

The impact of digitalization on employees' future competencies: has human resource development a conditional role here?

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Abstract

Purpose – The purpose of this paper is to research the impact of digitalization on employees' future competencies and the conditional role of human resource development (HRD) in the relationship between independent and dependent variables.

Design/methodology/approach – Empirical research covered 1209 enterprises from all of Slovakia, Poland and the Czech Republic. The research was conducted from 2019 to 2021. Using structural equation modeling (SEM), a theoretical model was tested and verified.

Findings – Confirmatory factor analysis has shown a good fit for the tested model. The purpose and character of our data showed a good alignment with the SEM partial least squares method, as the goal is to predict a construct. The model showed that employee-oriented digitalization positively affected the employees' future competencies, with no impact of customer-oriented digitalization treated as a control variable. Also, the moderating role of HRD has not been shown to be significant for the "digitalization – competencies" relationship.

Originality/value – Previous studies on the development of personnel competencies treated these competencies as antecedents of digital transformation and examined the formal role of HRD in building the competencies. The novelty of this study lies in exploring the pattern of interactions among the impact of an environment built by innovative technologies and HRD on the competencies of the future. Also, the research embedded in the environment of Poland, the Czech Republic and Slovakia has contributed to the complex understanding of the transition to digitalization, as this region has often been omitted in the field of human resource management (HRM) research focused on exploring digital transformation.

Keywords Digital transformation, Digitalization, Human resource development, Competencies of the future
Paper type Research paper

Introduction

Digital transformation – characterized by the fusion of advanced technologies and the integration of physical and digital systems (Almeida *et al.*, 2020) – has had a huge impact on



individual and organizational activities. The literature emphasizes that information technology (IT) has changed the ways people communicate, work and spend their leisure time, as well as affected people's job security (Rhisiart *et al.*, 2017) and competencies (knowledge, skills, attitudes) (Erro-Garcés and Hernández Palaceto, 2021). These changes have occurred in Western countries since the 1990s (Hoftijzer and Gortazar, 2018). At the same time, digitalization can be oriented at humans inside the company (who create the value) and outside of the company (who receive the value). That is why, we can divide it into employee-oriented digitalization (advanced solutions for data processing and related implications used in human resource management (HRM) processes) (Mazurchenko and Maršíková, 2019; Zhang and Chen, 2023) and customer-oriented digitalization (advanced solutions for data processing and related implications used in marketing and customer service) (Fernández-Rovira *et al.*, 2021).

The implementation of IT – accelerated by the COVID-19 pandemic – has become a necessary condition for staying competitive in a digital economy (Kraus *et al.*, 2021). Simultaneously, the most important antecedent of effective digital transformation is the development of technological competencies (Almeida *et al.*, 2020; Cetindamar Kozanoglu and Abedin, 2021), whereas the speed of technological change has created a significant gap “between the current capability of employees and the rapidly evolving requirements of their roles” (Piwowar-Sulej, 2021).

Considering the above arguments, most of the previous studies linking digitalization with employees' competencies focused on these competencies treated as antecedents of an organization's transformation toward digitalization (Blanka *et al.*, 2022; Delke *et al.*, 2023). In this context, Mazurchenko and Maršíková (2019) as well as Bissola and Imperatori (2019), emphasized the need for shaping human resource (HR) professionals' digital competencies for human resource management's (HRM's) digital transformation. However, one should consider that when employees use modern technologies, they can learn informally through practice (Kittel *et al.*, 2021). Furthermore, employee-oriented digitalization (e.g. the use of algorithms in human resource management) has the potential to increase the efficiency of individual decisions in the area of competencies development (Kinowska and Sienkiewicz, 2022). At the same time, the impact of digitalization in companies on employees' competencies remains an unexplored area, a promising gap to be filled by the current study.

At this point, it is worth highlighting that some authors went beyond digital competencies and analyzed other types of skills and expertise needed for digital transformation, such as creativity, critical thinking and problem-solving (Gekara and Thanh Nguyen, 2018). The latter represents so-called transversal (or transferable) competencies that have recently gained importance, helping individuals navigate and thrive in rapidly changing environments and making employees function effectively in any job role (Belchior-Rocha *et al.*, 2022; Council of Europe, 2021). Therefore, this study analyzes the broadly understood future competencies, which are responses to the global changes occurring in the modern world, predictors of a company's long-term success and stimulators of individual employability (Piwowar-Sulej, 2021). The latter is defined as employees' ability to perform work properly in their current and future jobs (Kenayathulla *et al.*, 2019). Thanks to the development of future competencies, employees remain valuable contributors also to society, which is essential for sustainable development (Aust *et al.*, 2019; Piwowar-Sulej *et al.*, 2023).

