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THE RELATIONSHIP BETWEEN WORKPLACE ROBOTS, EMPLOYEE EXHAUSTION, AND TURNOVER INTENTIONS IN THE AGE OF INDUSTRY 5.0: RESEARCH FROM FOUR SOUTHEASTERN EUROPEAN COUNTRIES

Jelena Lukić Nikolić, Pero Labus

Abstract

This paper examines and analyzes the relationship between workplace robots, employee emotional exhaustion, and turnover intentions within the context of Industry 5.0. Empirical research was conducted from January to May 2024. During this period, a total of 582 respondents from four Southeastern European countries (Serbia, Croatia, Montenegro, Bosnia and Herzegovina) participated in the research. The proposed relationships between variables were tested by using the partial least squares method for structural equation modeling (PLS-SEM, SmartPLS software). The research results confirmed that the emotional exhaustion of employees had a positive relationship with turnover intentions, while workplace robots' effects were negatively related to employee emotional exhaustion and turnover intentions. Leaders, managers, and human resource professionals may benefit from the findings presented in this paper, especially during the decision-making process on how to reduce the emotional exhaustion of employees by using workplace robots, which, in the end, will result in employee retention.

Keywords: *Industry 5.0, Workplace Robots, Emotional Exhaustion, Turnover Intentions, Employee Retention*

JEL classification: *O33, M54*

1. Introduction

Industry 5.0 indicates the transition to a more sustainable, human, and resilient industry (Xu et al. 2021), which is a much safer, more responsible, and more ethical than previous industrial revolutions (Özdemir and Hekim 2018). The primary goal of Industry 5.0 is to produce personalized products and/or services by involving intensive collaboration between humans and machines, especially robots (Demir, Döven, and Sezen 2019). In this industrial revolution, technology represents a means to support and facilitate human labor by providing a safe and pleasant workplace, well-being, and physical and mental health (Xu et al. 2021). As a result, Industry 5.0 has a wide range of implications for human resource management and organizational

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behavior. First of all, there will be fully automated jobs, as the primary focus of workplace robots is on executing mundane, monotonous, and repetitive tasks. In this way, employees will be able to focus on more creative and challenging tasks and activities. In some workplaces, employees and robots may collaborate to partially automate tasks; in these scenarios, robots will assist and support employees rather than replace them (Lukić Nikolić 2024). Likewise, there will be new job positions in organizations, such as Robotics Technicians and Engineers, Robot Operators and Programmers, Robotics Ethics and Policy Specialists, Robot Training Specialists, etc. Certain jobs will experience changes in their responsibilities and duties, and some employees will become stressed due to their fear of losing their jobs or having their pay cut as contemporary automated systems and robots take over some of their duties (Lukić Nikolić 2022). Nevertheless, employees are one of the most crucial components of an organization's ability to run smoothly and accomplish its goals. Moreover, in the contemporary business environment and fierce competition, the ability of an organization to retain employees is a key indicator of its strength (Kundu and Lata 2017). Consequently, numerous organizations are implementing special strategies oriented toward long-term employee retention (Hom and Griffeth 1995). These retention strategies may focus on competitive compensation and benefits, career development opportunities, training and development, a positive organizational atmosphere and culture, work-life balance, health and wellness programs, as well as strong onboarding processes, feedback mechanisms, employee recognition programs, and the preparation of an adequate employee value proposition (Lukić Nikolić and Lazarević 2022; Lukić Nikolić and Garabinović 2023). Some companies even have a particular person that works as an "Employee Retention Specialist" and is primarily responsible for retaining current employees (Singh 2019). Employee retention represents a state in which employees desire to remain with their current organization due to favorable working conditions and an organizational climate that fully satisfies and engages them (Kibui, Gachunga, and Namusonge 2014).

Leaders, managers, and human resource professionals face a significant challenge in developing and implementing effective employee retention strategies. The contemporary business environment, characterized by intense competition and relentless pressure to reduce costs, improve productivity, and satisfy customer demands, often leads to employee emotional exhaustion (Pacheco et al. 2023). As a result, numerous detrimental effects affect both the individual and the organization. The effectiveness of an organization is in doubt, and outcomes could be far worse in organizations with a high percentage of emotionally exhausted employees. Simultaneously, continuous technological progress in the age of Industry 5.0 has expedited the acceptance and application of various types of robots in the workplace (Turja and Oksanen 2019; Kim 2022; Lukić Nikolić 2024). Employers are experimenting with the use of workplace robots to enhance employees' overall experience, lessen emotional exhaustion, and decrease turnover intentions. According to estimates, by 2030, service robots could account for as much as 25% of the workforce (Bowen and Morosan 2018). As always with new technology, users have many doubts about its implementation and beneficial use (Čuić Tanković, Perišić Prodan, and Benazić 2023). Respecting each other's knowledge, skills, and capacities in the workplace is becoming increasingly important for humans and machines to coexist (Nahavandi 2019; Doyle Kent and Kopacek 2020). Leaders, managers, and employees need to be prepared for a working environment shaped by new technologies, such as robotic process automation, modern robotic systems, artificial intelligence, advanced data analytics, big data, and blockchain.

