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ORIGINAL PAPER

THE EFFECTS OF USING ARTIFICIAL INTELLIGENCE AND ROBOTICS IN LOGISTICS SERVICE PRODUCTION: AN APPLICATION IN 3PLS AND 4PLS

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ABSTRACT. Background: The purpose of this study is to investigate how artificial intelligence (AI) and robotic awareness, perceived organizational support, and competitive psychological climate approaches relate to turnover intention. In the literature, studies on robotic awareness and turnover intention have been undertaken in a variety of industries. In this respect, this study aims to address the absence in the literature of research on logistics services providers. This study aims to help businesses understand how to retain employees and foster a more inclusive and supportive workplace.
Methods: The study utilizes survey information from 100 senior managers in the operations function of logistics service providers. The outcomes are obtained by modeling structural equations with SmartPLS. Data from the survey were gathered using the snowball sampling technique.
Results: The results of the research reveal the effect of artificial intelligence and robotic awareness on competitive psychological and turnover intention.
Conclusions: The study aims to explore the role of a competitive psychological climate and organizational support in mediating the relationship between AI and robotics awareness and turnover intention. We identify that awareness of AI and robotics has a considerable, favorable effect on the psychological climate of competition and turnover intention. We also find that the competitive psychological atmosphere has a substantial, favorable effect on turnover intention.
In addition, organizational support has been demonstrated to have a substantial, favorable effect on turnover intention. However, it was not possible to identify the mediating role of organizational support and the psychological environment of competition in moderating the association between awareness of AI and robotics and turnover intention. On the basis of the research's findings, suggestions were made.

Keywords: Artificial intelligence, Robotic awareness, Logistics services provider, Cobots

INTRODUCTION

The technological developments humanity has reached today are based on discoveries and inventions throughout history. In particular, the Industrial Revolution in England in the 18th century and its effects caused developments that facilitated people's lives and fundamentally changed social life. In this first period when technology affected human life, steam machines started to be used intensively in industry (Yıldız, 2018). Technological advances since the start of industrialization—paradigm shifts that are now ex-post referred to as "industrial revolutions"—have occurred, for example, in the mechanization-related fields (first industrial revolution, as the term is used), extensive electrical energy use (referred to as the second industrial revolution), and the widespread use of digital (known as the third industrial revolution) (Lasi et al., 2014).

Businesses today feel obligated to evaluate their business models in light of technological developments to reduce costs and ensure an efficient and reliable supply chain, so much so that in the era of Industry 4.0, people have become involved as system designers across the whole manufacturing system, employees, and customers of the goods produced. Robots have

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developed from simple, automated automata to smart systems with versatile features, and newer types of service robots share the same space and tasks as humans, working in both industrial and service sectors (Savela et al., 2018:493). Also, while the developments in the field of technology have caused some professions to disappear entirely or to be seen less frequently, they have led to the birth of some occupations. As robots and other computer-assisted technologies replace tasks that were formerly performed by people, worries about the future of employment and incomes are growing (Acemoglu, Restrepo, 2017). Regarding this, our study is intended to close the significant research gaps in the literature on logistics turnover intention, perceived organizational support, and competitive psychological climate.

First, we investigate how robotic awareness and artificial intelligence contribute to turnover intention. Second, drawing on past research, we examine how perceptions of organizational support and the psychological climate of competition help us understand how robotic awareness and artificial intelligence affect turnover intentions in the logistics profession.

Each section of the essay is organized as follows: In Section II, a concise assessment of the literature is provided on robotic awareness and artificial intelligence, perceived organizational support, the psychological climate of competition, and turnover intention methodologies. In Section III, we describe the study's research methods. In Section IV, the results are presented following the research model and according to how they are discussed in the literature. Finally, the key conclusions are presented in Section V.

THEORETICAL BACKGROUND

AI and robotics awareness and turnover intention

Industry 4.0 is concerned with connecting all machine components through integrated data chains and processes (Tuba et al., 2017). Global machine networks are emphasized in Industry 4.0.—an innovative factory environment that can independently exchange knowledge and control each other. This cyber-physical system enables the intelligent factory to operate autonomously. For example, since a machine will know the production process that needs to be applied to a product, what changes will be made to that product, etc., it is possible to define that product, its configuration, and the route on the production line as a unique object.