Literature in HRM emphasizes that the shaping of future competencies takes place mainly in the process of human resource development (HRD) (Bennett, 2022; Hamzah *et al.*, 2022; Piwowar-Sulej *et al.*, 2023). HRD reflects company policies and practices related to the development of employees' knowledge, skills and attitudes. It provides employees with the resources, guidance and opportunities to develop and grow. This, in turn, benefits both the individual employees and the organization as a whole, as it ensures a more skilled and capable workforce (Vithayaporn *et al.*, 2021). Therefore, this study assumes that HRD should be a positive moderator of the relationship between digitization and employees'

future competencies. In summary, this study aims to answer the following research questions:

- RQ1. Does employee-oriented digitalization influence the level of employees' future competencies?
- RQ2. Does the relationship between employee-oriented digitalization and employees' future competencies reinforce the presence of HRD?

For this study, the authors used empirical research based on the online platform surveys conducted among in total of 1209 companies operating in three countries, i.e. Slovakia, Poland and the Czech Republic. The authors focused on Central European Countries (post-socialist) countries. Although the digital economy of these countries has been rapidly growing since 2017 and the growth dynamic has achieved higher rates than in the case of many Western countries, the education system of these countries places enough emphasis on digital technologies, which results in the lack of talented graduates in the labor markets (Marciniak *et al.*, 2020). The latter requires employers' engagement in future competencies development.

This study contributes to research on the factors influencing competencies of the future as well as studies on the outcomes of digitalization. In particular, it (1) identifies the impact of employee-oriented digitalization on the competencies of the future. Previous studies usually explored a specific type of digitalization (e.g. (Lähteenmäki *et al.*, 2022; Strohmeier, 2020),) and focused on employee digital competencies (e.g. (Cetindamar Kozanoglu and Abedin, 2021; Colbert *et al.*, 2016),). Although this study analyzes digitalization as an application of innovative technologies toward employees (facilitating HRM), it also uses digitalization toward customers (facilitating management of the relationships with customers) as a control variable. (2) responds to the call for research on the future role of HRD presented by Berber and Lekovic (2018) by measuring if HRD provides additive value to the relationship between independent and dependent variables (3) offers many theoretical and practical implications.

Theoretical background and hypotheses development

The impact of digitalization on employees' competencies of the future

Digitalization refers to the use and integration of new technologies into employees' tasks. It has altered the nature of work and decreased demand for workers performing routine tasks and having low qualifications. However, the shift towards thinking about the synergy between employees and machines rather than about a conflict between automation and employment has been postulated (Trompisch, 2017). Organizational imperative – as one of three research streams on technology in organizational research identified by Marler and Fisher (2013) – argues that the adoption of employee-oriented technologies is determined by the implementation of strategic HRM concept, being a way to specifically meet strategic HR objectives.

The implementation of modern technologies should be analyzed from the perspective of learning through practice. The latter is the principal process through which human capital has been developed (Billett, 2011). There are many learning opportunities during daily work (Wallo *et al.*, 2022). They can be divided into formal and informal. The extant literature emphasizes that formal HRD (designed and monitored by HR departments) often does not adequately address individual development needs (Jeong *et al.*, 2018). Informal learning is intentional and enables needs-based and field-based development. This learning takes place through employees' interaction and participation in a context (Cheetham and Chivers, 2001). As Kittel *et al.* (2021) emphasized, employees must be given the opportunity to learn something new to start informal (self-regulated) learning. The same authors illustrated their considerations about informal learning in the workplace with the example of a situation in which an employee learns how to use a new IT tool to resolve a specific task.

Depending on the software implemented in a company when using IT tools, employees may obtain baseline digital skills such as computer literacy, and specific digital skills, such as programming languages and industry or occupation-specific platform familiarity (Charles *et al.*, 2022). Moreover, IT tools help to overcome traditional barriers imposed by time and geography. Thanks to modern technologies, employees have facts and easy access to information which may increase their ability to learn, adapt and act in new situations. Furthermore, the use of internet-based communicators, videoconferencing as well as online collaboration tools in companies increases the employees' opportunity to learn how to communicate and collaborate in virtual teams (Colbert *et al.*, 2016). The above-listed competencies are included in different typologies of competencies of the future (Kotsiou *et al.*, 2022; Rawboon *et al.*, 2021). What is also important, people may learn from situations when the technologies fail. Decius *et al.* (2019) presented that if the machine is wrongly working, an employee usually tries to find a solution using a trial and error strategy or asks more experienced coworkers for advice. Finally, technological advancements in HRM can provide employees with information related to the level of their competencies and necessary changes (Kinowska and Sienkiewicz, 2022). The above allows for the formulation of the following hypothesis.

