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HRM 4.0 Practices and their Effect on Organizational Performance

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ABSTRACT

The digital transformation linked to the Industry 4.0 concept is fundamentally altering human resource management and creating new HRM 4.0 practices that influence organisational performance. This paper aims to analyse which HRM practices have a statistically significant effect on specific business performance indicators and to determine their relative importance. The research was carried out through surveys. Data were analysed using factor analysis and both single and multiple linear regression. The findings confirmed that practices promoting autonomy at work, the hybrid work model, and employee psychological well-being have the greatest impact on performance metrics. Employer branding proved to be a strong predictor of both productivity and workforce stability. Conversely, purely technological tools such as gamification, automated resume screening, and online interviews did not show significant effects. Personalised and performance-based pay systems contribute most to profitability, while continuous learning and retraining are vital for job satisfaction and reducing staff turnover. The discussion highlights that the success of HRM 4.0 depends more on the strategic integration of practices than on digitalisation itself. The limitations of the research include the self-assessment nature of the data, the sector-specific sample, and the cross-sectional design. Nonetheless, the study offers valuable insights for developing effective HR strategies in the digital era.

Keywords: HRM 4.0, Employer branding, Performance-related remuneration, Staff turnover, Working conditions 4.0, Continuing Education.

INTRODUCTION

The dynamics of digital transformation and the advent of Industry 4.0 are fundamentally altering how organisations operate today. Digital technologies are not only impacting production, management, and communication processes, but are also increasingly influencing human resources management. HRM 4.0 introduces a new concept that integrates traditional HR functions with modern technologies, automation, and data analytics. This leads to the development of new practices and skills that are transforming the role of HR departments, the nature of employee work, and the overall functioning of businesses.

The scholarly discussion highlights that implementing digital tools can greatly influence business performance, productivity, employee satisfaction, and workforce stability. Much research emphasises the need for innovation in recruitment, adaptation, training, appraisal, and reward, driven by the transformational factors of Industry 4.0 that are pressuring new approaches. However, empirical knowledge about which specific HRM 4.0 practices most significantly affect organisational performance indicators remains limited. Particularly lacking are comprehensive quantitative analyses that examine multiple HR functions simultaneously and explore their relationships with

various aspects of organisational performance. Therefore, this paper offers an empirical validation of how different HRM 4.0 practices impact productivity, satisfaction, turnover, and profitability.

The main aim of the paper is to analyse which human resource management practices have a statistically significant impact on selected business performance indicators and to identify their relative importance.

LITERATURE REVIEW

In the context of Industry 4.0 and the ensuing digital transformation of enterprises, HR functions and individual practices are also changing.

The main aim of personnel management in a company is to establish dynamic, vibrant structures of employees (Balakrishnan, Parivara, 2023), which can continuously inspire and adaptively implement necessary changes and innovations, while also monitoring and responding to the processes emerging in competing firms (Szarková et al., 2013). In the context of the digitalisation of human resource management, we present the table below the text, in which the elements are specified (Darbandi et al., 2022).

Table 1. Guidelines for modifying the digitisation process of human resources management.

Digital workforce	Digital workplace	Digital HR
attracting innovative employees	creating a working environment that provides high productivity	transformation of personnel management functions on the basis of the latest computer technologies
closing the digital skills gap	ability to gather information on tasks	use of digital tools and software products
ensuring continuous improvement of knowledge and skills, abilities with the help of modern technologies	use of modern means of communication	
	apply feedback from employees	

Source: own processing according to Melnychenko et al. (2021).

According to the authors Dirani et al. (2020), in the era of social distancing, the primary role of HR is to establish a stable environment for employees. In this context, authors Rizvi and Ilyaz (2021) and Bennet (2021) recommend that HR departments focus on new and innovative approaches practices.

The role of human resource management in organisations has shifted from a conservative stance to a more creative and innovative approach in implementing initiatives (Gregori, Holzmann, 2020), such as competency-based recruitment, innovative compensation, results-oriented performance management, and human capital empowerment (Salamzadeh, Dana, 2019).

The issue of transforming competences and skills in the context of Industry 4.0 is discussed in the opinion of the European Economic and Social Committee entitled "The impact of digitalisation on the service sector and employment in the context of industrial change" (Holubčík, Soviar and Lendel, 2023). The document highlights that digitisation is transforming all segments of society and the economy, and therefore logically influences both work and employment. It emphasises the problem in the field of digitalisation and points to the promotion of collective bargaining in the areas and enterprises most affected by digitalisation to prevent the deepening of income inequality, which partly arises due to the existence of digitalisation. The third part of the document focuses exclusively on the transformation of the skills required by individual workers (Eur-lex, 2016).