The effects of Industry 4.0 on the whole supply chain need to be analyzed, as it is crucial to ensure good cooperation among manufacturers, suppliers, and consumers to improve transparency in all steps, from the moment the order is placed until the end of the product life cycle (Tjahjono et al., 2017:1175). The Boston Consulting Group, an American company, published a study that identified the following technologies as Industry 4.0 enablers (Baldassarre et al., 2017):

- Advanced Manufacturing Solutions are cooperative, autonomous, and programmable robots that can communicate with people and other robots.
- Augmented Reality is a collection of tools that lets you add details to your feelings.
- Additive Manufacturing describes building objects using additive manufacturing techniques, primarily 3D printing. Additive manufacturing enables enterprises to produce and sell finished products right away on the market or produce individual components that can also add value to products in terms of design, using a variety of fundamental technologies that differ mainly owing to the capacity to employ diverse materials.
- Simulations are essential to minimize faults in products and processes and optimize them.
- Integration of information vertically and horizontally along the whole value chain, from the supplier to the final customer.
- The term "cybersecurity" refers to the requirement to safeguard network security while also protecting computer systems.
- Big Data, which denotes the gathering and processing of vast volumes of data to

enhance goods and manufacturing procedures.

- The Cloud, which symbolizes the requirement to share substantial amounts of data or IT resources, is always accessible over the Internet.
- The Industrial Internet of Things is a collection of technologies and sensors that enable communication between the human and artificial worlds, including the transmission of goods and industrial methods.

The fourth industrial revolution we are currently living in is characterized by the interconnection of sub-components of the production process through the Internet of Things (IoT). Robots are described by the International Organization for Standardization as "programmable devices that can move and carry out tasks in their environment." (Oyekan et al., 2019:41). According to NASA, a robot is a machine that can be used to perform tasks. While some robots can work independently, others always need a person to tell them what to do (Alaiad, Zhou, 2014: 826).

Robots may prove to be a desirable option for humans for material handling in the future due to their error-free operation and sophisticated sensing skills. Robots contribute greatly to production costs, as they can reduce waiting time and speed up automated processes. Robots also offer innovative alternatives to storage processes. They provide flexibility, as they can provide an uninterrupted service. Robotic technology can adapt to complex and changing warehouse environments thanks to self-learning systems. But despite all these advantages, robots are still one of the most expensive solutions in warehouse management (Potkonjak et al., 2011).

Table 1. Cobots and conventional industrial robots are contrasted.

Traditional industrial robots	**Cobots**
Fixed installation	Flexible and portable
Periodic, repeatable tasks; infrequent changes	Frequent task changes; tasks repeated infrequently
On-line and off-line programming	On-line instruction and supported by off-line methods
Traditional programming languages	Easily programmable using graphical user interfaces
Not easy to teach	Easy to teach
Rarely interact with the worker, only when programmed	Frequent interaction with the worker, even force or precision assistance
Workers and robot separated by a fence	Workspace sharing with workers
Cannot interact with people safely	Interacts with people safely
Profitable only with medium to large lot size	Profitable even at small lot level
Small or big and fast	Small and slow
Cannot reduce cost and footprint to justify new applications	Reduce cost and footprint to justify new applications
No requested risk assessment	Requested risk assessment
Usually, 6 axes with last three intersecting in wrist	Usually, 6 and 7 axes with many offsets

Source: Calitz, A. P., Poisat, P., Cullen, M. (2017). The future African workplace: The use of collaborative robots in manufacturing. SA Journal of Human Resource Management, 15(1), 1-11.).

Unlike traditional robot technology, Industry 4.0 robots are expected to move from assistance to cooperation and co-production. These robots are expected to be promoted to the level of colleagues, and it is stated that man and machine will cooperate more intensively in production processes (Berger, 2016). Cobots, also known as collaborative robots, are robotic devices designed to interact physically with people in a shared office. The main advantages of cobots include flexibility in production, less risk, and high performance. Because of cobots, human workers are now assigned to tasks with high added value rather than repetitive or dangerous ones. (Calitz et al., 2017).

