in more detail here. The breadth of the different approaches should also be shown. I2, for example, reports on this and describes the first approaches to digitalisation in the operational area.

Direct reference to the digitalisation of HR measures is made, for example, in connection with job applications and personnel acquisition.

Such approaches of digitised application processes and successively digitised applicant management thus seem to be gaining in importance (cf. I7, line 117). At the same time, however, concerns are also expressed here. For example, regarding data protection, for which responsibilities must be clarified both externally and internally (cf. I11, line 91).

1.4 Quantitative results

1.4.1 Descriptive description of the sample

In section 5.2.1 it was shown to what extent the reliability and thus the psychometric quality of the available data allows a scale to be created. This review forms the basis for the descriptive description of the available data. In a first step, reference is made here to classic sample characteristics, which include, for example, the group of socio-demographic data. This is followed by a presentation of the psychometric parameters for the scales discussed in section 5.1.1.

The gender distribution within the sample is shown in Figure 16. The plot shows that 75 % (and thus 120 persons) of the sample were male. Table 5 shows the distribution of educational qualifications within the sample.

With 43.2 % of the respondents, the largest group of persons states that they have completed a university degree. The second largest group is made up of people who have completed vocational school (25.9 %), while a further 20.4 % state that they have completed an educational qualification not listed here. Regarding the industry classification of the respondents, Figure 17 shows a clear picture.

More than 85 % of the respondents therefore come from the electrical trade sector. The sample thus meets the criterion formulated in section 5.4.3. The size of the companies in which the survey participants work is summarised in Table 6.

According to the survey, most of the respondents work in companies with more than fifty employees. Only a minority of less than 10% of the participants stated that they work in a smaller organisation.

The industry and position experience of the study participants as well as their age is listed in Table 7.

The average age of the respondents is thus $MW = 39.81$ years, with an average of $MW = 8.90$ years of experience in their current position and a total of $MW = 13.95$ years of experience in their industry.

Following on from these socio-demographic variables, the next step was to focus on the scales presented and formed in section 5.2.1. Table 8 shows the descriptive values for the three commitment scales.

Table 1: Descriptive description Commitment

	Min	Max	MW	Std.dev.	Skew		Kurtosis	
					Stat	SE	Stat	SE
Emotional commitment	1,57	5,00	3,7311	,63757	-,244	,191	-,109	,379
Rational commitment	1,00	5,00	2,4251	,86771	,507	,191	-,207	,379
Normative commitment	1,00	4,63	3,8299	,73410	-1,510	,191	2,110	,379

Regarding skewness and kurtosis, the following statement can be made based on the available results: Significant skewness is found in the scales *Rational Commitment* and *Normative Commitment*. Regarding the kurtosis, a significant value is only found for the *Normative Commitment scale*. To illustrate this finding, the distribution form for normative commitment is shown in Figure 18.

