

Leadership Competences in the Digitalised World of Work: A Question of Gender and Culture?

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Abstract: As a central obstacle to the introduction of digitisation, many companies cite primarily the lack of suitable specialists with specific skills. One solution could be to increase the labour market participation of qualified women and persons with a migrant background. In order to harness the potential of skilled women and migrant women to shape the digital transition, companies and organisations need to reduce their reservations about women and people with a migrant background. Special measures must be used to raise awareness of diversity and highlight its benefits. Qualified women with and without a migration background in particular can play a major role in the context of digitisation due to their specific competences. According to experts, social, intercultural and risk management skills attributed to women and female immigrants are particularly necessary in the digitised world of work. But what specific skills do executives need in times of Industry 4.0? And are there gender- and culture-specific differences? This paper describes the results of an online survey of 515 students and company representatives that was conducted in Germany in the period from November to December 2018. Participants were asked to assess different competences, behaviours and knowledge resources in terms of their relevance to leadership in the world of work of the future. It turns out that "openness to change", "IT and media literacy", "learning aptitude" and "the ability to think in context" are specific competences that industry managers need, according to the respondents. In addition, "problem-solving competence" is important for students and "communicative competence" for company representatives. While the origin of the participants does not seem to have any influence, gender- and age-dependent differences can be observed in the results. For example, the women surveyed consider the four competences "innovation competence", "decision-making ability", "ability to think in context" and "willingness to make decisions" to be less relevant than men do. A comparison between generations also reveals some noticeable differences. Older respondents rated "openness to change", "self-organisation" and "problem-solving competence" as particularly relevant.

Keywords: Digitisation, digitised world of work, qualification potential of women and migrants, digitisation competences

1. Introduction

In order to shape digital change and industry 4.0 and secure the long-term competitiveness of companies and organisations, specific knowledge resources and skills of employees and managers are necessary. In this context, the increasing shortage of skilled workers in Germany is becoming a problem factor as considerable bottlenecks exist especially in STEM occupations, in mechanical and automotive engineering, in mechatronics, automation and electrical engineering, as well as in information technology and software development (Bundesagentur für Arbeit, 2018). In order to counteract these negative developments, an increase in the labour force participation of women, older people and people with a migration background is recommended as a suitable measure (Handelsblatt, 2017).

In Germany, women rarely opt for STEM occupations; only 15% of STEM employees are female (Arbeitsagentur, 2019). Unlike in Germany, young women in Eastern Europe, Southeast Asia or some countries of origin of current refugees are more likely to opt for STEM occupations.

This makes qualified women and immigrants interesting, promising target groups for companies and organisations in order to prevent a shortage of skilled workers. However, there are still reservations on the part of companies and organisations about women and people with a migration background who prevent them from exploiting their potential. Special measures are needed here to sensitise company actors to diversity and to demonstrate its advantages.

In addition, qualified women with and without a migration background can play a special role in the context of digitalisation due to their specific competences: According to experts, the digitised working world of the future will require social, intercultural and risk management skills that are attributed to women and immigrant women.

It is also known that cooperation between men and women, natives and immigrants in the sense of consciously perceived diversity can lead to more balanced decisions and more innovation (Franken and Christoph, 2014; KIT, 2011; McKinsey, 2018; Stuber, 2009). This can create additional added value for companies and organisations.

In order to realise these benefits, innovative model instruments are needed to promote the participation of qualified women in digital change in business and science. These instruments must be applied on both sides— in the special preparation of STEM women for the requirements of the digitised world of work and in the sensitisation of decision-makers in companies and organisations for women and immigrant women as contributors to digitisation.

2. State of research

The research on the potentials of qualified women with and without a migrant background for industry 4.0 forms an interface between the subject areas "digitisation/industry 4.0", "gender/women in STEM" and "migration/integration".

2.1 Digitisation / Industry 4.0

The importance of digitisation and industry 4.0 for the future competitiveness of companies is enormous (Zühlke, 2014; BDI, 2019).