The aim of this paper is to examine and analyze the relationship between workplace robots, employee emotional exhaustion and turnover intentions in the age of Industry 5.0. The rapid evolution of Industry 5.0, characterized by the increasing integration of robots in workplaces, presents a critical challenge - understanding the multifaceted impact of automation on employees (Yam et al. 2023). The theories that underpin this research are sociotechnical systems theory and job demands-resources theory. By exploring how the introduction of workplace robots (a technical change) affects employee exhaustion and turnover intentions (social aspects), the paper provides empirical evidence for sociotechnical systems theory. Job demands-resources theory explains that job demands can lead to exhaustion, while job resources can reduce

employee exhaustion. In the context of workplace robots, this theory can be used to investigate how the introduction of robots affects the balance of job demands and resources, and subsequently, employee emotional exhaustion and turnover intentions. This research topic is of paramount importance as it seeks to address this challenge by examining both the positive and negative effects of robot adoption on employee emotional exhaustion and turnover intentions. The findings will offer valuable insights for organizations striving to optimize workplace robot implementation. Organizations can develop targeted strategies to mitigate negative consequences and foster a positive work environment. This includes implementing measures to reduce emotional exhaustion, decrease turnover rates, and promote a culture of continuous learning and adaptation, ultimately ensuring a successful and sustainable transition into the age of Industry 5.0.

The paper is organized as follows. The first part presents a literature review on employee turnover intentions, emotional exhaustion, and workplace robots in the age of Industry 5.0. The second part focuses on research methodology and provides a summary of the empirical research undertaken, beginning with the questionnaire structure, data collection procedure, and statistical software and techniques used. The third part contains the research results, while the fourth part discusses the research findings. Finally, the conclusion presents the key findings, their implications, the limitations of the paper, and propositions for future research on this topic.

2. Literature Review and Hypotheses Development

2.1. Employee Turnover Intentions and Emotional Exhaustion

Employee turnover is caused by a sequence of cognitive processes that happen before an employee departs from the organization (Hom et al. 2017). It is defined as the number of employees who leave an organization and are replaced by new employees (Codling et al. 2023). Voluntary turnover occurs when an employee decides to quit a job or organization, while involuntary turnover occurs when an employer decides to terminate an employee (Holtom et al. 2008). Employee turnover has a significant detrimental impact on organizational outcomes (Han 2022). It results in higher expenses due to the need to acquire and train new employees, a loss of tacit knowledge, decreased efficiency, and lower service quality (Duarte and Silva 2023). In those industries and businesses where employee-client connections are essential, high turnover rates have a detrimental impact on customer satisfaction and overall experience. Turnover intention is an employee's deliberate and intentional decision to leave their job and the organization (Tett and Meyer 1993). Employees who express higher levels of turnover intention are more likely to actively search for new employment opportunities and eventually resign from their current positions. Understanding and addressing the factors that contribute to turnover intention is crucial for organizations seeking to retain their valuable talent. There are numerous factors that influence employee turnover intentions, including organizational and managerial support, role clarity, autonomy, salary, reward system, job stress, and well-being (Kim 2014). Working in a highly competitive industry can be extremely stressful due to poor working conditions, a heavy workload, and constant pressure to impress clients (Chalkiti and Sigala 2010). In practice, employee turnover is mostly influenced by poor relationships with management and coworkers, job insecurity, and a low level of interactions among employees as well as between employees and superiors (Codling et al. 2023). One of the strongest predictors of employee turnover intentions is their emotional exhaustion (Ducharme, Knudsen, and Roman 2008; Knudsen, Ducharme, and Roman 2009; Green, Miller, and Aarons 2013; Ding and Wu 2023).

Maslach and Jackson (1981) defined emotional exhaustion as employees' feelings of being emotionally exhausted by their job. This definition emphasizes the draining nature of work-related stress on an individual's emotional well-being. Schaufeli and Buunk (2003) described emotional exhaustion as a chronic state of physical and emotional depletion that results from excessive job demands and exposure to stress. This definition emphasizes the chronic and persistent nature of emotional exhaustion, as well as its potential causes. Emotional exhaustion is defined as the depletion or overuse of an employee's psychological and emotional resources (Ding and Wu 2023). It happens