Technology support greatly facilitates the organization of work and the circulation of information, reducing production time and allowing products to be of the highest quality to satisfy even the most demanding customers (Grabowska, 2020: 94).

The use of cobots in assembly and production lines will increase worker safety and productivity and expand automation in the production environment. As more cobots are introduced, even more areas of use will be explored (Evjemo, 2020).

AI and robotics can replace repetitive and routine tasks for humans. AI and human collaboration can also increase employee productivity and make business processes more efficient. AI can support human decision-making and work collaboratively. This can reduce employee turnover intentions because their work becomes more efficient and satisfying. On the other hand, integrating AI and robotics into business processes may change the roles, responsibilities, and skills of some employees (Brougham, Haar, 2018).

Where employees find it difficult to adapt to change, it may increase turnover intentions. The impact of AI on turnover intentions is a complex issue that can be influenced by many factors and may differ for each workplace and employee group (Segovia-Perez et al., 2023).

We offer the following hypotheses based on research on AI and robotics awareness and turnover intention.

H1: AI and robotics awareness positively and significantly influences turnover intention.

Perceived organizational support and turnover intention

Turnover intention is defined as an individual's perceived probability of staying or leaving an employing organization (Mendis, 2017). Job dissatisfaction is a key factor in turnover intentions; in fact, if employees experience discontent, they won't be loyal or committed to the company (Thu Suong, 2020).

Perceived organizational support is described as collective perceptions of how much a company values its employees' contributions and cares about their well-being (Aldabbas et al., 2023). Perceived organizational support is a key predictor of turnover intentions and was developed on the premise that employees form opinions about how much a company values their contributions and is concerned about their welfare, based on how they feel the company will reward their hard work and take care of their socio-emotional needs. Increased job satisfaction, performance, dedication, and reduced turnover are outcomes of perceived organizational support (Dawley et al., 2010). Also, employees who reported feeling a lot of organizational support had less workplace stress and recovered more rapidly (Takala, Ramli, 2020).

Employees' perceptions of the organization's ability to value their contributions and concerns are known as perceived organizational support. According to Ardias, an employee's impression of organizational rules, norms, and processes relating to the evaluation of their contributions and welfare is perceived as organizational support (Sumardjo, Supriadi, 2023).

After AI and robots have been implemented on a global scale, it is quite acceptable to question whether they would endanger millions of jobs, resulting in widespread unemployment and job loss. Many studies indicate that as the world becomes more technology-driven, the process of artificial intelligence and robotization could directly displace up to 45% of previously conducted business activities (Li et al., 2019).

High perceived organizational support employees are more likely to demonstrate a strong sense of loyalty and belonging to their employer. Perceived organizational support might thus decrease a worker's intention to leave their job. There is a significant relationship between perceived organizational support and employees' turnover intention. In addition, organizational support leads to a decrease in employees' stress and burnout (Wang, Wang, 2020).

As a result, AI and robotics awareness can have an impact on the behavior of employees at work. Organizations should consider the needs of employees when integrating these technologies into business processes and provide appropriate support and training to help the workforce adapt to technological change. For example, employers investing in AI and robotics technologies to enhance employees' capabilities and using these technologies to reduce employees' workload can increase employees' job satisfaction and therefore reduce turnover intentions. Moreover, a work culture and organizational support that

focuses on employee job satisfaction and engagement also play an important role.

Thus, based on the definition of perceived organizational support and turnover intentions, we propose the following hypotheses:

H2: AI and robotics awareness positively and significantly influences perceived organizational support.

H3: Organizational support positively and significantly influences turnover intention.

H4: Organizational support moderates the relationship of AI and robotics awareness with turnover intention.

Competitive psychological climate and turnover intention

The increasing use of artificial intelligence and robotic technologies in the business world may cause employees to face a competitive psychological climate. A competitive psychological climate describes a work environment where employees are encouraged to compete with and outperform one another.

While such a climate can enhance performance, it can also be associated with negative outcomes such as turnover intention.