Industry 4.0 offers companies economic advantages, since individual customer wishes can be considered and even individual items can be produced profitably (it's OWL, 2014; Brödner, 2017). Studies on the economic potential of industry 4.0 anticipate constant growth in gross value added in mechanical and plant engineering: this is estimated at 99.8 billion euros by 2025 in Germany through the application and provision of industry 4.0 technologies and services, which corresponds to an annual increase of 2.2% (Wieselhuber et al., 2015).

Many companies cite a lack of suitable specialists and problems with data security as central obstacles to the introduction of digitisation (BITKOM, 2015; Kroker, 2019).

For employees, the use of new technologies means a change in their working environment and their tasks (BMBF, 2015; Vogels, 2018). In future, people will mainly be concerned with setting, monitoring and securing production strategies (Stehr, 2014; BMBF, 2016); the tasks of traditional production and knowledge-workers will grow together (Boes and Kämpf, 2016). For digitised work in production and services of the future, employees need digital competence, a high degree of independence and self-organisation as well as an understanding of the interaction of all actors in the value creation process (Hirsch-Kreinsen, 2014; Hahne, 2016; LinkedIn, 2017). Social skills (especially communication and team skills) and the ability to work together in an interdisciplinary and intercultural manner are becoming increasingly important as work will increasingly take place in cross-functional internal or even cross-company networks (BMBF, 2015), often in digital, virtual and project form (BMBF, 2015; Bultemeier and Marrs, 2016). According to Franken, Prädikow and Vandieken, the next five years will see the demand for different skills depending on the employee group. In addition to openness to change, the ability to learn is particularly important for semi-skilled and unskilled workers, for managers communicative skills and for academics the ability to think in context. (Franken, Prädikow and Vandieken, 2019). A further study confirms that digital and media competence, social and communication competence and problem-solving and optimisation competence are the top three future competences.

When considering both sexes, a different prioritisation of competences was also noticeable. While male respondents rated problem-solving and optimisation skills, interdisciplinary thinking and acting as well as social and communication skills as the most relevant, female respondents rated digital and media skills, social and communication skills as well as personal responsibility. It is also conspicuous that, overall, women rate competences higher (cf. Franken and Wattenberg, 2019; Franken, Schenk and Wattenberg, 2019).

The design of digital work should allow more flexibility in terms of working hours and places of work as well as a better work-life balance (BMBF, 2015; Eisenbeis-Trinkle, 2014; Bultemeier and Marrs, 2016). This will make it easier to reconcile family and career, which will benefit women and mothers in particular (Robert Bosch, 2014; German Bundestag, 2018).

2.2 Gender / Women in STEM

Above all, the potential of qualified women should be better exploited against the background of the increasing shortage of skilled workers and in the interests of equal opportunities.

In 2018, 16.7% of the members of the Executive Board worldwide were women. Northern and Western Europe are the leading regions, each with an average of 36.3% and 26.7% women. This is followed by the USA and Canada with 20.9% and Central and Eastern Europe with 15.5%. These differences mainly result from the women's quotas for members of the Board of Management that have come into force in recent years (EY Reporting, 2019). In America, women hold 20.4% of the board seats in the R3000 companies, an increase of 17.7% in 2018. 27.7% of the board seats in the 100 largest companies are held by women and 15.7% in the 1000 smallest companies. Women hold more than 20% of the board seats in five out of nine industry sectors. In 2018, they were represented in only two out of nine industries (2020 Women On Boards, 2019). In 2015, in Africa's top 307 companies, only 14% of board members were women. The country with the highest proportion of women on the Executive Board is Kenya (19.8%), while the country with the lowest proportion of women is Ivory Coast (5.1%) (Oyaro, 2018). Advantages of female board members are an improved decision-making process in the board, apparent improvement of the presence on the board as well as exemplary character for women at other organisational levels. Disadvantages could occur in various board teams due to internal communication problems and communication with management. Board quotas could imply that, due to a lower total of women in senior management, women with less experience would join the board. In general, it also seems that quotas have little positive effect on more women joining senior management (Smith, 2018).