when job expectations are excessive and personal resources are insufficient. It is frequently caused by excessive and complex work responsibilities, the requirement to be continually available to superiors, colleagues, or clients, deadline pressure, or a lack of knowledge and abilities for assigned tasks and activities (Maslach, Schaufeli, and Leiter 2001; Lukić Nikolić and Mirković 2024). Employee emotional exhaustion causes a variety of negative consequences, including constant feelings of mental, emotional, and cognitive exhaustion, anxiety, feelings of powerlessness, apathy, decreased motivation and satisfaction, and decreased productivity and work results (Schaufeli and Enzmann 1998; Costin, Roman, and Balica 2023). Individuals can experience emotional exhaustion in a variety of situations, places, and work environments (Yang 2023). Multiple studies have demonstrated that one of the major causes of employee exhaustion is work overload and activities that are extensive, urgent, and complex (Leiter and Maslach 2005; Casserley and Megginson 2009; Edú-Valsania, Laguía, and Moriano 2022). Furthermore, the pressure to produce the best possible results, without errors, and within the specified dates can contribute to emotional exhaustion. Emotional exhaustion diminishes employees' satisfaction with their jobs and weakens their commitment to the organization. This is because exhaustion depletes their energy and enthusiasm, making it difficult to find meaning and fulfillment in their work (Demerouti et al. 2001; Park and Kim 2021). As a result, employees may start looking for alternative employment options. Consequently, the proposed hypothesis in this research is:

Hypothesis 1: Employee emotional exhaustion is positively related to their turnover intentions.

2.2. Workplace Robots

Many organizations are attempting to prevent employee exhaustion and turnover intentions using various solutions and methods. One of the solutions is to implement workplace robots. Robots are intelligent physical systems equipped with sensors, actuators, and a certain amount of artificial intelligence, and are programmed by computer algorithms to do various jobs in place of or alongside humans (Carrozza 2019; Smids, Nyholm, and Berkers 2020). Robots can sense their environment (they have perception) and act upon it (execute an action) in an intelligent manner (Bekey 2005). Workplace robots are designed to be reprogrammable, allowing them to adapt to different tasks and environments. This flexibility is crucial in industries where production processes may change frequently (Siciliano and Khatib 2016). Unlike specialized machines that can only perform a single task, workplace robots are often designed to be multifunctional. This means they can be equipped with different tools and accessories to perform a variety of functions, which reduces the need for multiple machines, saving space and costs (Nof 2019). A collaborative robot, often known as a cobot, is specifically designed to work and interact with humans (Castillo et al. 2021). This type of robot possesses human-like qualities, allowing it to collaborate with both people and other robots. Unlike traditional industrial robots that were usually isolated in a separate workplace from employees, collaborative robots share the same workspace with employees and work together with them on mutual tasks (Pauliková, Gyurák Babeľová, and Ubárová 2021; Lukić Nikolić and Labus 2024).

Robots offer several benefits to organizations. They cost less than human employees, make fewer mistakes at work, and never complain about working conditions (Nakitare et al. 2020). Robots and automation systems can enhance the quality and variety of products and services (Ing, Grossman, and Christian 2022). Robots' primary benefits include supporting employees with everyday activities, delivering continuous services, and ensuring consistent service quality (Kwanya 2023). Furthermore, mobile robots and exoskeletons make some occupations easier and less physically demanding, allowing women to work in traditionally male-dominated jobs (Breque, De Nul, and Petridis 2021). In hazardous or high-stress work environments, robots can replace humans, protecting them from physical and psychological harm. This reduces the risk of burnout caused by prolonged exposure to dangerous or stressful situations (Parasuraman and Riley 1997). Robots can automate repetitive, mundane, and physically demanding tasks, thereby reducing the workload on employees. This can prevent exhaustion stemming from excessive work demands and free up employees to focus on more stimulating and intellectually engaging activities (Nof 2019). Furthermore, when robots take over tedious tasks, employees can focus on more

meaningful and skill-enhancing activities. This can lead to increased job satisfaction, a sense of accomplishment, and reduced emotional exhaustion (Frey and Osborne 2017). By automating routine tasks, robots can enable flexible work arrangements, allowing employees to adjust their schedules and work remotely when needed. This flexibility can promote better work-life balance, reducing stress and exhaustion (Brynjolfsson and McAfee 2014). Consequently, the proposed hypothesis in this research is:

Hypothesis 2: Employee emotional exhaustion is negatively related to workplace robots' effects.

Robots can take over dangerous or physically demanding tasks, improving workplace safety and reducing the risk of injuries. This can enhance job satisfaction, promote overall employee well-being, and reduce their turnover intentions. Robots can contribute to the organization's overall success leading to increased wages, bonuses, and other benefits for employees, incentivizing them to remain with the organization (Acemoglu and Restrepo 2020). Additionally, robots can alleviate stress caused by factors such as heavy workloads, tight deadlines, and repetitive tasks. By taking on these burdens, robots can create a less stressful work environment, improving employee well-being and reducing turnover intentions. Consequently, the proposed hypothesis in this research is:

Hypothesis 3: Workplace robots' effects are negatively related to employee turnover intentions.