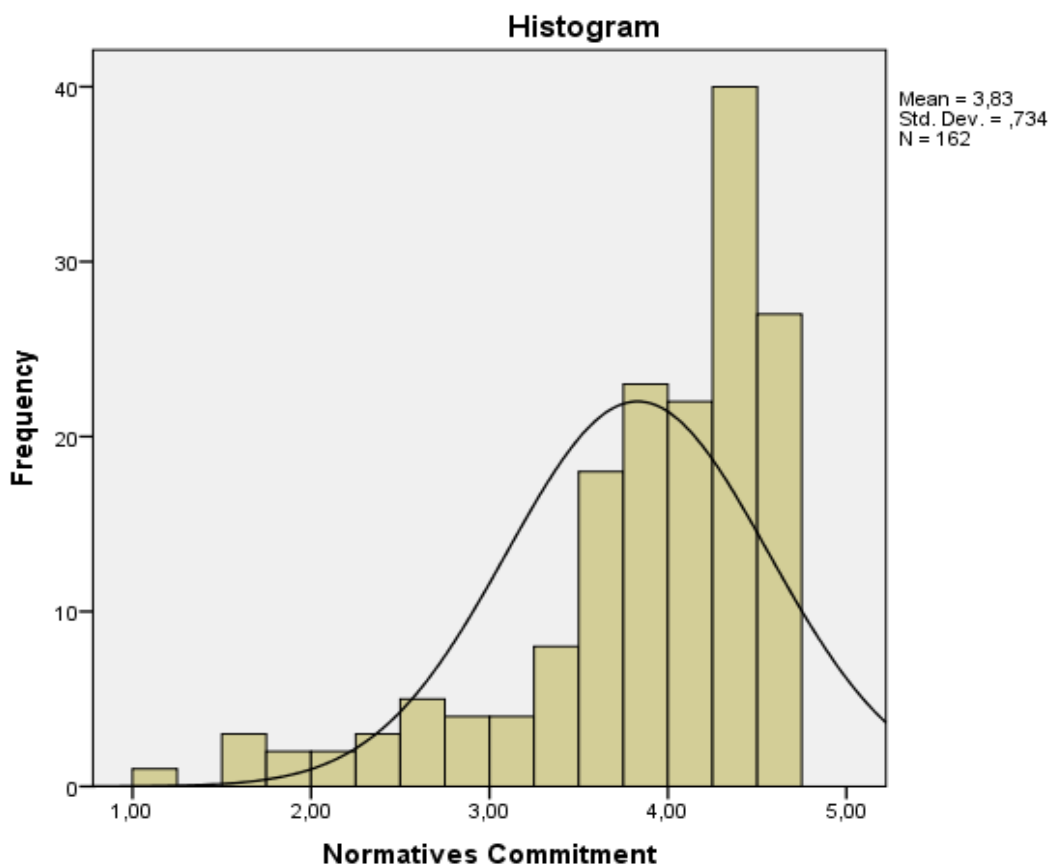


Figure 1: Representation of the distribution form

This representation makes it clear that this is a right-split distribution with significant kurtosis.

Table 9 shows the descriptive values for the three aspects of the *digital scales*. In terms of skewness, there is a significant result for all the scales shown, but for kurtosis or excess only for *digital learning* and *digital HRM*.

Subsequently, these characteristic values are also presented for the scales of the perception of e-HRM. For this purpose, Table 10 summarises the e-activities and e-outcomes as described in this paper in a tabular presentation. In this representation, the conspicuous forms of distribution again become clear: all scales are those with significant skewness. The kurtosis is also significantly conspicuous for all scales with the exception of *e-compensation*. Figure 19 again shows this form of distribution using the example of *e-productivity*, which is characterised here by the most pronounced skewness and kurtosis.