H1. Employee-oriented digitalization positively impacts employees' future competencies.

The moderating role of human resource development

HRD consists of policies and practices that aim at the development of employees' abilities. In particular, HRD means integrating "training and development, career paths and organizational development to improve individual and organizational effectiveness" (McLagan and Suhadolnik, 1989, p. 1). Modern HRD is responsible for creating a culture of learning in the workplace as well as increasing employees' engagement in self-development (Srimannarayana, 2019). The basic instrument of HRD is HR training associated with "a formal and systematic modification of behavior through learning which occurs as a result of education, instruction, development, and planned experience" (Armstrong, 2006). This formal learning has a high degree of structure, and it is often in a classroom setting, trainer-controlled and externally validated, as well as involves an external stimulus (Kittel *et al.*, 2021).

Many previous studies provided evidence that HRD practices enhance employees' specific competencies (e.g. Chaubey *et al.*, 2022; Ferrari, 2022; Xie *et al.*, 2020). At this point, it is worth emphasizing that HRD is expected to facilitate the development of the skills not only needed now but also of those that will be needed in the future (Piwowar-Sulej, 2021; Torraco and Lundgren, 2020). Therefore, HRD is also expected to act as a positive moderator of the "digitalization – employees' future competencies" relationship, which has been presented in the following hypotheses:

H2. HRD positively moderates the "employee-oriented digitalization – employees' future competencies" relationship.

Methodology

Research approach

The current study presents a part of a broader research project devoted to the problem of the complexity of digitalization in HRM practice with the focus on employee-oriented digitalization and customer-oriented digitalization. The idea of research was first discussed by HR leaders of companies in Slovakia, based on cooperation with the association for the HR community in Slovakia (HRcomm), to be validated. The research problem to solve in this study concerns the impact of employee-oriented digitalization on employees' future competencies, with moderating impact of HRD. This study adopts

positivism as a research paradigm that builds on verifying *a priori* hypotheses and assumes that knowledge is revealed from measurable observations (Lim, 2023). Since the most appropriate research approach for testing causal relations is the quantitative one (Creswell, 2014), a survey was used as a research method.

The empirical research was conducted in companies in Poland, the Czech Republic and Slovakia in the period 2020–2021 and this period captured the boost of digitalization caused by the COVID-19 pandemic. The sample set was 2.500 in size, while proportional stratification took place according to control signs of the company size and affiliation to the sector. The companies were approached in person or by email with a request to fill out the questionnaire in electronic form on the Google Forms platform. Respondents were people responsible for shaping HRM policies and practices in companies included in the survey pool. 48.4% of the approached companies participated by correctly completing the questionnaire. Meanwhile, 42 questionnaires were excluded due to incorrect completion.

The subject of research was 1209 enterprises from all Slovak ($n = 525$), Poland ($n = 96$) and Czech regions ($n = 588$). 296 (24%) of them were micro-sized, 277 (23%) small-sized, 283 (23%) mid-sized, and finally 353 (29%) enterprises were large. According to the business sector, 30% (363) of enterprises were from the production sector, 35% (422) of them provided services and 35% (424) belonged to other sectors. From the point of view of ownership, 802 (66%) enterprises were domestic and the remaining 407 were of foreign origin (Table 2).

Research instrument

The questionnaire has been developed by academics with expertise in HRM who are members of the academic community platform, Slovak Academic Association of People Management (SAAPM). Beyond demographics, future competencies (9 items) and two forms of digitalization (6 items for each type of digitalization), it contains sections covering topics that are subject to a change in HRM in companies in their digital transformation, identified by literature studies and discussion with academics and HR practitioners such as organizational values (11 items) and modern HRM practices (16 items including 3 HRD practices). Table 2 presents the final variables (with adequate validity and reliability scores) used in the current study.

Two types of digitalization are concerned, and the questionnaire contains technological innovations in data transformation from analog to digital. The authors included data processing-related technological innovations, such as biometric data, big data, quick data and predictive data. The authors also included interaction-related digitalization, such as platforms for remote work and networking (Table 2).