Figure 1 illustrates the research framework used in this paper.

3. Methodology

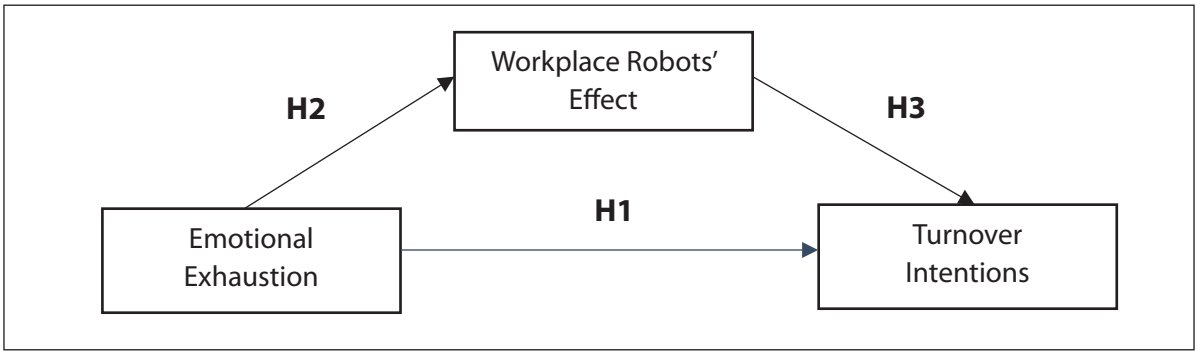
3.1. Research Technique

The field research was conducted using a questionnaire technique for data collection. At the beginning of the questionnaire, the key goal of the research and a prerequisite for participation – the deployment of workplace robots in the organization were stated. The first part of the questionnaire consisted of profile questions such as gender, age, education, length of working experience, and the country in which respondents work. The second part of the questionnaire included three measurement scales with statements that respondents answered by selecting one of the options on a seven-point Likert scale (1 – completely disagree, 7 – completely agree). The first scale, "Emotional Exhaustion" (EE), was based on Maslach Burnout Inventory, focusing on the dimension of Emotional Exhaustion among employees (Maslach, Jackson, and Leiter 1996). The second scale, "Turnover Intention" (TI), included three statements from the Michigan Organizational Assessment Questionnaire (Cammann et al. 1983). To facilitate interpretation and presentation of results, all statements in this scale were formulated in a negative tone. The third scale, "Workplace Robots' Effects" (WRE), consisted of three statements derived from previous literature and field research regarding robots in the workplace and their key positive effects. The final questionnaire contained a total of 15 statements, which are presented in Table 4.

3.2. Procedure

The pilot study was conducted after the completion of the initial version of the questionnaire. It included 30

Figure 1. Research Framework



Source: Authors

respondents who work in organizations from the hospitality industry that use workplace robots, with the goal of determining the questions' comprehension, clarity, and unambiguity. Following a few minor stylistic changes suggested by respondents during the pilot research, the questionnaire was improved and completed, showing a high level of reliability of the measurement scales (the Cronbach alpha coefficient for all three scales was greater than 0.7).

The final questionnaire was conducted online using Google Forms. Data collection lasted from January 2024 to May 2024. The questionnaire was sent to managers of hospitality establishments in four Southeastern European countries (Serbia, Croatia, Montenegro, Bosnia and Herzegovina) with a kind request to distribute it to their employees for completion. During this period approximately 1,200 employees from hospitality establishments received the questionnaire. A total of 582 respondents participated in the research, making a response rate of 48.5%, which is considered satisfactory in the field of social science, bearing in mind that the acceptable response rate ranges from 30 to 70% (De Vaus 2013). In accordance with the "ten times" rule (Barclay, Higgins, and Thompson 1995), which states that the minimum sample size should be ten times the number of independent variables in the most complex regression in the model, the sample size obtained in this research is more than sufficient (10 x 9 = 90, while 582 respondents participated in this research).

The collected answers were processed and analyzed using Statistical Software for Social Sciences (SPSS) version 21.0 and SmartPLS software version 4.0. The proposed hypotheses were assessed using the partial least squares method for structural equation modeling (PLS-SEM).

3.3. Respondents

Table 1 shows the key characteristics of the respondents who participated in this research. Slightly more women (52.1%) than men (47.9%) participated in the research. In terms of age structure, the largest number of respondents were between 30 and 50 years old (62.5%), followed by respondents who were under 30 years old (23.9%). A small number of respondents (13.6%) were over 50 years old. The largest number of respondents who participated in the research had completed secondary school (63.8%). Another 25.6% of respondents completed high school, and 8.2% had completed university-level education. Regarding the length of work experience, the largest number of respondents had been working for more than 10 years (48.3%), followed by those who had been working for 5 to 10 years (22.5%) and those who had been working for 1 to 5 years (22.0%). Respondents from Serbia (30.8%), Croatia (18.0%), Montenegro (27.3%) and Bosnia and Herzegovina (23.9%) participated in the research.