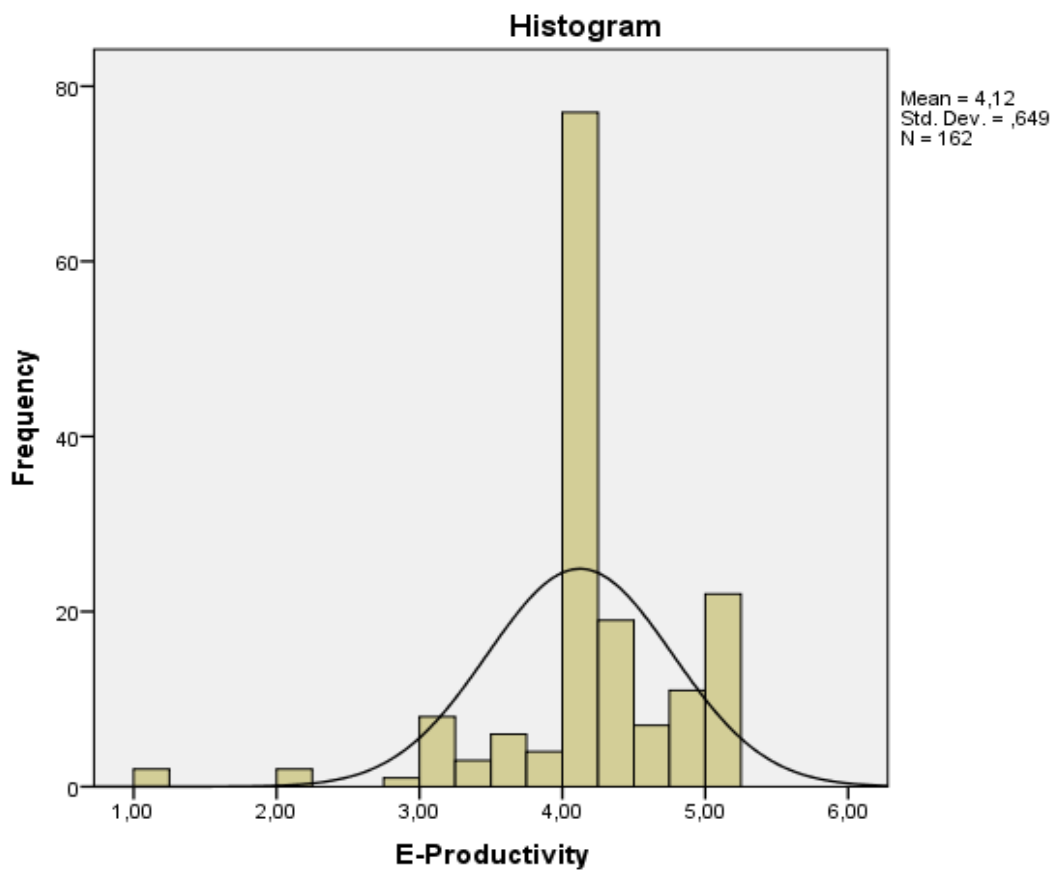


Figure 2: Distribution form E-productivity

This interplay of strongly pronounced skewness (which in the specific case, as with the other variables of this cluster, indicates a right-skewed distribution) and strong excess implies that the respondents generally give very positive evaluations in this area. At the same time, from the perspective of possible bias, it should be noted that results characterised by a high degree of skewness and excess can be subject to a ceiling effect on the one hand (cf. Groeneveld

& Meeden, 1984) and the possibility of a variance restriction on the other. Such a restriction, as Sackett and Yang (2000) explain for example, can lead, among other things, to the fact that actually existing correlations may be underestimated within the framework of the statistical evaluation. Classic examples of such variance restrictions can be found, for example, in the context of examining the results of IQ tests in selection settings. Here, a corresponding restriction takes place through selection, which leads to the fact that correlations can be underestimated in corresponding studies (cf. Burns & Boice, 2009).

1.4.2 Inferential statistical processing

The inferential statistical analysis of the data collected and presented in section 5.2.2 follows the approach of establishing an understanding of the relationships within the individual data complexes in a first step in order to address the issue of validity. It is assumed that meaningful correlations within the variable complexes are to be tested in terms of divergent validity in order to establish the quality of the data beyond the test of reliability (see section 5.2.1).

1.4.2.1 Convergent and divergent validity

In a first step, this was done regarding the variables of the commitment area. A bivariate correlation analysis was used to determine the extent to which the variables of the emotional, normative, and rational commitment aspects are related to each other. Table 11 summarises the results of the test.

As can be seen from the data, the results are partly in line with expectations: Emotional commitment correlates positively with rational commitment and normative commitment. This therefore confirms the assumption that these are fundamentally related sub-aspects. This could not be confirmed for the relationship between rational commitment and normative commitment, where no significant correlation was found.

Table 12 shows the comparable examination of the *digital cluster*. It becomes clear here that although the attitude towards digital learning and digital competence correlates significantly with each other, at the same time the scale *perception of digital HRM* shows no correlation with the other two variables. For this reason, this scale was also successively included in the following cluster, which deals with the internal relationship of the developed scales of *e-activities* in the field of HRM. Again, a set of bivariate correlation analyses was carried out, which is summarised in Table 13.

Here, too, the results were almost entirely in line with expectations. The scales introduced in section 5.4.2 (*e-recruitment*, *e-compensation*, and *e-communication*) correlate significantly positively with each other. This is an indication of their convergent validity on the one hand and on the other hand that the development of individual digital HRM measures (hereafter also referred to as E-HRM in reference to the questionnaire used) should in principle represent an at least approximately homogeneous procedure. At the same time, it is noticeable that the specially developed short scale *Perception of Digital HRM* was not related to these scales or was even negative (Digital HRM * E-Recruitment, $r = -.186, p < .01$).

In the following, the internal relationship of the so-called *e-outcomes* is discussed. The results of the corresponding review are presented in Table 14.

In this analysis, the consistently significant and strongly positive relationship of the variables to each other becomes clear: There are - as shown in Table 14 - consistently positive relationships between the three variables, which can be assigned to the e-outcomes described in Section 5.4.2.