In managerial roles, numerous studies highlight skills regarded as crucial in the digital age (Koman et al., 2024). Initially, these include critical thinking, problem solving, networking, collaboration, agility, adaptability (Shen, Zhang and Liu, 2022), effective oral and written communication, as well as evaluation and analysis of information (analytical thinking or 'information literacy'), creativity, and imagination. (Kwiotkowska, Gębczyńska, 2022).

The concept of the Fourth Industrial Revolution implies significant changes that need to be adapted to, which is also reflected in the shift in skills (Staffenova, Kucharcikova and Tokarcikova, 2024), including mastery of digital platforms, willingness to embrace change, intercultural and language skills, creativity, and innovation (Lubis, 2019).

Closely related to this issue is the need for retraining and upskilling not only employees but also managers. The new working conditions demand a new set of skills that HR managers should have. Businesses must consider that new training should be incorporated into company policies (Sivalingam, Mansori, 2020).

METHODOLOGY

The data collection was conducted using a questionnaire as the method of inquiry, which we administered from October to November 2025. We sent the questionnaire to a total of 743 respondents, and received 245 responses. Seven responses were excluded due to incompleteness or duplication. The final number of valid responses was 238. The response rate was approximately 33%. From this, we can conclude that we employed quantitative data collection methods collection.

The exploration of the research questions was conducted through a questionnaire, followed by analysing, sorting, and evaluating the data collected from respondents. After establishing the research question, we developed a research model and set the aim of further exploring the variables.

The research question focused on examining the impact of HRM functions on selected indicators of business and employee performance. The above relationship was first verified through a simple linear regression analysis and subsequently confirmed by multiple linear regression analysis.

Among the steps in exploring the research question was the development of a factor analysis. Here, we focused on classifying two categories of variables. First, we divided HRM 4.0 practices into eight latent factors, and then, for HRM 4.0 competencies, factor analysis identified two latent factors. This facilitated our investigation of the aforementioned moderating effect of Competency 4.0 on the relationship between HRM 4.0 practices and firm and employee performance indicators. In the research, we employed quantitative methods regression and factor analysis and the research concept of moderation.

VO1: Do HR management practices in the digital transformation environment influence enterprise performance indicators?

RESULTS

In testing the predictors of the productivity of the staffing function's job design and working conditions using a simple linear regression method, we found the following results. The practices that significantly impact productivity are: Leisure activities program (stβ = 0.38), creation of infrastructure for a hybrid work environment (stβ = 0.36), employee mental health care program (stβ = 0.32), adherence to job cybersecurity (stβ = 0.33), provision of autonomy at work (stβ = 0.33), use of innovative technologies with AI elements (stβ = 0.31), provision of technical equipment for online work (stβ = 0,29), online team-building activities (stβ = 0.25), use of alternative work arrangements (stβ = 0.23), job rotation (stβ = 0.21), online communication (stβ = 0.21), virtual team meetings (stβ = 0.21), use of alternative work time arrangements (stβ = 0.16), and creation of cumulative jobs (stβ = 0.14). The variables are ordered according to their degree of influence by standard deviation. No influence was identified for job optimisation variable.

After a subsequent multiple regression test, we found the provision of autonomy at work (NPP7) to be statistically significant. The results are displayed in Table 2.

Table 2. Multiple regression of job design and productivity.

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	2.46	0.31	7.86	< .001	
NPP1	0.09	0.07	1.27	0.207	0.09
NPP2	-0.05	0.09	-0.58	0.562	-0.05
NPP3	0.04	0.07	0.57	0.570	0.04
NPP4	-0.09	0.08	-1.11	0.268	-0.08
NPP5	0.07	0.07	1.05	0.293	0.08
NPP6	-0.11	0.07	-1.56	0.120	-0.11
NPP7	0.16	0.08	2.06	0.041	0.16
NPP8	0.13	0.07	1.74	0.083	0.13
NPP9	0.17	0.10	1.67	0.095	0.13
NPP10	0.09	0.08	1.18	0.238	0.10
NPP11	0.09	0.09	1.01	0.312	0.09
NPP12	0.06	0.07	0.82	0.416	0.06
NPP13	-0.10	0.07	-1.41	0.160	-0.12
NPP14	-0.07	0.08	-0.80	0.427	-0.07
NPP15	0.07	0.08	0.90	0.369	0.09

Source: statistical software Jamovi, 2025.