Table 1. Key characteristics of respondents

Characteristics		N	%
Gender	Male	279	47.9
	Female	303	52.1
Age	Below 30	139	23.9
	From 30 to 50	364	62.5
	Above 50	79	13.6
Education	Primary School	14	2.4
	Secondary School	371	63.8
	High School	149	25.6
	University	48	8.2
Length of working experience	Up to 1 year	42	7.2
	From 1 to 5 years	128	22.0
	From 5 to 10 years	131	22.5
	Above 10 years	281	48.3
Country	Serbia	179	30.8
	Croatia	105	18.0
	Montenegro	159	27.3
	Bosnia and Herzegovina	139	23.9

Source: Authors' own calculations

4. Results

4.1. Reliability, Validity, and Descriptive Statistics

Reflective indicator loadings for the structural model were calculated and presented in Table 2. All values of the reflective indicator loadings are higher than the threshold value of 0.708, indicating that the reliability criterion is satisfied (Hair et al. 2021).

Table 3 shows Cronbach's alpha coefficient, Composite Reliability (rho_a and rho_c), and Average Variance Extracted (AVE) values used to establish indicator and construct reliability and validity. Cronbach's alpha for the Emotional Exhaustion (EE) scale was 0.983, with rho_a and rho_c both at 0.985, while the Average Variance Extracted (AVE) was 0.878. Cronbach's alpha for the Turnover Intentions (TI) scale was 0.961, with rho_a of 0.961, rho_c of 0.975, and Average Variance Extracted (AVE) of 0.928. For the Workplace Robots' Effects (WRE) scale, Cronbach's alpha was 0.940, rho_a was 0.955, rho_c was 0.961, and the Average Variance Extracted (AVE) was 0.892. The obtained results for each of the scales indicated significant scale reliability as well as construct reliability and validity, since Cronbach's alpha and Composite Reliability (CR) were greater than 0.7, and the Average Variance Extracted (AVE) exceeded the threshold value of 0.5 (Fornell and Larcker 1981).

Table 2. Reflective indicator loadings

	EE	TI	WRE
EE1	0.949		
EE2	0.925		
EE3	0.950		
EE4	0.950		
EE5	0.968		
EE6	0.954		
EE7	0.862		
EE8	0.920		
EE9	0.951		
TI1		0.974	
TI2		0.978	
TI3		0.939	
WRE1			0.931
WRE2			0.955
WRE3			0.948

Source: Authors' own calculations

Table 3. Scale reliability and construct reliability and validity

Scale	Cronbach's alpha coefficient	rho_a	rho_c	AVE
Emotional Exhaustion (EE)	0.983	0.985	0.985	0.878
Turnover Intention (TI)	0.961	0.961	0.975	0.928
Workplace Robots' Effects (WRE)	0.940	0.955	0.961	0.892

Source: Authors' own calculations

Table 4. Mean (M) and Standard Deviation (SD) for scales and statements

Scales	M	SD
Emotional Exhaustion (EE)	**2.35**	**1.939**
I feel emotionally drained from my work (EE1)	2.22	2.004
I feel used up at the end of work day (EE2)	2.63	2.080
I feel fatigued when I get up in the morning and have to face another day on the job (EE3)	2.08	1.914
Working with clients all day is really a strain for me (EE4)	2.38	2.042
I feel burned out from my work (EE5)	2.11	1.995
I feel frustrated by my job (EE6)	1.96	1.930
I feel I am working too hard on my work (EE7)	2.85	2.389
Working directly with people put too much stress on me (EE8)	2.63	2.233
I feel like I am at the end of my strength (EE9)	2.29	2.071
Workplace Robots Effects (WRE)	**6.21**	**1.571**
Workplace robots are more efficient and faster compared to humans (WRE1)	6.07	1.676
Workplace robots lead to significant savings (WRE2)	6.22	1.578
Robots' free up employees from repetitive and manual tasks (WRE3)	6.35	1.459
Turnover Intentions (TI)	**1.97**	**1.726**
I often think of leaving the organization (TI1)	1.86	1.695
It is highly likely that I will look for a new job next xyear (TI2)	1.93	1.778
If I may choose again, I will not choose to work for the current organization (TI3)	2.14	1.906

Source: Authors' own calculations

Table 4 shows mean (M) and standard deviation (SD) for each of the measurement scales and their respective statements. The mean value for the entire Emotional Exhaustion (EE) scale was 2.35. The statement that employees feel they are working too hard had the highest mean value (2.85), while the statement that employees feel frustrated with their job had the lowest mean value (1.96). The mean value for the entire Workplace Robots' Effects (WRE) scale was 6.21. The statement that robots free up employees from repetitive and manual tasks had the highest mean value (6.35), while the statement that workplace robots are more efficient and faster than humans had the lowest mean value (6.07). The mean value for the Turnover Intention (TI) scale was 1.97. The statement that employees would not choose to work for their current organization again if given the choice had the highest mean value (2.14), while the statement that employees often think of leaving the organization had the lowest mean value (1.86).