The example of Germany shows that, statistically speaking, women are better qualified than men. Nevertheless, they still have considerable difficulties getting to the top floors. In 2017, only one in three managers (29%) was female (Destatis, 2018). In the 100 largest German companies, the proportion of women on the executive boards was 10% for the first time in 2018 (Hols and Wrohlich, 2019). In the Dax, M-Dax and S-Dax companies, the proportion of women on the board increased last year but is currently still 8.6% (Haufe Online Redaktion, 2019). Women are also still underrepresented in science: in 2013, the proportion of women in professorships was 25% (Destatis, 2019). This means that the qualifications and specific skills of women are hardly used to shape digitisation in industry and science.

The proportion of women in STEM occupations is slowly rising but is still well below average at 15.4%. The highest proportions of women are in mathematics and natural sciences, with a good third of women employed in technical and IT occupations, while the figure for women is only 13 to 17% (Federal Employment Agency, 2019). And it is precisely these occupational groups that are decisive for the success of digitisation. The number of women studying STEM is steadily increasing but is still very small overall (Kompetenzzentrum, 2015; Komm mach Mint, 2018).

2.3 Migration / Integration

Less present than the discussion on women in management positions and in STEM occupations is the discussion on the topic of qualified migrant women. Migration can only be viewed from a specific perspective—the example of Germany shows that the proportion of people with a migration background has increased by 62% in the last 10 years to 10.92 million (Federal Statistical Office, 2019). A person then has a migration background as soon as he or she or at least one parent was not born with German citizenship (Federal Statistical Office, 2013). In 2018, around 20.7 million people in Germany had a migration background, which represented a share of more than 25% of the total population and an increase of 21% over 2013. Since 2013, the number of immigrants has risen from year to year (Federal Statistical Office, 2019). This circumstance is accompanied by an increasing qualification level of migrants and still unsolved integration problems (Jungwirth, Grigoleit and Wolffram, 2012).

Of a total of 10.1 million women with a migration background in 2013, 3.3 million have a vocational qualification, 959,000 are university graduates and 41,000 have a doctorate (Federal Statistical Office, 2015b). The level of education and qualification varies depending on the country of origin; immigrants from Western, Northern and Eastern Europe have a particularly high proportion of university graduates (Höhne and Schulze Buschoff, 2015). However, this potential is only used to a limited extent: Many migrant women in Germany are employed under their qualifications, have to struggle with many obstacles on their way to a career, are unemployed, make it as solo self-employed or are not available to the labour market. As women, they are held

back by the "glass ceiling"; because of their migration background, they often must assert themselves against prejudices (Franken et al., 2016). According to estimates by Höhne and Schulze Buschoff (2015), the probability of unemployment among highly qualified ethnic German immigrants, women from the former Yugoslavia (1st generation) and immigrants from EU Eastern Europe is more than twice as high as in the reference group without a migration background. Women migrants from non-EU countries are even three to five times more likely to be affected by unemployment (Höhne and Schulze Buschoff, 2015). And it is precisely amongst these immigrants that many STEM occupations have been learnt (Jungwirth/Grigoleit and Wolffram, 2012). Practical decisions on the employment of qualified migrant women take place in companies and organisations where barriers and prejudices remain in the minds of many HR managers (Franken and Christoph, 2014). Some research findings show that, despite their qualifications, highly qualified female immigrants in STEM occupations, most of who come from Eastern Europe, are confronted with barriers that are difficult to overcome in companies and organisations (Jungwirth/Grigoleit and Wolffram, 2012). It is necessary to introduce change here to improve the image of qualified migrant women and to communicate the advantages of their employment widely. Research and analyses on the effects of a broader participation of women and migrant women in business and society show higher productivity (quantitatively and qualitatively), more success in international activities, better cooperation in teams, more creativity, higher customer satisfaction (especially among heterogeneous customer groups) and a positive image of the company as an employer (Franken, 2015a; Franken and Christoph, 2014; KIT, 2011; Stuber, 2009).