The extant literature distinguishes many detailed future competencies (Kotsiou *et al.*, 2022). In the current research, those skills were selected as competencies related to digital transformation by a focus group consisting of HR leaders in the phase of questionnaire design.

To address future competencies development, the authors included the Human Resource Development (HRD) construct to examine the innovative approach impact (Table 1). It covers the following practices: taking into account the freedom and personal responsibility of the employee in the choice of education, assigning a key role to employee education in corporate culture and evaluating the benefits of training for both the employee and the company.

For the measurement of items in the questionnaire, Likert five-level scale was used. For the status of the application, the minimum value was 1 – not applied at all and the maximum value was 5 – applied fully. The level of competencies was measured by the minimum value 1 – not present at all and the maximum value of 5 – developed fully.

The questionnaire was content and face-validated by HR leaders of companies in Slovakia in the pilot survey (semi-structured interviews). Table 2 presents, in addition to an overview

| Category of enterprise | | SK | % Within country | | Within category | |
|------------------------|------------|------|------------------|------|-----------------|-----|
| | | | PL | CZ | Total | % |
| enterprise size | micro | 33.3 | 19.8 | 17.3 | 296 | 24 |
| | small | 22.3 | 21.9 | 23.6 | 277 | 23 |
| | medium | 18.7 | 30.2 | 26.5 | 283 | 23 |
| | large | 25.7 | 28.1 | 32.5 | 353 | 29 |
| industry | production | 20.2 | 42.7 | 36.7 | 363 | 30 |
| | service | 30.3 | 28.1 | 40.1 | 422 | 35 |
| | other | 49.5 | 29.2 | 23.1 | 424 | 35 |
| owner | domestics | 65.5 | 59.4 | 68.2 | 802 | 66 |
| | foreign | 34.5 | 40.6 | 31.8 | 407 | 34 |
| Total | | 525 | 96 | 588 | 1209 | 100 |

Source(s): Authors' work

Table 1.
Structure of the research sample

of the sections of the questionnaire, the results of Cronbach's alpha and McDonald's Omega, which are measures of internal consistency. The resulting values in [Table 2](#) confirm the high level of reliability of the examined constructs.

Control variable

Previous studies concluded that market sensing can serve as a core competence, which is difficult for competitors to imagine ([Bharadwaj and Dong, 2014](#)). Customer orientation and building employee future competence have been examined in the study by [Forsten-Astikainen and Heilmann \(2018\)](#), concluding that without customer orientation, there is a danger that learning will start to divert from the customers. Further, a study by [Vallo Hult and Byström \(2022\)](#) emphasized a greater focus on generating a joint purpose and a holistic picture, where the systems are part of the development, not the development. To reflect the complexity and include an outside-in perspective, customer-oriented digitalization was considered a control variable in this study.

As [Bernerth and Aguinis \(2016\)](#) asserted, the use of statistical controls is a practical approach to remove variance associated with non-focal variables, such as customer-oriented digitalization in this case. This approach serves to correct and improve any weaknesses in the data collection process. The cited authors examined the use of control variables in research, noting a common shortcoming: many studies include control variables without substantial effort to relate them to the focal variables of interest. In contrast, the current research provides a thorough explanation and justification for using customer-oriented digitalization as a control variable. Following the recommendations of [Schjoedt and Bird \(2014\)](#), the authors took several measures when dealing with the control variable. Additionally, during the model development, the authors tested various models, ultimately choosing the one with the best fit that also logically aligns with the current state of knowledge.

Analytical strategy

The created theoretical model, according to previously published findings (see [Figure 1](#)) was necessary to verify to achieve the research goal. The theoretical model was tested by structural equation modeling (SEM). Considering the nature of the data, the asymptotically distribution-free (ADF) method was used for modeling. This method was chosen because it is robust against the non-normality of the variables, and it was the best fit from the offered estimation methods in the SW AMOS software. The purpose and