The phrase "psychological climate" is frequently used to refer to views of workplace conditions in organizational psychology, wherein an individual's attitudes, personality, conduct, motives, mentality, and fundamental beliefs affect the effectiveness of the company. How employees understand and experience their corporate environment is known as the psychological climate (Hassan et al., 2012). The degree to which employees believe organizational rewards are given based on how they perform in comparison to their peers is referred to as the competitive psychological climate. It is suggested that the intense competition among scientists may lead them to give up their academic jobs (Gim et al., 2015).

On the other hand, one of the stresses at work is modern technology, which has been linked to a host of detrimental employment-related consequences, including high levels of job instability and uncertainty about future career advancement (Li et al., 2019).

Employees may have the desire to abandon their jobs, owing to job insecurity as a result of AI and robotics knowledge. Therefore, employee competitiveness might make workers feel more motivated to keep their jobs. A person who has a competitive spirit may learn more about the most recent technologies being used (Khaliq et al, 2022).

On the other hand, where AI and robotics are combined with a competitive psychological climate, there may be intense pressure and the expectation to perform at a consistently high level. This may increase employee turnover intentions. Turnover intention refers to the idea that an employee intends to leave their current job. Furthermore, the use of artificial intelligence and robotics may lead to the automation of some job tasks and the replacement of human labor. This may cause employees to worry about future job security. Working in such a job may increase turnover intention.

Thus, based on the definition of competitive psychological climate and turnover intention, we propose the following hypotheses:

H5: AI and robotics awareness positively and significantly influences a competitive psychological climate.

H6: Competitive psychological climate positively and significantly influences turnover intention.

H7: Competitive psychological climate moderates the relationship of AI and robotics awareness with turnover intention.

RESEARCH METHOD

Today, businesses increasingly need 'one-stop' service providers. Using and relying on the services of various specialists performing a range of logistics tasks is considered to be characteristic of modern business systems. An enterprise can expand its logistics operations

outside the organization by purchasing services under a contract with a third-party logistics (3PL) or Fourth Party Logistics (4PL) service provider (Pavlić Skender et al., 2017). 3PL service providers, which are widely preferred in outsourcing, provide significant benefits, such as cost reductions and service improvements. 3PL is considered the orchestrator of the logistics industry (Zacharia et al., 2011). 4PL is a supply chain Strategic Tactical integrator that combines and manages the resources, capabilities, and technology of service providers to deliver a comprehensive supply chain solution (Cezanne, Saglietto, 2015). The main characteristic of a 4PL service provider is said to be freedom of presence, and its core function is to manage its own and third parties' resources, capabilities, and technologies to deliver a comprehensive supply chain solution (Mehmann et al, 2013). 3PL and 4PL service providers were selected as the main population for this study, as they utilize technology in fulfilling the integrator role. In the first study, a qualitative research method was used on industry databases and on the websites of logistics services providers. The aim of this study is to identify the activities of logistics providers. This study allows us to define 4PL service providers.

The survey data was gathered using the snowball survey method. A non-random sampling method called "snowball sampling" is used to encourage a set of concepts to participate in the study (Taherdoost, 2016). One of the most common non-probability sampling approaches, the snowball sampling methodology, is particularly suitable when the population of interest is challenging to contact and when compiling a list of the population causes difficulties for the researcher (Etikan et al., 2016).