1.4.2.2 Connections between the clusters

Following the cluster-internal presentation of the results in section 5.2.1.1, the correlations between the variables of different clusters are discussed below. This is intended to show how the individual topic areas correlate with each other, which is directly aimed at answering the research question posed here (see section 1.3). It will thus be shown to what extent aspects of the use of digital HR measures are related to various aspects of employee commitment. Socio-demographic variables are also critically examined in the context of these aspects.

For this purpose, the first step is to check whether male and female persons differ from each other regarding their commitment, their attitude towards digital competence and the relevance of digital learning. This should help to classify further effects and show any bias or bias effects that could have an influence here. However, it must be considered in this comparison using a series of t-tests that the sample does not have a balanced gender ratio, which can complicate the interpretation of the results. This problem can be accepted here, however, because the gender comparison is not the focus of the research interest. Rather, it is only carried out as a supplementary analysis of possible confounding effects. Table 15 shows in a descriptive way the differences between the two genders regarding the data relevant here.

Table 2: Gender differences, descriptive

Gender		N	MW	Std.dev.
Emotional com- mitment	male	120	3,8061	,64330
	female	41	3,5087	,58055
Rational commit- ment	male	120	2,4096	,89997
	female	41	2,4686	,78620
Normative com- mitment	male	120	3,9550	,69843
	female	41	3,4930	,71992
Digital Literacy	male	120	3,5503	,58439
	female	41	4,0532	,57039
Digital Learning	male	120	3,9394	,52953
	female	41	4,0752	,61131

Table 16 then shows the result of the series of *t-tests*. As can be seen from the results, the Levene test for variance equality carried out for the prerequisite test was consistently inconspicuous; there is a non-significant result for all variables here. Therefore, no corresponding correction of the results of the actual *t-tests* had to be made.

The presentation of the significance test shows that there are partly significant differences between the group of female and male respondents. These were shown regarding emotional and normative commitment as well as digital competence and digital literacy. Regarding rational commitment and attitudes towards digital learning, however, there were no significant differences between the respondent groups in the gender comparison.

This result is also illustrated in the graph in Figure 20.