3. Objective and research question

The current state of research proves that qualified women with and without a migrant background represent a considerable and currently insufficiently used resource in the context of digitisation. The purpose of research is to gain a deeper insight into the specific requirements of enterprises in the context of digitisation and industry 4.0 and to work out the specific advantages of a higher participation of women and immigrants in the shaping of digitisation in order to point out the necessary instruments and measures for their acquisition and promotion.

The central research question is intended to analyse the competences of qualified women and men, natives and immigrants for the digitised world of work and to compare them with the requirements of digitised enterprises.

It is therefore:

RQ: What specific competences are needed in the world of work 4.0 in the opinion of women and men, company representatives and students as well as people with and without a migration background?

The following hypotheses are based on previous findings:

H1: Men and women rate the competences to be assessed differently relevant for the world of work 4.0.

H2: Participants with and without a migrant background rate the competences to be assessed by them differently relevant for the working world 4.0.

H3: In contrast to students, persons who are already in professional occupations rate different competences as relevant for the working world 4.0.

H4: Where available, differences in the assessment of competences between company representatives and students can be explained by the age difference.

4. Method

As a survey instrument, a quantitative survey in the form of a questionnaire was carried out in Germany from November to December 2018. In addition to literature research on the current state of research, the survey was based on an explorative interview series [n=6] among HR managers and decision-makers in companies as well as students. In the course of this the questionnaire was developed with nine demographic questions as well as one question that asked the participants to assess a total of 14 competences, knowledge resources and behaviours with respect to their relevance for the working world 4.0. The survey was conducted using a six-tier scale in which respondents were able to express their assessment (not at all significant [1] to very significant [6]) of the relevance of the items mentioned. The six-step scale and thus the even number of possible answers was chosen to rule out answer distortions with regard to the tendency towards the middle. From a value of 3.5, a general agreement can be assumed. In order to determine possible correlations between the

assessments and the groups surveyed, the Chi-square was calculated according to Pearson and Cramer's V. Mean values were also compared with a T-test. The variance homogeneity was checked with the Levene test.

The questionnaire was created online and distributed to students and companies via email distribution lists, newsletters from the participating universities and previous project partners as well as Facebook and personal contacts. In addition, the questionnaire was distributed in paper form at workshops and conferences of the accompanying transfer project and subsequently digitised. The survey included company representatives with and without management or personnel responsibility as well as students. The evaluation was carried out according to gender and migration background. A binary gender classification was deliberately used as this is primarily applied in practice relevant to the company. Nonetheless, it was possible not to make an entry.

5. Results

5.1 Sample characteristics

A total of 515 people took part in the survey and completed the questionnaire in full, 106 of them in paper form. Three hundred and six persons identified themselves as male, 205 as female and four did not complete the questionnaire (Table 1). Of all respondents, 114 (22.1%) reported having a migration status.

Table 1: demographic data

Age categories	Sex		Migration backgr.		Professional position		
	male	female	with	without	Comp. Repr.	Students	Others
No information	4		9		3	1	
Generation Z	50	21	15	56	2	70	0
Generation Y	138	128	77	185	97	162	7
Generation X	79	31	17	93	93	4	12
Baby Boomer	39	25	3	60	58	0	6
Overall	306	205	112	394	253	237	25
		515		515			515

The participants were divided into different age groups (Baby Boomer: born before 1964; Generation X: 1964–1979; Y: 1980–1995; Z: 1996–2009). Most respondents are in the group Generation Y (266 or 51.7%). The average age is $M=35.3$ ($MD=30$, $SD=13.3$). In addition to age and gender, a distinction was made between positions in professional life. Two hundred and thirty-five persons are in employment, 237 are students. Almost as many employees (48.8%) as persons with decision-making powers (managers 25.4%, managing directors 18.3% and self-employed 7.5%) were surveyed among company representatives (Figure 1).