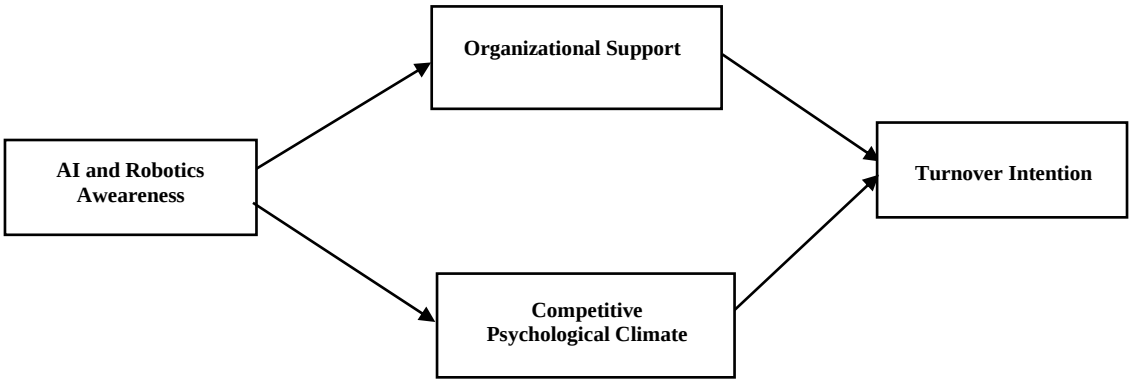

Fig 1. Research Model and Hypotheses

According to the research model, AI and robotics awareness will impact perceived organizational support and competitive psychological climate both directly and indirectly through turnover intention.

RESEARCH MODEL CONSTRUCTIONS

In this study, four main variable groups were used. We invited respondents to the survey's first section to reply to questions on the demographic information of the respondents. The survey's second section used items of dimensions regarding AI and Robotics Awareness. For the third and fourth parts of the survey, we asked the respondents to answer questions about the perceived organizational support and competitive psychological climate of respondents' firms. In the last part of the survey data were collected on turnover intention. Items were taken and modified from Li et al. (2019)'s study to better align them within the context of logistics services providers. The variables of the study are summarized in Table 2.

Table 2. Variables of the study

Demographic information of the respondents
1. Gender
2. Age
3. Education status
4. Work experience
Variables related to AI and Robotics Awareness
5. I think there is a high risk that my job will succumb to automation and my job will be replaced by machines with artificial intelligence.
6. There is a high probability that my job in this organization will be automated.
7. I am very pessimistic about my future in this organization as employees can be replaced by an AI system.
Variables related to perceived organizational support of respondents' firm's present conditions.
8. Our firm strongly considers my personal values and goals when making decisions.
9. Our firm genuinely cares about the well-being of each individual.
10. I can get help immediately if I need it.
11. Small mistakes will be forgiven.
12. Our firm is ready to help me when I need a special favor.
Variables related to competitive psychological climate of respondents' firm's present conditions.
13. I am constantly compared to my colleagues by my supervisor.
14. My reward is determined in comparison to my colleagues.
15. Everyone in this organization wants to be seen as a top performer.
16. My colleagues always evaluate their own performance and compare it with mine.
Variables related to turnover intention
17. I will leave as soon as I find a new job with a higher salary.
18. I think it's time to think seriously about quitting.
19. I'm looking forward to quitting my job.

The question was measured using a Likert-type scale, and the response options ranged from 1 (strongly disagree) to 5 (strongly agree) (see Table 1).

RESULTS

In this section, we present the results of our analysis of the suggested models. In particular, we look at the confirmatory factor analysis and respondent profile, which are described below. Then, we give several managerial standpoint perspectives.

The profile of responder companies

Information about the sampling method and the target participants for a study was provided. The study used convenience sampling, which means that the respondents were selected based on their availability and accessibility rather than through a random sampling method. In this case, the respondents were selected from the member lists of Utikad (Association of International Forwarding and Logistics Service Providers), which currently has 668 members.

The questionnaire was delivered to various individuals within these logistics providers, including chief executive officers, board members, operations managers, sales and marketing managers, and fleet directors of third party and fourth party logistics providers. There were 100 participants involved in this study.

Confirmatory factor analysis

Our PLS-SEM model's indicator reliability, convergent validity, discriminant validity, internal consistency (composite reliability), and indicator reliability are all examined using SmartPLS. When evaluating PLS-SEM measurement models, internal consistency reliability is examined first. The values of Cronbach's alpha of each factor were between 0.815 and 0.906.

It is a different measure that can be interpretable similarly to Cronbach's alpha. Composite reliability values were between 0.871 and 0.941. Thus, internal consistency reliability is said to be provided. Additionally, AVE values should be greater than 0.50, and factor loadings of each indicator (item on the scale) should be higher than 0.60 (Hair et al., 2014). The AVE values were between 0.662 and 0.856, which was considered significant support for convergent validity. The factor loadings were between 0.631 and 0.842. (Table 3).