The results show that most of the measured individual 4.0 practices for job design and working conditions are predictors of employee productivity when considered separately. If a firm implements all the measured practices at the same time, then only autonomy at work will boost employee productivity.

Individual testing of the recruitment and hiring committee variables revealed statistically significant effects for the variables in this order: employer branding to attract candidates (stβ = 0.34), use of social media to find candidates (stβ = 0.27), referral programmes (stβ = 0.28), use of visual elements to attract candidates (stβ = 0.29), and use of innovative technology with AI features (stβ = 0.23). The following variables showed no effect: online interviews, recording of online interviews, use of gamification elements, and automated CV screening. Following subsequent multiple regression testing (Table 3), there was a statistically significant effect of employer branding to attract applicants (NV7) on employee productivity.

Table 3. Multiple regression of recruitment and selection on productivity.

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	2.58	0.24	10.95	< .001	
NV1	0.08	0.08	0.98	0.328	0.08
NV2	0.08	0.07	1.13	0.259	0.10
NV3	0.01	0.08	0.11	0.916	0.01
NV4	0.04	0.07	0.60	0.550	0.05
NV5	-0.04	0.09	-0.48	0.634	-0.03
NV6	-0.06	0.09	-0.61	0.544	-0.05
NV7	0.23	0.08	2.85	0.005	0.22
NV8	-0.00	0.08	-0.02	0.982	0.00
NV9	0.13	0.08	1.71	0.089	0.13

Source: statistical software Jamovi, 2025.

When tested using simple regression analysis, there was no relationship between appraisal and reward practices and employee productivity. We examined this result in more detail with multiple regression (Table 4), which shows only one predictor of productivity, namely employee pay based on performance.

Table 4. Multiple regression of employee appraisal and compensation on productivity.

Predictor	Estimate	SE	t	p	Stand. Estimate
Intercept	2.80	0.23	12.12	< .001	
HO1	0.03	0.07	0.41	0.681	0.03
HO2	0.05	0.07	0.68	0.496	0.05
HO3	0.24	0.09	2.57	0.011	0.23
HO4	-0.01	0.09	-0.07	0.943	-0.01
HO5	-0.01	0.08	-0.17	0.867	-0.01
HO6	0.13	0.07	1.81	0.071	0.13

Source: statistical software Jamovi, 2025.

DISCUSSION

The content of the research question was to examine the impact of HRM practices under digital transformation conditions on enterprise performance indicators. Innovative tools related to working conditions and job design, especially those linked to work-life balance, have the greatest influence on labour productivity. These include leisure and mental health care programmes, as well as infrastructure for hybrid work environments. Organisations undergoing digital transformation are primarily shaped by workplaces that enable autonomy at work. This finding is supported by research from Jamal et al. (2020), who report that increasing employee autonomy positively affects productivity and job satisfaction. It is also consistent with research by Lopes (2014), whose results suggest that denying autonomy to employees leads to job dissatisfaction. The effect on productivity will not be due to job optimization.

Businesses undergoing digital transformation mainly concentrate on employer branding to enhance employee productivity. Online interviews, online interview recording, and automated CV screening do not contribute significantly to productivity.

Regarding employee appraisal and remuneration, we observe a positive effect on productivity for firms implementing performance-related pay. Digitally oriented enterprises also adopt instant feedback in their appraisal processes.

In the context of enhancing employee productivity through adaptation, learning, and development, progressive companies are employing online training and sharing videos about the organisation online. Personalised and ongoing training for employees is also important.

Of the innovative practices in job design and working conditions, adherence to workplace cybersecurity has the greatest impact on employee satisfaction. Businesses aiming to improve employee satisfaction create working conditions that allow for hybrid working and autonomy work.

Among modern recruitment and selection practices, employer branding and the use of social media to find and attract candidates have proven to be significant predictors of employee satisfaction. Recording online interviews and automated CV screening have no impact on employee satisfaction.

A significant finding was that all appraisal and reward practices independently influence employee satisfaction. Most notably for digitally progressive businesses, rewarding employees based on performance rather than traditional time-based appraisal methods.

The practices that most influence satisfaction are those related to training, specifically retraining and upskilling, online training, and support for continuing education. Subsequent testing of the impact of these practices on employee satisfaction collectively confirmed the influence of retraining, upskilling, and online training in the form of.