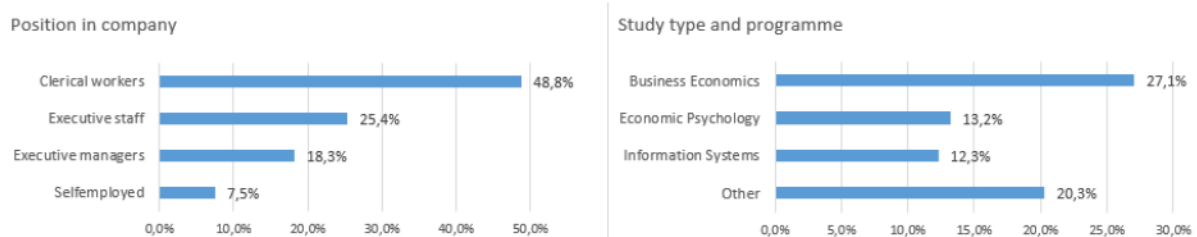


Figure 1: Position in company and study programme

Of the students, 146 are in Bachelor's and 91 in Master's studies. The most frequently mentioned courses are Business Administration (27.1%) and Business Psychology (13.2%).

5.2 Results of the questionnaire

The following table compares an overview of the mean values of the groups surveyed and the respective rank of competence.

Table 2: Resulting list of competences

competency	mean & rank	sex		migration background		status		generation		
		m.	f.	yes	no	Corp.	Stud.	x	y	z
Openness to change	5.50 1	5.52 1	5.47 1	5.42 2	5.53 1	5.57 1	5.03 8	5.64 1	5.52 1	5.30 1
IT and media competence	5.40 2	5.36 3	5.45 2	5.47 1	5.37 2	5.39 2	5.40 2	5.40 6	5.45 2	5.25 3
Learning ability	5.36 3	5.41 2	5.30 3	5.38 3	5.35 3	5.44 3	5.12 5	5.55 2	5.32 3	5.26 2
Ability to think in context	5.25 4	5.32 4	5.15 4	5.19 5	5.26 4	5.39 4	5.41 1	5.41 5	5.23 4	4.96 7
Problem-solving competence	5.22 5	5.24 6	5.18 5	5.22 4	5.21 6	5.25 7	5.03 7	5.35 8	5.23 5	5.03 5
Ability to work in a team	5.21 6	5.23 7	5.19 6	5.17 6	5.22 5	5.29 6	4.74 13	5.44 4	5.17 6	5.03 6
Communicative competence	5.20 7	5.26 5	5.11 8	5.16 7	5.21 7	5.33 5	4.42 14	5.44 3	5.10 8	5.07 4
Interdisciplinary thinking and acting	5.09 8	5.15 8	5.01 9	5.01 9	5.11 8	5.22 8	4.48 12	5.39 7	5.03 9	4.85 9
Innovation competence	5.08 9	5.05 11	5.13 7	5.07 8	5.08 9	5.12 11	5.26 3	5.12 11	5.11 7	4.86 8
Flexibility	5.05 10	5.08 10	5.01 10	4.97 10	5.07 10	5.19 9	5.09 6	5.25 10	5.00 10	4.77 11
Self-organisation	5.03 11	5.08 9	4.96 11	4.95 11	5.05 11	5.17 10	5.18 4	5.31 9	4.94 11	4.76 12
Decision-making ability	4.91 12	5.01 12	4.78 13	4.91 12	4.91 12	4.97 12	4.95 9	5.08 12	4.83 12	4.85 10
Analytical capabilities	4.79 13	4.77 13	4.81 12	4.85 13	4.76 13	4.83 13	4.85 11	4.92 13	4.80 13	4.52 13
Experiential knowledge	4.56 14	4.60 14	4.50 14	4.60 14	4.54 14	4.65 14	4.90 10	4.71 14	4.47 14	4.29 14

In a comparison of all mean values, the interviewees consider openness to change (5.50), IT and media competence (5.40) and the ability to learn (5.36) to be particularly relevant. Less in demand are analytical skills (4.79) and experiential knowledge (4.56). However, all the values determined are above 3.5 and thus generally within the approval range.