Table 3. Factor loadings, Cronbach's α, composite reliability, and AVE values of the scale

Item	Factor Loading	Cronbach's α	CR	AVE
AI and Robotics Awareness				
AI1	0,939			
AI2	0,951	*0,905*	*0,941*	*0,842*
AI3	0,859			
Perceived Organizational Support				
OS1	0,828			
OS2	0,819			
OS3	0,874	*0,886*	*0,917*	*0,688*
OS4	0,761			
OS5	0,860			
Competitive Psychological Climate				
PC1	0,882			
PC2	0,846	*0,815*	*0,871*	*0,631*
PC3	0,713			
PC4	0,722			
Turnover Intention				
TI1	0,903			
TI2	0,938	*0,906*	*0,941*	*0,841*
TI3	0,911			

On the basis of the proposed model, a series of multiple regression analyses were used to determine path coefficients. The last findings are shown in Figure 2.

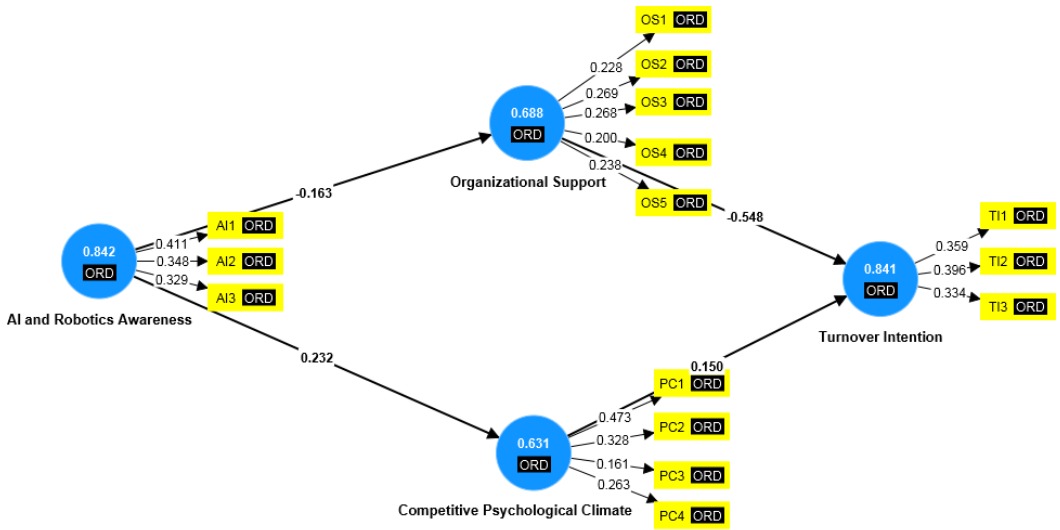

Fig 2. The path model of this study

Henseler et al. (2015) propose the heterotrait–monotrait ratio of correlations (HTMT) as a new approach to assess discriminant validity in variance-based SEM. Authors suggest a threshold of HTMT of 0.90. As seen in Table III, HTMT values are below the threshold value. As can be seen in Table 4, the result indicates that discriminant validity is well established.

Table 4. Heterotrait-monotrait ratio of correlations (HTMTs) for checking discriminant validity

	AI and Robotics Awareness	*Competitive Psychological Climate*	*Organizational Support*	*Turnover Intention*
AI and Robotics Awareness				
Competitive Psychological Climate	0.228			
Organizational Support	0.179	0.519		
Turnover Intention	0.239	0.448	0.687	

Hypothesis testing

The hypotheses are tested using SmartPLS 4, and the findings are shown in Tables 5 and 6. The bootstrapping resampling method was used with 5,000 subsamples to determine the significance of the structural model. The standardized path coefficients and p-values used in the hypothesis testing achieved appropriate results. We find support for H1, H3, H5, and H6 ($p< 0.05$).