Table 2.
Items of the constructs
in the questionnaire

| Section | Construct | Items | Meaning of items | Factor loading | Standard error | p-value | McDonald's omega | | |
|-----------------------------|--------------------------------------|--------------------------|---|---------------------------------|--|---------|------------------|-------|--------|
| Digitalization to Customers | Customer-oriented digitalization | DC3 | Digital interaction platforms (customer contact, networking) | 0.745 | 0.027 | <0.001 | 0.862 | | |
| | | DC4 | Big data analytics (for marketing purposes) | 0.854 | 0.019 | <0.001 | | | |
| | | DC5 | Quick analytics (e.g. feedback) | 0.810 | 0.023 | <0.001 | | | |
| | | DC6 | Predictive analytics (e.g. in marketing) | 0.846 | | | | | |
| | | DE3 | Digital interaction platforms (e.g. internal communication, networking) | 0.716 | 0.028 | <0.001 | | | |
| | | DE4 | Big data analytics (e.g. employee motivation analysis) | 0.822 | 0.027 | <0.001 | | | |
| Digitalization to Employees | Employee-oriented digitalization | DE5 | Fast analytics (e.g. feedback) | 0.803 | 0.026 | <0.001 | 0.844 | | |
| | | DE6 | Predictive analytics (e.g. in work performance management) | 0.843 | | | | | |
| | | Attitude and Soft Skills | | 0.870 | | | | | |
| | | Competencies | Employee future competencies | Technical and analytical skills | | 0.963 | | 0.062 | <0.001 |
| | | | | Way of thinking related | | 0.927 | | 0.066 | <0.001 |
| | | | | CE2 | Soft skills (interpersonal relations, Communication, Willingness to cooperate, Information sharing...) | 0.650 | | | |
| Modern concepts of HRM | Attitude and Soft Skills | CE8 | Ability to independently solve a problem | 0.686 | 0.054 | <0.001 | 0.795 | | |
| | | CE9 | Personal involvement | 0.788 | 0.056 | <0.001 | | | |
| | | CE1 | Professional qualifications (for the job) | 0.612 | 0.053 | <0.001 | | | |
| | | CE3 | Technology and IT skills, Working with specific software | 0.655 | | | | | |
| | | CE4 | Ability to study independently (search and process information) | 0.797 | 0.053 | <0.001 | | | |
| | | CE7 | Analytical skills (Excel, SPSS, Business Intelligence, Big Data...) | 0.699 | 0.045 | <0.001 | | | |
| Source(s): Authors' work | Way of thinking related competencies | CE5 | Critical thinking | 0.774 | | | 0.795 | | |
| | | CE6 | Creativity and creative thinking | 0.741 | 0.035 | <0.001 | | | |
| | | HR14 | The company takes into account the freedom and personal responsibility of the employee in the choice of education | 0.616 | 0.031 | <0.001 | | | |
| | | HR15 | Employee education has key role in corporate culture and is perceived as a shared responsibility | 0.850 | 0.028 | <0.001 | | | |
| | | HR16 | The company evaluates the benefits of training for both the employee and the company | 0.860 | | | | | |
| | | | | | | | | | |