Women and men show a slightly different response behaviour [H1] with almost consistently marginal lower values for women than for men and the overall average. The items innovation competence ($\chi^2=10.895$, $p=.028$, $V=0.146$), decision-making ability ($\chi^2=13.801$, $p=.017$, $V=0.164$) and ability to think in context ($\chi^2=14.228$, $p=.014$, $V=0.167$) show a statistically significant correlation. The interviewed men rate these items more relevantly than women. In the mean value comparison in the T-test, however, a random correlation can only be excluded and thus confirmed for decision-making ability (T-test $p=.006$, Levene $p=.002$).

When looking at the values with regard to the interviewees' migration background, only minimal differences in height and ranking can be found. For example, people with a migration background consider IT and media skills to be the most relevant. However, further evaluation shows no significant connections between a migrant background and the assessment given, so that [H2] cannot be confirmed statistically.

More noticeable differences in response behaviour can be observed among company representatives and students [H3]. Thirteen of the competences are rated more highly by company representatives than by the population as a whole; eight competences are rated significantly higher than by students, above all communicative competence (+0.91) and interdisciplinary thinking and acting (+0.74). Only experiential knowledge (-0.25) is clearly classified as less important. The following Table 3 shows the items that are significant in both Cramer's V and the T-test, but not in the Levene test, and thus indicate at least a partial connection.

Table 3: Relational dimensions of companies / students

Items	χ^2	p	V
Ability to work in a team	30.888	.001	0.173
Interdis. thinking and acting	29.399	.001	0.169
Self-organisation	22.766	.004	0.149
Communicative competence	21.387	.019	0.144
Experiential knowledge	20.774	.023	0.142
Openness to change	19.831	.011	0.139
Innovation competence	17.529	.025	0.131

Since this allows correlations, but not causes, to be identified for the different assessments of company representatives and students, a comparison is also carried out according to different age groups—due to the small number of cases without baby boomers [H4]. It can be seen throughout that Generation X and Y and thus older participants consider competences to be more important than younger ones. The only exception is IT and media competence, which is rated the highest in Generation Y. Table 4 also shows the items that were significant at Cramer's V in a generational comparison.

Table 4: Interdependency measures for generation comparison

Items	χ^2	p	V
Ability to work in a team	35.407	.002	0.152
Interdis. thinking and acting	33.197	.003	0.149
Experiential knowledge	31.982	.006	0.145
Self-organisation	27.793	.006	0.135
Innovation competence	23.656	.023	0.124
Openness to change	21.045	.050	0.118

When evaluating the mean values using the T-test, generation X and Z are used for comparison. This shows that for the items openness to change (T-test $p=.004$, Levene $p=.004$), self-organisation (T-test $p<.001$, Levene $p=.020$) and problem-solving competence (T-test $p=.011$, Levene $p=.019$) there is a significant correlation between age and assessment.

6. Conclusion

The present study deals with the manifold competence and knowledge requirements for the world of work 4.0 from the point of view of women and men, persons with and without a migration background as well as company representatives and students.

According to the assessment of all interviewees, the study confirms that openness to change, IT and media competence and learning ability will be of particular relevance in the future. The gender comparison reveals interesting findings. Young qualified women have expectations of the competences required for the digitised world of work that are almost completely in line with the requirements of companies. There are more deviations among young men. In addition, the statements made by young women on the importance of innovation, communication skills and the ability to work in a team prove that as future managers they possess specific competences for coaching and shared leadership, which are crucial for a modern understanding of leadership (cf. Franken, 2019).

Furthermore, there are differences in the way we look at company representatives, students and age groups. Company representatives and representatives of Generation X consider competences to be more relevant, especially openness to change, communicative competence and interdisciplinary thinking and acting. Reasons for this may lie in the experience of the interviewees in companies as well as in how they deal with change. No significant differences could be found with regard to migration status. It is conceivable that, for example, a similar level of education led to comparable response behaviour. Future studies should take this circumstance into account and, if necessary, investigate culture-dependent aspects within the framework of their own attribution of culture or personal migration experience depending on their country of origin. As a recommendation for companies and organisations, it can be deduced that it is necessary to focus more strongly on the target groups of qualified women and immigrants in order to tap their valuable specific potential, not only as a measure against the shortage of skilled workers but also for the new work and management concepts in the digitalised world of work.

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