Table 5. Significance testing results of the structural model path coefficients for direct effect

Variables	Std. error	t	R^2	P
AI and Robotics Awareness → Competitive Psychological Climate	0,094	2,478	0.673	*0,007*
AI and Robotics Awareness → Organizational Support	0,107	1,524		0,064
AI and Robotics Awareness → Turnover Intention	0,070	1,776		*0,038*
Competitive Psychological Climate → Turnover Intention	0,091	1,647		*0,049*
Organizational Support → Turnover Intention	0,100	5,476	0.270	0,000

We find a significant, positive impact of AI and robotics awareness on competitive psychological climate and turnover intention. We also found a significant, positive impact of competitive psychological climate on turnover intention. Furthermore, a significant, positive impact of organizational support on turnover intention has been found.

The model's predictive power is reflected by the variables' R-squared values (Hair et al., 2014). The effect size of variables can be classified as large (Wetzls et al., 2009) (see Table 5).

Table 6.. Significance testing results of the structural model path coefficients for mediating effect

Variables	Std. error	t	p
AI and Robotics Awareness → Competitive Psychological Climate → Turnover Intention	0,029	1,212	0,113
AI and Robotics Awareness → Organizational Support → Turnover Intention	0,060	1,497	0,067

The analysis's results suggested that AI and Robotics Awareness have not mediated the impact of Competitive Psychological Climate and Organizational Support on the Turnover Intention, not supporting hypotheses H4 and H7 (see Table 6).

CONCLUSIONS

There is growing interest and research in leveraging the natural and unique capabilities of both robots and humans in collaboration. The increasing presence of robots and robotic

systems in various industries and sectors does indeed bring about significant advantages in terms of productivity and cost-effectiveness. However, there are valid concerns regarding the potential impact on employment and the broader economy. The findings also have some important implications for managers. Firstly, increased robot employment will lead to unemployment. One argument is that the adoption of robots in the workforce may result in job displacement for human workers. As robots become more capable of performing tasks traditionally done by humans, there is a concern that a significant number of jobs will become obsolete. This can lead to unemployment, especially for workers in industries that heavily rely on manual labor. Moreover, the use of robots may reduce labor costs for businesses. As a result, companies might opt to replace human workers with robots to cut expenses, exacerbating the potential unemployment problem. If a large portion of the workforce remains unemployed, it can have adverse effects on the economy, such as decreased tax revenues, reduced consumer spending, and increased reliance on social welfare programs.

Secondly, adaptation and training will create new opportunities. An alternative perspective acknowledges the potential for job displacement but emphasizes the importance of adapting to new technologies. Advocates of this viewpoint argue that instead of fearing unemployment, efforts should be made to train and reskill the workforce to align with the changing demands of the job market. Training programs can be established to equip workers with the necessary skills to operate and maintain robotic systems, as well as to develop expertise in emerging fields related to robotics and automation. This approach can lead to the creation of new job opportunities in areas such as robotics engineering, programming, and system maintenance.

Additionally, as robots become more prevalent, they can take over hazardous or physically demanding tasks, reducing the risk of workplace accidents and injuries. This shift can lead to safer working environments and improved overall well-being for workers. On the other hand, according to a different view, employees should be trained following the new technology training, new job fields to be opened, and the creation of a new, qualified, and educated working segment in society. Over time, robots being able to perform many tasks that can be dangerous for humans will become common place.

This study supported previous research on the competitive environment by demonstrating that a highly competitive workplace is linked to higher turnover intentions. Additionally, this study demonstrated a favorable relationship between AI and robotics awareness and turnover intention, corroborating other findings.

The majority of earlier research was conceptual, descriptive in form, making recommendations, or concentrated on the behavior of employees in terms of robots and artificial intelligence. The conceptual papers examined significant research topics and outlined a study agenda for the future. They also offered several frameworks for organizational support, turnover intention, turnover awareness, and competitive psychological climate. The few studies that have looked at the connections between the variables included in this study are quite rare. In addition, there is no research examining the relationships of the existing variables in the field of logistics.

We have discovered that awareness of AI and robots has a considerable, favorable effect on the psychological environment of competition and turnover intention. We also discovered that a competitive psychological atmosphere has a large, favorable effect on turnover intention. In addition, organizational support has been shown to have a large, favorable effect on turnover intention.

The study by Gabriel et al. (2014) looked at the connections between turnover intention and a competitive psychological climate. According to the study's findings, the likelihood of turnover is strongly correlated with the competitive psychological climate.