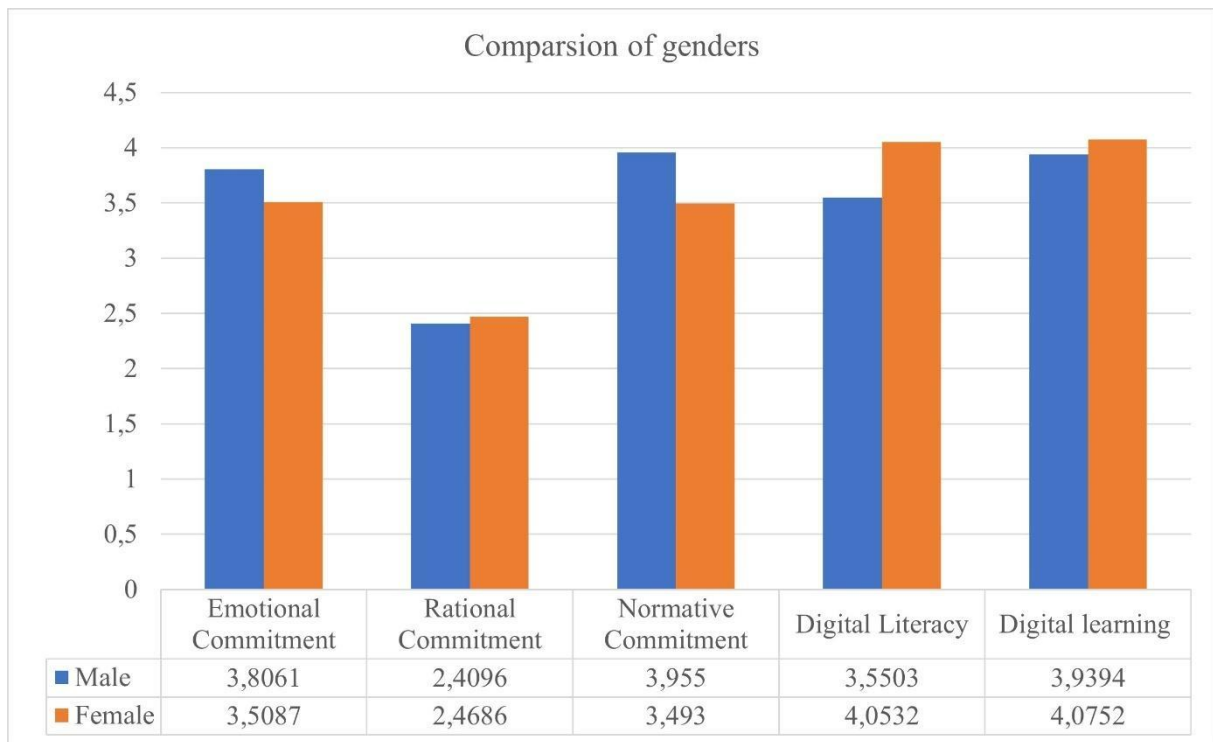


Figure 3: Gender comparison

Subsequently, the focus was placed on the correlations. The first step was to examine the extent to which the three aspects of organisational commitment are related to digital competence, attitudes towards digital learning and perceptions of digital HR practices. This showed that both emotional and rational commitment are negatively related to digital literacy and digital learning. An important level of digital literacy or digital learning is thus associated with low emotional and rational commitment. This was not shown in this form for normative commitment: Here, a positive correlation could even be found with the attitude towards digital learning. At the same time, a significant negative correlation was found between normative commitment and the perception of digital HR functions. To further deepen this result, the relationship between the aspects of commitment and the individual activities of digital HRM was considered in a next step. In this context, the relationship to the outcomes of e-HRM is also examined accordingly.

Only some relevant correlations are found here. For the variable *Emotional Commitment*, it can be stated that this is neither connected with the e-activities nor with the e-outcomes. Regarding rational commitment, the picture is less clear: it is negatively related to e-compensation and e-employee satisfaction but does not show any significant correlations regarding the other variables.

Normative commitment, in turn, is characterised by a consistently positive correlation with the individual aspects of e-compensation and e-outcomes: With the exception of the variable *e-communication*, *normative* commitment basically correlates significantly positively with all the presented aspects of the two clusters e-activities and e-outcomes. The relationship between the aspects of one's own attitude towards digital aspects (digital competence and digital learning) and the perception of the aspects of e-HRM was then also examined. Here, too, relevant results were consistently found: People with higher digital literacy and more positive attitudes towards digital learning also tend to evaluate both the activities of e-HRM and the corresponding outcomes more positively than people with lower values would do so.

1.4.2.3 Multivariate approach

Finally, these bivariate approaches, which could already contribute to gaining knowledge, were supplemented by a series of multivariate analyses. In this context, an attempt was made to find out to what extent the individual aspects (digital literacy, digital learning, e-activities, e-outcomes) can contribute in principle to the explanation of variance regarding the commitment of the respondents. Although the bivariate results here could in principle provide information about the extent to which correlations exist in principle, these approaches ignore the intercorrelations between the individual variables. However, it was shown in the previous sections that these appear to be significant, which makes a corresponding analysis necessary. Therefore, a total of three regression analyses were carried out, each of which followed a step-by-step procedure regarding the inclusion of predictors. This approach of multiple linear regression analyses is suitable not only for checking the basic forecasting performance of a set of predictors. It can also be used to determine which variables can actually contribute significantly to a gain in knowledge. The results of the regression analyses for the variables *Emotional Commitment*, *Rational Commitment* and *Normative Commitment* are presented below.

Table 20 shows the results of the regression analysis for the variable *emotional commitment*. This representation makes it clear that only the variable *Digital Literacy* can explain variance regarding emotional commitment. Despite the bivariate correlations found, the other variables do not prove to be significant predictors of emotional commitment or are at least not able to explain variance across *digital literacy*. However, the general predictive power can be considered weak, as implied by the R^2 value.

Table 21 lists the results of the regression analysis for the variable *Rational Commitment*. This variable again shows that only *digital literacy* is a significant predictor. A significantly different picture emerges when looking at normative commitment.

Table 22 lists the results of the regression analysis for the variable *Normative Commitment*. Here, on the one hand, a significantly better predictive performance is shown, as implied by $R^2 = .330$. At the same time, a significantly higher number of predictors were included in the actual model. *E-recruitment*, *digital HRM*, *e-employee satisfaction* and *digital literacy*, which also contributed to the variance explanation in the other regression models, proved to be significant here.