Among the innovative practices of job design and provision, we observe the greatest impact on turnover from adhering to job cybersecurity and establishing the infrastructure for a hybrid workplace.

The use of alternative working arrangements, job rotation, and online team building do not significantly impact turnover. According to the overall results, the strongest predictors of low turnover are compliance with cybersecurity measures and online practices communication.

Employer branding to attract candidates and referral programmes have the strongest impact on low turnover. The reason is that employees who have been with the company for a long time are willing to recommend the company to friends and therefore utilise referral programmes. Uploading online interviews, automated CV scanning, and the use of innovative AI technologies do not influence turnover. When employing all recruitment and selection practices, the most important aspect is to build an employer brand to attract candidates.

Among employee evaluation and compensation practices, compensation-related methods such as performance-based pay, personalised pay, and employee involvement in total remuneration are indicators of low turnover. Appraisal practices do not have a statistically significant impact on turnover. At the same time, our further testing of these practices did not confirm any statistically significant effect on turnover.

When examining the HR function of employee onboarding, we discovered that introducing a new employee online has the most positive effect on turnover. This suggests that for employees to remain with a company, it is crucial they begin their journey through the online environment during the induction process. Regarding training, the most significant factor influencing turnover is promoting ongoing education for staff. The online individual and team introduction of new employees was also confirmed as a key predictor for all aspects of employee adaptation, learning, and development practices.

Among the job design practices that significantly influence profitability are those centred on work-life balance, such as developing a leisure programme and caring for employees' psychological well-being. Key activities in work design include implementing a hybrid working model and granting autonomy at work. After analysing all these practices, we observe a notable impact from adherence to workplace cybersecurity, providing autonomy at work, and a leisure programme design.

A key finding was that job optimisation does not impact profitability. The profitability of firms from innovative recruitment and selection practices is significantly affected by employer branding and referral programmes. Employer branding alone was found to have a notable impact when all practices were employed. Profitability is not impacted by recording online interviews, using gamification elements, automated CV screening, or adopting innovative AI technologies elements.

Our analysis of employee evaluation and remuneration practices reveals their impact on corporate profitability. The most notable effect when each practice is applied individually is from performance-based and personalised employee remuneration. Although employee performance appraisal practices do influence outcomes, their effect is less significant than reward practices. Consequently, when multiple appraisal and reward strategies are employed, performance-based pay exerts the greatest influence on profitability.

CONCLUSION

Research results show that HRM 4.0 practices linking technological innovation with the principles of promoting autonomy, psychological well-being, and work-life balance are of the utmost importance. Autonomy at work, infrastructure for hybrid working models, and mental health initiatives are among the strongest predictors of productivity. Equally significant is the impact of employer branding, which has been confirmed as one of the key factors influencing productivity, workforce satisfaction, and stability.

On the contrary, not all digitisation elements yield the expected results. Practices such as gamification, automated CV screening, or online interview recording have not proven to be significant factors influencing organisational performance. This indicates that technological innovation alone is insufficient. In particular, performance is improved by solutions that are strategically integrated into the overall functioning of HR and reflect the real needs of employees.

The findings also indicate that personalised and outcome-oriented remuneration is the most significant predictor of profitability, which in a digital environment heightens the importance of flexible remuneration models and immediate feedback. Learning and development practices have been shown to be essential not only for satisfaction but also for low turnover rates, especially when they are based on continuous learning and the promotion of adaptation.

However, several limitations must be considered when interpreting the results. The dataset is based on a questionnaire survey, which may introduce subjective bias, and the questionnaire response rate of 33 % could lead to sampling bias. Additionally, the survey was conducted within a specific geographic and sectoral context, limiting its full generalisability. The cross-sectional design does not allow for capturing the long-term effects of HR

practices, which often only become apparent over time. The model also did not include other important moderating variables, such as the level of digital maturity or organisational culture, which may significantly influence the effects of the practices studied.

Despite these limitations, the research offers valuable insights for practice. Businesses should concentrate their HR strategies on practices that are proven to support performance and systematically develop the digital and analytical skills of HR managers. Simultaneously, the successful implementation of HRM 4.0 appears to require not just technological investments but also the ability to align these with employee needs and organisational culture. Looking ahead, there is potential for longitudinal research, cross-industry comparisons, and the inclusion of additional factors in analytical models that can facilitate a deeper understanding of the impacts of HRM 4.0 on organisations performance.

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