4.2. Discriminant Validity and Variance Inflation Factor

Three approaches were used to examine discriminant validity: cross-loading indicators, the Fornell-Larcker criterion, and the heterotrait-monotrait (HTMT) correlation ratio (Ab Hamid, Sami, and Sidek 2017). Table 5 shows the cross-loading results. The results demonstrated that the loading of each item on its related measurement scale was greater than the loadings of items on other measurement scales, indicating the presence of discriminant validity (Barclay, Higgins, and Thompson 1995).

Table 5. Discriminant validity: Cross-loadings results

	EE	TI	WRE
EE1	0.949	0.672	-0.121
EE2	0.925	0.599	-0.113
EE3	0.950	0.635	-0.118
EE4	0.950	0.596	-0.108
EE5	0.968	0.664	-0.104
EE6	0.954	0.657	-0.103
EE7	0.862	0.511	-0.065
EE8	0.920	0.558	-0.082
EE9	0.951	0.602	-0.104
TI1	0.625	0.974	-0.183
TI2	0.632	0.978	-0.182
TI3	0.635	0.939	-0.170
WRE1	-0.095	-0.174	0.931
WRE2	-0.084	-0.155	0.955
WRE3	-0.127	-0.191	0.948

Source: Authors' own calculations

Table 6 shows the results for discriminant validity as determined by the Fornell-Larcker criterion. The results demonstrated that the square root of the Average Variance Extracted (AVE) had a higher value than all correlations with the latent variable (Fornell and Larcker 1981). Consequently, discriminant validity, according to the Fornell-Larcker criterion, was satisfied.

Table 6. Discriminant validity: Fornell–Larcker criterion

	EE	TI	WRE
EE	0.937		
TI	0.655	0.963	
WRE	-0.110	-0.185	0.945

Source: Authors' own calculations

Table 7 shows the results of discriminant validity using the heterotrait-monotrait (HTMT) correlation ratio. The obtained results were below the specified threshold of 0.85 (Henseler, Ringle, and Sarstedt 2015), indicating that discriminant validity, according to the heterotrait-monotrait correlation ratio, was satisfied.

Table 7. Discriminant validity: heterotrait–monotrait (HTMT) ratio of correlation

	EE	TI	WRE
EE			
TI	0.671		
WRE	0.111	0.193	

Source: Authors' own calculations

Table 8 shows the results for the Variance Inflation Factor (VIF) for the inner model. All values were lower than the treshold of 3 (Hair et al. 2021), indicating that collinearity did not pose a problem in this research model.

Table 8. Variance Inflation Factor (VIF)

	Variance Inflation Factor (VIF)
EE -> TI	1.012
EE -> WRE	1.000
WRE -> TI	1.012

Source: Authors' own calculations

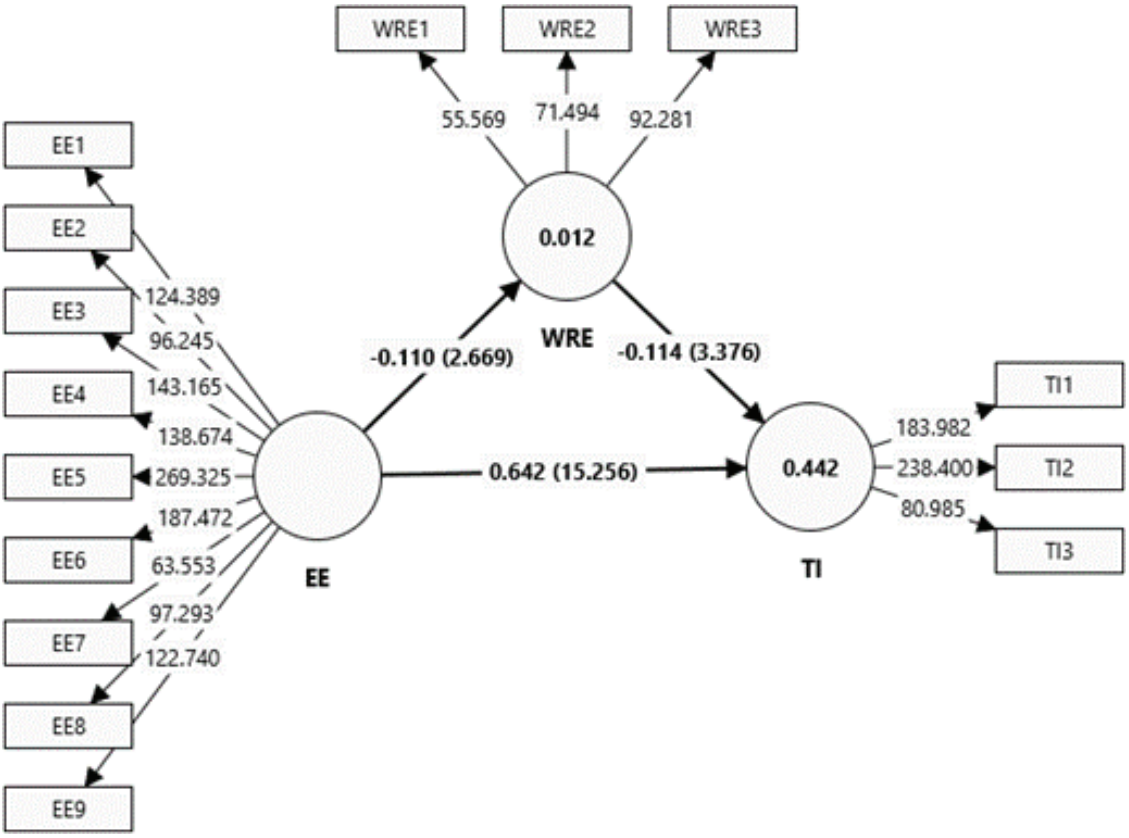
4.3. Hypotheses testing and discussion of research findings