In order to check to what extent, the predictive performance of the regression models could be influenced by a different approach - and thus also to check the general predictive power of the full set of predictors - the regression analyses were repeated in a last step, whereby the *Enter method* of variable inclusion was used in this run. This uses all potential predictors to increase the predictive power of a model.

Only a summary version of the results is presented in this context. Table 23 lists these for the variable emotional commitment. Here it can be seen that the inclusion of all possible predictors does not lead to a clear increase in predictive performance. However, as the increased distance between R^2 and the adjusted R^2 implies, the problem of overfitting increasingly arises. This implies that the initially set up prediction model with only one predictor delivers the more valid result.

The result for rational commitment is similar. By including all potential predictors in the model, the predictive power could be increased to $R^2 = .174$. For the variable normative commitment, which already stood out in the first version due to its higher predictive power and the use of several predictors, there was only a non-significant change in the prognostic validity.

In summary, it could be shown that although the variables used here can in principle contribute to the prediction of employee commitment, they are only comparatively weak predictors, as a comparison with the explanations of Cohen (1992) regarding the classification of effect sizes shows. In particular for emotional and rational commitment, the variables used could only explain a little more than 10% of the variance. It was also noticeable here that the company's own digital competence, but not the digital leadership or digital HRM measures used by the company, had a significant influence. Only for normative commitment was there a significant effect - contrary to the original expectation.

2 Discussion

2.1 Critical discussion of the results and triangulation

The present study was able to show the extent to which new challenges and opportunities arise for the electrical trade as a result of digitalisation. This was examined from three different perspectives: In a first step, based on the current professional and research literature, the environment in which these developments are taking place and how digitalisation (and globalisation in connection with it) are shaping business life was presented (see Bouwman, Nikou & de Reuver, 2019; Mithas, Tafti & Mitchell, 2013). It has also been shown how the role of employees in entrepreneurial success is becoming increasingly important, which means that corresponding measures to increase motivation and retention are or should increasingly become the subject of entrepreneurial and leadership activity (Reinhard & Abel, 2013; Verbeke, Dietz & Verwaal, 2011). In this context, digital measures of human resource leadership and management are described as a reaction to social and economic developments (Marler & Parry, 2016; Thums & Müller, 2019). They are considered valuable tools not only to increase the efficiency of HRM, but also to be able to respond to the demands of employees in the company (see sections 2.3 and 2.5). In particular, it can also be shown here to what extent digitalised HRM can succeed in promoting companies in the context of the digital transformation. In summary, this theory-based approach showed what a relevant role HRM can play in creating a basis for companies and their transformation. Already in the introduction, it was explained to what extent different challenges of the contemporary business environment create the necessity of a strategic HRM. Following on from this, the tools and finally the objectives of such HRM and the associated necessity of digitalisation were described.

This description provided the basis for the empirical research work, which aimed to find out the implementation status of corresponding measures and the associated development picture in the environment of the German electrical trade. Both qualitative and quantitative approaches were used. In a first step, it was shown based on expert interviews to what extent digitisation in the skilled trades is already seen as part of management practice and what general challenges arise for personnel selection and personnel development. Here it became clear that the industry is subject to constant change, which is not only increasingly driven by the disruptive power of the COVID 19 pandemic. At the same time, however, it is also emphasised that digitalisation itself is significantly changing the requirements profile for applicants, because the activities in the industry itself are evolving. It is becoming increasingly clear - as the theoretical analysis also showed - that employee must bring new competences with them and manage to

actively add value in a digitalised environment. At the same time, however, it also became clear in the context of the analysis carried out here that the necessary framework conditions and prerequisites only seem to be in place to some extent: The digitalisation of human resources management is only partially perceived as central here; rather, the focus seems to be on other aspects. It is also clear that the necessary resources for actively driving this development only seem to be available to a limited extent; especially in the context of financial and time resources, it is emphasised here that HR management - and in a similar form management itself - hardly seems to be in a position to take on strategic agendas.

The quantitative perspective clearly focused on the relationship between digital HR measures and employee commitment. It was investigated to what extent such digitalised measures are perceived positively by employees and whether there appears to be predictive validity regarding organisational commitment - which is described in section 2.3.1 as one of the most relevant variables of contemporary entrepreneurial activity. In summary, it was shown that digital HR measures hardly receive any attention, and their predictive validity therefore appears to be low. This is only partly consistent with the initial assumptions. These suggested that modern, digitally supported approaches in the HR sector could certainly make a valuable contribution to increasing employee loyalty, for example. However, such a finding cannot be demonstrated on the results found here in the electrical trade sector: The perception of digital measures - as the inferential statistical observations make clear - does not seem to be related to other key figures of HR activities or their results.