Source(s): Authors' work

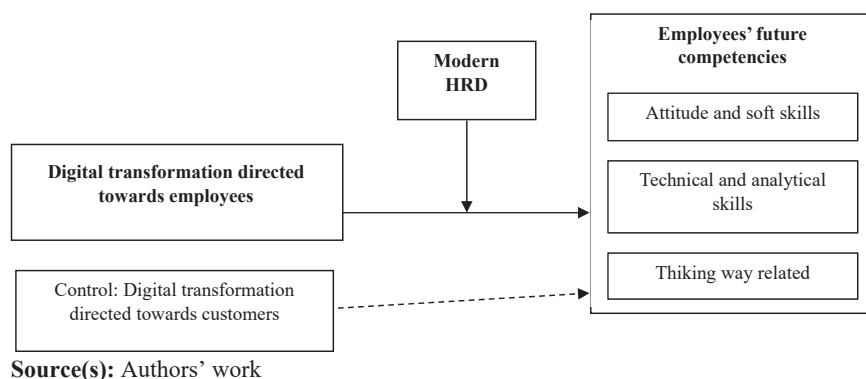


Figure 1.
The research model

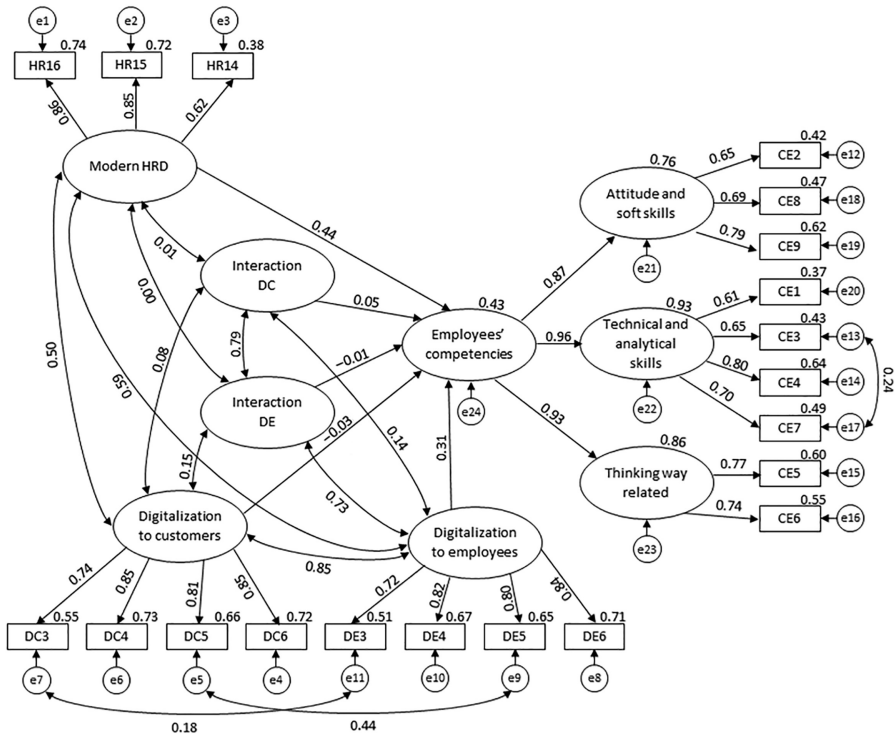
character of the data showed a good alignment with the SEM partial least square method as the goal is to predict a construct. At the same time, the research model is complex with many indicator variables where there is the need to use the latent variables scores in further analysis (Hair *et al.*, 2021; Venturini and Mehmetoglu, 2019). The resulting path model was adjusted based on the assessment of the values of the modification indices and the comparison of the resulting values of the Bayesian Schwartz's Information Criteria (BIC). After creating the model, the authors used the confirmatory factor analysis to ensure that they had identified reasonable latent variables and that the measured indicators were a good fit for this.

To model the moderation, the authors used the two-stage approach as described and tested by Chin *et al.* (2003). The suitability of the created theoretical model was tested through absolute and comparative criteria (Hair *et al.*, 2022; Soukup, 2022), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA). The created model was compared with the saturated model within the BIC values (the tested model should have lower BIC values). There was evaluated the significance and magnitude of the path coefficients. Finally, the authors interpreted the results considering the path coefficients and the significance between the latent variables (Soukup, 2022).

Results

The authors built and tested a structural model to describe the different impacts of digitalization on employees' competencies moderated by HRD differentiated by whether it was aimed at either employees or customers. They expected that there would be a positive direct effect of both types of digitalization and that it would be positively moderated by the HRD as depicted in the path diagram in Figure 2.

By building and testing the model, the authors came to the following results. Overall the results of the structural equation model indicated a good fit to the data ($\chi^2 = 646.440$, $df = 190$, $p < 0.001$, AGFI = 0.902, CFI = 0.854, TLI = 0.823, RMSEA = 0.045 and BIC of tested model = 1093.586 to BIC of the saturated model = 1795.680). Figure 2 presents the results with standardized coefficients, while the resulting p -values declare significant effects between all elements ($p < 0.001$) in the path diagram, in addition to moderating links and the effect of the latent variable digitalization towards customers on employees' future competencies ($p \geq 0.050$).



Note(s): The latent variables are presented in the ovals. These constructs are created by extracting the common variability of the observed variables shown in rectangles. Each rectangle, but interaction terms, connected with a straight direct line to a latent variable represents an observed variable that is explained in detail in Table 2. Also depicted in rectangles are two interaction terms that are products of digitalization and modern HRD, used to model the moderation effect. Following scientific standards and best practices, the numbers between variables indicate path coefficients, curved lines represent correlation coefficients, and the numbers at the upper corners of the rectangles indicate the explained variance for each observed variable, as accounted for by the latent variable

Source(s): Authors' work

Figure 2.
Results of the path diagram

The model showed that employee-oriented digitalization positively affected the employees' future competencies ($\beta = 0.307, p < 0.001$). Meanwhile, customer-oriented digitalization was not significantly associated with employees' future competencies ($\beta = -0.029, p = 0.672$). This made the authors accept the **H1** hypothesis that digitalization aimed at employees has a direct positive effect on employees' competencies, with no impact of customer-oriented digitalization as a control variable.