To test the structural model, 10,000 random subsamples of the original data set were created (with replacement enabled). The results are presented in Figure 2.

Table 9 shows the results regarding PLS-SEM ratio coefficients and their level of significance, aimed at evaluating the relationships between the measurement scales. The results revealed that the relationship between emotional exhaustion of employees and their turnover intentions was positive and statistically significant (β= 0.642, t = 15.256, p = 0.000). The results also showed that the relationship between emotional exhaustion and workplace robots' effects was negative and statistically significant (β= -0.110, t = 2.669, p = 0.008). Furthermore, the relationship between workplace robots' effects and employee turnover intentions was negative and statistically significant (β= -0.114, t = 3.376, p = 0.001).

Table 10 presents the coefficients of determination (R^2) in order to examine the percentage by which the independent variables explain the dependent variable. The results revealed that 44.2% of the variance in EE is predicted by TI (moderate value), while only 1.2% of the variance in EE is predicted by WRE (weak value).

Figure 2. Results from bootstrapping analysis (β and t values)



Source: Authors

Table 9. Statistical significance and hypotheses testing

	β	t	p	Hypothesis
EE -> TI	0.642	15.256	0.000	H1: Confirmed
EE -> WRE	-0.110	2.669	0.008	H2: Confirmed
WRE -> TI	-0.114	3.376	0.001	H3: Confirmed

Source: Authors' own calculations

Table 10. Coefficient of determination (R^2) results

	R^2	R^2 adjusted	Interpretation of values	Criteria (Hair, Ringle, and Sarstedt 2011)
TI	0.442	0.440	Moderate	R^2=0.25 weak R^2=0.50 moderate R^2=0.75 substantial
WRE	0.012	0.010	Weak	

Source: Authors' own calculations

Table 11. Effect size (f^2) results

	f^2	Effect size	Criteria (Cohen, 1988)
EE -> TI	0.730	Large	Above 0.35 large effect
EE -> WRE	0.012	Small	0.15-0.35 medium effect
WRE -> TI	0.023	Small	0.02-0.15 small effect

Source: Authors' own calculations

Table 11 presents the results regarding the effect size (f^2). The results revealed a large effect (0.730) of EE on TI, while the effect size of EE on WRE and WRE on TI is small (0.012 and 0.023 respectively).

The conducted statistical analysis, which used a partial least squares method for structural equation modeling (PLS-SEM), resulted in the acceptance of *Hypothesis 1* which states that the emotional exhaustion of employees is positively related to their turnover intentions. Furthermore, the research results showed that the emotional exhaustion of employees had a negative relationship with workplace robots' effects, confirming *Hypothesis 2*, and that workplace robots' effects were also negatively related to employee turnover intentions, confirming *Hypothesis 3*.

Multiple studies have consistently found a strong positive correlation between emotional exhaustion and turnover intentions of employees. This indicates that employees experiencing higher levels of emotional exhaustion are more likely to consider leaving their organization. A meta-analysis by Lee and Ashforth (1996) found a strong positive correlation between emotional exhaustion and turnover intentions across various occupations and industries. Empirical results revealed that employees' emotional exhaustion was a strong predictor of their intentions to leave the job and organization (Ducharme, Knudsen, and Roman 2008). For example, research conducted on a sample of 410 leaders of addiction treatment organizations found that increased emotional exhaustion was connected with higher turnover intentions among employees (Knudsen, Ducharme, and Roman 2009). Other studies have also demonstrated that employees' emotional exhaustion had a positive and statistically significant relationship with their turnover intentions (Green, Miller, and Aarons 2013; Ding and Wu 2023).