It should be borne in mind that the specialist and research literature included in this study (see section 2.3.1 or 2.2.3) consistently focuses on the international or US situation and primarily on companies in other sectors, whereas the mixed-methods study presented here decidedly looks at companies in the German electrical trade. The results thus obtained should therefore be considered and discussed in precisely this context. Their limitations should therefore be understood less as an indicator of a lack of validity - this applies to this study as well as to the literature findings included - than as evidence that the electrical trade sector in Germany appears to differ significantly from *typical* sectors.

In addition to these findings regarding digitisation itself, which only partially correspond to the findings from the international specialist literature, the topic of international migration is repeatedly emphasised as a challenge for the skilled crafts sector during the qualitative processing. As can be seen in sections 5.1.2.1 and 5.1.2.2, the interviewees are consistently critical of this development and the resulting increase in diversity in the companies. This raises

the question of the extent to which the topic of diversity management is sufficiently appreciated in the sector or in the field and to what extent corresponding management approaches are used in practice. The available findings (see section 5.1) do not provide any indication that this topic is actively addressed in management practice. An examination of the literature itself (cf. for example Nentwich, Liebig & Steyaert, 2010) does not lead to the conclusion that corresponding efforts exist on a broad scale or are being promoted. Rather, it appears that the topic of diversity management is more likely to be considered in the context of internationally operating groups and companies (cf. Jin, Lee & Lee, 2017). At the same time, however, the interviewees emphasise that this is precisely where they see a central challenge. The integration of non-German speaking employees was repeatedly described as challenging. In this context, it is questionable to what extent the management and leadership practices currently applied in the German skilled crafts sector are up-to-date and adequately able to meet the requirements of ongoing socio-demographic developments. Authors such as Hollander (2012), for example, show that by using appropriate, inclusive leadership approaches, it is possible to establish diversity not only as a danger, risk, and threat, but as an actual opportunity for the company. However, according to Booyesen (2014), this is primarily dependent on the will and ability of the respective managers. They must succeed in creating an environment characterised by inclusion that is able to take up the challenges; specifically, in such a way that advantages can be utilised.

2.2 Answering the research question

The initial research question was: **How are leadership and human resource management in German SMEs in the electrical trade sector handled regarding the requirements and specifics of increasing digitalisation?**

Here it becomes clear that the consequences of digitalisation must be discussed and considered in particular regarding the changing requirement profiles. In particular, the consideration of the state of research - such as the results presented in section 1.1 or 2.2 with reference to North (2011) or Caldwell (2001) - makes it clear here that human resource management in relation to digitalisation is a fundamentally highly relevant procedure. This consideration provided the basis for the empirical work that was carried out as part of this research. The assumptions were at least partially confirmed.

The evaluation of the expert interviews, for example, illustrates the awareness of the experts that the technological requirements for the skills and competences of the employees are

gradually changing, which is also increasingly influencing the job profile as such. Similar to North's (2011) postulation, the experts interviewed also seem to have a fundamental understanding that the business environment must increasingly be regarded as a *knowledge society* and that there is therefore a substantial change in requirements. The importance of digital and personal competences of the employees is emphasised throughout. Thus, the perspective of the experts themselves shows that the digitalisation and repositioning of HRM is only partially recognised as a relevant development. This already shows a discrepancy with the expected result based on the state of research. In the following, the perspective of employees was taken within the framework of a quantitative study.

However, digital leadership and HR management measures themselves seem to play only a partial role in German SMEs in the electrical trade sector, as the perspectives included here make clear. In particular, the quantitative research perspective made it clear that this hesitation is certainly in the interest of the employees, as there is hardly any predictive power of digital HR measures in the context of employee retention. Although it was expected that the perception of digital HR measures should also lead to higher levels of retention (see Marley & Parry, 2016; Melanthiou, Pavlou & Constantinou, 2015), this does not seem to be the case: In general, there seems to be more of a wait-and-see or neutral attitude towards the issue.