As for the **H2** hypothesis, the authors did not find a significant moderating effect of HRD on the relation between employee-oriented digitalization and employees' competencies ($\beta = -0.005, p = 0.918$). Therefore, hypothesis **H2** was rejected.

Additionally, the results showed that HRD was a significant predictor of employees' future competencies ($\beta = 0.440, p < 0.001$). This may suggest a mediating effect of this

variable on the relation between employee-oriented digitalization and employees' competencies that should be examined in future research.

Discussion

This study examined the impact of digitalization, measured as the application of employee-oriented digitalization, on employees' competencies of the future and the moderating role of HRD. It provided empirical evidence for the significant impact of employee-oriented digitalization on the development of employees' competencies for the future. Customer-oriented digitalization, according to the results, was not significantly impactful on the development of employees' future competencies. HRD practices (such as learning culture, freedom and responsibility in education, or recognition and evaluation of training) have been found not to have a moderating impact on the relationship between independent and dependent variables. However, they directly affected the development of employee competencies of the future. The findings of this research have important theoretical and practical implications.

Theoretical contributions

The study addressed the research gap in understanding digital transformation in companies from the HRM perspective, as recommended by various authors (Blanka *et al.*, 2022; Kinowska and Sienkiewicz, 2022; Piwowar-Sulej, 2020). This study contributed to the theory by noticing the impact of digitalization on the level of employees' competencies of the future, depending on the orientation of digitalization, whereas past literature on the usage of technology in HRM showed its positive outcomes mainly in the form of increased HR services and better communication (Marler and Fisher, 2013). This study also shed new light on the antecedents of future competencies, showing that the use of employee-oriented technology plays an important role here, whereas previous research emphasized that shaping of future competencies takes place mainly in the process of HRD (Bennett, 2022; Hamzah *et al.*, 2022). It also extended past evidence on the impact of technologies on digital skills (Colbert *et al.*, 2016) by demonstrating that employee-oriented technologies stimulate the development of different competencies (which go beyond digital skills and include, e.g. soft skills and critical thinking).

The results showed the complexity and simplicity of the development of competencies of the future. The implication of simplicity suggests that employees will develop their technical skills, way of thinking and attitudes as the content of their competencies of the future, by using digitalization for their work. This finding supports the learning-by-doing approach, which confirms knowledge about the development of human capital and competencies building in interaction with technologies (Billett, 2011; Trompisch, 2017). The value of learning opportunities during work and self-regulated learning, pointed out by Wallo *et al.* (2022) and Kittel *et al.* (2021), as well as the value of feedback received from the employee-oriented software have been emphasized by the results of this study. This finding is complementary to theories in competency modeling, which suggest the replacement of jobs by more flexible and boundaryless work roles to develop competence for more adaptable organizations (Stevens, 2013). The power of simplicity in the development of competencies of the future discovered by this study indicates support of agility in learning suggested by Jaiswal *et al.* (2022) for capacity building while ensuring success in the turbulent business environment.

The results also indicated the contribution to strategic HRM and the new role of HRD in employee capacity building. In particular, the second stream of strategic HRM literature emphasizes the crucial role of high-quality HRM activities in developing, unique resources

(employees' competencies) to make companies achieve competitive advantage (Marler and Fisher, 2013). In this context, HRD activities could be important stimuli for employees' future competencies. Although the current research indicated support for the study by Berber and Lekovic (2018), where systematic estimation of the need for training or high investment into training was not significantly related to innovative potential, it supported Marler's and Fisher's (2013) statement that employee-oriented digitalization makes HR more strategic.

This study also answered the call for more research on the interrelated nature of workplace learning and proactive learning behaviors (Sparr *et al.*, 2017) by discovering the nature of the role of HRD in the facilitation of digitalization to competence development relationship. However, the moderating role of HRD in the relationship between digitalization and the development of future competencies has not been confirmed. This result can be explained by considering a strategic perspective on the competence development in conditions of digital transformation. The study suggests it is too soon to recognize HRD with a significant moderating effect on the digitalization – future competencies relationship. It adds to the study on digitalized talent management by Wiblen and Marler (2021), suggesting HR professionals need to learn how to manage the “human–technology” interface because technology use may decrease the agency and role of human stakeholders, and HR may not fit into the future of work. It also calls for future similar studies to determine the progress of HRD in moderating the “digitalization – competencies” relationship.