The second and third hypothese that workplace robots are negatively related to emotional exhaustion and turnover intentions of employees highlights the role and importance of robots in contemporary workplaces in the age of Industry 5.0. Workplace robots may perform not only "dull, dirty, and dangerous" tasks instead of humans (Parker and Grote 2019), but also physically demanding tasks that often lead to employee fatigue and discomfort. By taking over repetitive tasks, heavy lifting, and tasks requiring awkward postures, robots can reduce the physical strain on employees, which is a significant contributor to overall exhaustion. This can lead to improved physical well-being, increased energy levels, and consequently, reduced emotional exhaustion and turnover intentions. Furthermore, robots can operate continuously without the need for breaks, enabling companies to maintain round-the-clock operations without overburdening human employees. This can prevent burnout and exhaustion associated with long working hours (Brynjolfsson and McAfee 2014). Automation often leads to the redesign of job roles, allowing employees to focus on tasks that require human creativity, critical thinking, and emotional intelligence. This

job enrichment can increase employee satisfaction and engagement, reducing turnover rates.

The use of robots in Southeastern European countries is still in its early stages compared to more industrialized regions like Western Europe or East Asia. However, there is a growing interest in the adoption of robotics across various industries and regions. As technology advances and becomes more affordable, robots are expected to play an increasingly important role in every country and industry, especially in hospitality.

5. Conclusion

This paper examined and analyzed the relationship between workplace robots, employee emotional exhaustion and turnover intentions in the age of Industry 5.0 across four Southeastern European countries (Serbia, Montenegro, Croatia, Bosnia and Herzegovina). Empirical research was conducted between January and May 2024, including 582 respondents. The proposed relationships among variables in the research framework were tested using the partial least squares method for structural equation modeling (PLS-SEM, SmartPLS software). The research results confirmed that the emotional exhaustion of employees had a positive relationship with turnover intentions, while workplace robots' effects were negatively related to employee emotional exhaustion and their turnover intentions.

Theoretical implications of this paper include the fact that this is one of the first studies conducted in these four Southeastern European countries to address workplace robots' effects, employee emotional exhaustion, and turnover intentions in the age of Industry 5.0. Furthermore, this research uses a specific methodology (questionnaires and PLS-SEM) and encompasses a large sample size (582 respondents). The applied conceptual model, which integrated various theoretical perspectives to explain the complex relationships between workplace robots, employee emotional exhaustion, and turnover intentions, may serve as a foundation for future research in this area. The questionnaire was validated, and its reliability and validity were confirmed, providing a strong basis for future research on this topic. Consequently, this paper deepens the understanding of organizational behavior by examining how technological change, particularly the adoption of workplace robots, impacts employee attitudes, emotions, and behaviors. By exploring how the introduction of robots (a technical change) affects employee exhaustion and turnover intentions (social aspects), the paper provides empirical evidence for sociotechnical systems theory and inform strategies for optimizing sociotechnical work systems in the age of Industry 5.0. Additionally, this research provides empirical support for job demands-resources theory explaining that in the context of workplace robots, employees experience lower emotional exhaustion and lower turnover intentions.

Beyond theoretical implications, this paper also has practical implications. Workplace robots are becoming more prevalent, and their impact on employee behavior and performance can be significant. Organizations that recognize the benefits of workplace robots can use them to reduce employee turnover intentions and emotional exhaustion. As a result, leaders, managers, and human resource professionals may benefit from the findings reported in this study, particularly during the decision-making process on how to prevent employee emotional exhaustion, ultimately contributing to long-term employee retention. Organizations planning to introduce workplace robots should exercise caution and be mindful of the potential negative consequences on employees and organizational behavior. To retain employees, organizations must design a clear plan and provide guidance for their professional development in accordance with the requirements of Industry 5.0.

This research has several limitations. First, the conceptual research framework used in this research included emotional exhaustion, workplace robots' effects, and employee turnover intentions and their relationships, without considering a broader range of other variables that may be important in organizational research. Variables such as leadership style, psychological safety, employee engagement, commitment, and career opportunities, among others, were not considered in this framework. Second, a questionnaire technique was used to collect data, rather than an interview approach, which might provide broader and deeper insights based on respondents' discussions.

Future research on this topic should incorporate

additional variables into the conceptual research framework to produce more comprehensive and all-encompassing results. In addition to the questionnaire technique for data collection, future research could be enhanced by incorporating interviews to provide more detailed findings. Furthermore, a longitudinal study would be useful in determining whether and how contemporary improvements in workplace robots influence employee behavior, particularly emotional exhaustion and turnover intentions. Finally, it would be beneficial to analyze the professional development of employees whose tasks are more prone to automation.

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