In general, it can be seen that digitalisation is discussed in particular regarding professional requirements, where, for example, impulses are given through corresponding training measures to increase digital skills and abilities. This is to be understood with reference to the fact that although it is recognised that requirement profiles are changing and that further development should be sought through targeted measures, other approaches to digital HRM have not yet gained much importance.

In summary, therefore, a thoroughly critical attitude can be summarised here: Although the - especially international - specialist literature not only postulates the importance of modern and digitised HR measures, but is also able to demonstrate this in an empirical way (see Melanthiou, Pavlou & Constantinou, 2015; Petry & Jäger, 2018; Roper, Sivertzen, Nilsen & Olafsen, 2013), the observation carried out here makes it clear that this only seems to be the case to a limited extent in the German craft sector. Neither do the experts interviewed here describe that digital and strategic approaches seem to be of great relevance in entrepreneurial practice (see section 5.1), nor does the survey of employees indicate that the extent of digital activity of HRM seems to be of high relevance. The present research question can thus only be

partially affirmatively answered: Although the international business environment offers indications of the importance of digital HRM, it seems to be hardly established in the German electrical trade. The main hurdles here are the limited resources available, whereby both financial and time resources as well as competences can be addressed here. There seems to be insufficient knowledge about how a modern HRM can be established despite the scarcity of resources and the understanding that such a HRM would be necessary seems to exist only to a limited extent. In this regard, however, the question also arises to what extent such a modern HRM would actually be expected in this environment: Contrary to expectations, there seems to be little expectation on the part of employees regarding digital HRM measures.

3 New scientific results

Based on extensive long-term observations and experiences in the electrical trade, research questions were formulated and aggregated. These research and sub-research questions were validated through extensive literature research, expert interviews, and quantitative surveys with over 160 participants, with important results and insights for the electrical trade. The basis for this is the triangulation.

Novel and particularly noteworthy results are the following aspects:

1. **Digitalisation in the electrical trade is only partially perceived as central.** It also becomes clear that the necessary resources for actively driving this development only seem to be available to a limited extent; especially in the context of financial and time resources, it is emphasised here that personnel management - and in a similar form the management itself - hardly seems to be in a position to take on strategic agendas. The quantitative research perspective in particular makes it clear that this hesitation is certainly in the interests of employees, as there is hardly any predictive power of digital HR measures in the context of employee retention.
2. **Digital HRM measures are described as a reaction to social and economic developments.** They are seen as a tool not only to increase the efficiency of HRM, but also to be able to respond to the demands of the employees in the company. In general, there seems to be a rather wait-and-see or neutral attitude towards the topic.
3. **Employees must bring new competences with them** and must be able to actively add value in a digitalised environment. The evaluation of the expert interviews illustrates the awareness of the experts that the technological requirements for the skills and competences of the employees are gradually changing, which is also increasingly influencing the job profile as such.
4. **It turns out that digital HR measures hardly receive any attention** and accordingly their prognostic validity seems to be low. This is only partly consistent with the initial assumptions.
5. **The interviewees were consistently critical of the increase in diversity in the companies.** The available findings do not provide any indication that this topic is actively addressed in management practice. At the same time, however, the interviewees emphasise that they see this as a central challenge. The integration of non-German speaking employees was repeatedly described as challenging.

6. **Digital leadership measures seem to play only a partial role in German SMEs in the electrical trade** sector, as the perspectives included here make clear.

There seems to be insufficient knowledge about how to establish a modern HRM despite the scarcity of resources, and there also seems to be only limited understanding that such a HRM would be necessary.

Publications on the topic of the dissertation

Thomas, G. (2020). Digital Maturity of HR in SMEs. *European Journal of Economics and Business Studies*, 6(1), 56-62. DOI: <https://doi.org/10.26417/ejes.v6i1.p56-62>

Thomas, G. (2020). Data Usage in Talent Management-Challenges for SMEs in the Field of Skilled Crafts. *Socioeconomic Challenges*, 4(1), 75-81. [http://doi.org/10.21272/sec.4\(1\).75-81.2020](http://doi.org/10.21272/sec.4(1).75-81.2020)

Thomas, G. (2020). Leadership Models and Leadership Styles as Success Factors in Small and Medium-sized Enterprises. *Business Ethics and Leadership*, 4(1) 35-42. [http://doi.org/10.21272/bel.4\(1\).35-42.2020](http://doi.org/10.21272/bel.4(1).35-42.2020)

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