The responsive (direct influence) role of HRD has been recognized as significant. An impactful concept of HRD in the digital era might be emerging from high commitment human resource strategy (HCHR) further developed by Colins (2021) a philosophical approach focusing on investment in employee skill and capability development. Kim (2022) suggests that HRD should be more agile and responsive so employees and systems can quickly prepare for the “human–technology” interaction and receive timely support. Bennett (2010) notes that HRD must claim virtual HRD (VHRD); otherwise, other fields may design dynamic constraints into organizational technology that may undermine practices.

Practical implications

Based on a Eurostat survey on the current digitalization situation in terms of digital competencies (Eurostat, 2022a) and their development by companies (Eurostat, 2022b), all three surveyed countries are in the middle of the pack. This may suggest that although there is a general infrastructure and foundation for digital skills development, there still is a lot of space for improvement to become competitive with the best countries in this regard.

As far as the participation of employees in continuing vocational training in companies is concerned, all surveyed countries have decreased in 2020 compared to 2015 (Eurostat, 2022c). HRD in companies operating in these countries was mostly focused on technical skills and competencies related to customer service or teamwork (Eurostat, 2022c). Research conducted in 2017 revealed that Polish universities were not appropriately equipped to address the ongoing changes in the business environment. Furthermore, about 50% of Polish employees anticipated carrying out the same responsibilities in the next decade. They believed that changes in the labor environment wouldn't impact them. Merely 30% of Poles actively developed their skills, with only 20% participating in courses and training initiatives to upgrade their professional capabilities (Piwowar-Sulej, 2018). However, adult participation in both formal and non-formal education also in other surveyed countries is much lower than the Organization for Economic Cooperation and Development (OECD) average (Kalenda, 2015; OECD, 2020). Considering the above, this study models possible routes to achieving the goal of digital competence as well as other competencies needed for further development of business.

The current results have implications for organizational change management. As the business landscape evolves, acquiring and cultivating future competencies becomes crucial for staying competitive and innovative (for individuals, businesses and societies) (Aust *et al.*, 2019; Piwowar-Sulej, 2021). This study suggests that to develop competencies of the future, companies will do so through employee-oriented digitalization. Moreover, using digitalization, employees will develop competencies regardless of any application of the currently applied concept of HRD as learning through practice is the principal process through which human capital can be developed (Billett, 2011), adding learning opportunities (Wallo *et al.*, 2022). That is there are two channels the company can use to develop future competencies, the “digitalization channel” is more so important as it addresses the gap created by formal HRD (Jeong *et al.*, 2018).

The findings indicate changes in the current role of HRD in competence development. Results confirm the impact of the responsiveness of HRD to competence development, while the proactive role of HRD measured by moderating effect has not shown significance. This means that for company capacity building in the digital transformation, HR departments need to focus on enabling digitalization in work content and HRD responsiveness to emerging needs for competence.

This study also delivers practical implications related to education and decision-makers in research design for competencies in digital transformation. It implicates an action to the strategic call for the lead role of universities in digital transition in Europe (European Commission, 2022), by contributing to understanding the mechanism of future competencies development, as the core of this change. The study results can serve as a valuable material for courses devoted to the problem of HR development. Furthermore, the authors created and tested the research model, enhancing future researchers to further explore the identified absence of the expected effects as well as further development of the current model.

Limitations and future research directions

Despite the beneficial findings, this study also has several limitations and creates many avenues for further research. The limiting factor of this study is the use of a non-standardized questionnaire. It was validated in the first phase of the research by semi-structured interviews with HR leaders in Slovakia. Representatives from the other two countries were not involved. At the country level, an effort was made to represent the structure of the economy in the country. However, the research sample does not control the regional representation structure of enterprises in the territories of Poland, the Czech Republic and Slovakia. The research sample from Poland has a lower volume compared to samples from other countries. Also, the study does not deliver the implication for the whole Central and Eastern European (CEE) region. Thus, the sample is not fully representative. The research can be extended in the future to all CEE countries to deliver more general outcomes. Another gap for further research is in the validation of the results of this study on an independent study or alternative data sample. Furthermore, the possible mediation effect of HRD needs to be investigated. In the future – more holistic research models – additional variables such as employees’ participation in the implementation of digital solutions (Ullrich *et al.*, 2023) or leaders’ support (reflected in, e.g. shared leadership) (Stone and Dulebohn, 2013) can be included. This study also considered customer-oriented digitalization as a control variable; however its research design was focused on employee-oriented digitalization. Future studies might explore a customer-centric approach. Finally, following Lim’s (2023) arguments, future research should shift between different research paradigms to address the complex issues arising from digitalization.

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