According to Brougham and Haar's research from 2017, moderators should receive greater attention when examining how employees perceive robots and AI in relation to

workplace outcomes. In addition to responding to Brougham and Haar's (2017) appeal, the current study adds new, further theoretical insight into how organizational support and AI awareness impact an employee's intention to leave their job. The results of this new study show that turnover intentions and AI awareness are related.

The results of Li et al. (2019)'s study show that when employee behaviors and activities are acknowledged and rewarded by their employer, there is a weakening association between AI awareness and turnover intentions. From a theoretical perspective, it emphasizes the role of a competitive psychological climate and organizational support in mediating the relationship between AI and robotics awareness and turnover intention (Li et al., 2019). However, the mediating effect indicated in this study was not detected. The environmental factors of the country where the research was conducted and the variables related to the sector may be the reason for this.

The reasons for the lack of a mediating effect of organizational support between AI and robotics awareness and turnover intention may be due to various factors such as negative attitudes towards technology, concerns about job security, lack of adequate training and support, emotional commitment, organizational culture, and management attitude and communication. Understanding and addressing these reasons can help organizations adapt to technological transformation and help employees work in harmony with technology.

Environmental factors of a country can include cultural norms, legal frameworks, and economic conditions, among others. These factors can significantly impact the adoption and acceptance of AI and robotics in the workplace, as well as employee attitudes towards them. Additionally, variables related to the sector, such as the nature of the work, the level of automation already present, or the industry's competitiveness, can also influence how AI and robotics awareness relates to turnover intention. However, considering the contextual factors mentioned, it is plausible that the absence of a mediating effect could be attributed to the complex interplay between country-specific and sector-specific factors, which were not adequately accounted for in the study. Future research could explore these factors further to gain a more nuanced understanding of the relationship between AI and robotics awareness, turnover intention, and the mediating role of competitive psychological climate and organizational support.

In conclusion, while the increasing use of robots and robotic systems in the workforce has the potential to disrupt employment patterns, it is essential to adopt a proactive approach. By providing adequate training and support to the workforce, societies can benefit from the advantages offered by robots while mitigating the negative impact on employment. Embracing new technologies can lead to the creation of new job opportunities and a more efficient and safer work environment in the long run.

It is recommended that future studies be tested on different samples and on enterprises with different levels of automation and applied in different cultures.

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REFERENCES

Aldabbas, H., Pinnington, A., & Lahrech, A. (2023). The influence of perceived organizational support on employee creativity: The mediating role of work engagement. *Current Psychology*, *42*(8), 6501-6515. https://doi.org/10.1007/s12144-021-01992-1

Acemoğlu, D., Restrepo, P. (2017). Robots and Jobs: Evidence from Us Labor Markets NBER WorkingPaper No. w23285. https://doi.org/10.3386/w23285

Akhtar, P., Kaur, S., & Punjaisri, K. (2017). Chain coordinators' strategic leadership and coordination effectiveness: New Zealand-Euro agri-food supply chains. *European Business Review*, *29*(5), 515-533. https://doi.org/10.1108/EBR-08-2015-0082

Baldassarre, F., Ricciardi, F., & Campo, R. (2017, October). The advent of Industry 4.0 in manufacturing industry: Literature review and growth opportunities. In DIEM: Dubrovnik International Economic Meeting (Vol. 3, No. 1, pp. 632-643). Sveučilište u Dubrovniku.

Berger, R. (2016). The Industrie 4.0 transition quantified. How the fourth industrial revolution is reshuffling the economic, social and industrial model.

Brougham, D., Haar, J. (2018). Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace. Journal of Management & Organization, 24(2), 239-257. https://doi.org/10.1017/jmo.2016.55

Calitz, A. P., Poisat, P., & Cullen, M. (2017). The future African workplace: The use of collaborative robots in manufacturing. SA Journal of Human Resource Management, 15(1), 1-11.

Cezanne, C., & Saglietto, L. (2015). Redefining the boundaries of the firm: the role of 4PLs. *The International Journal of Logistics Management*, *26*(1), 30-41. https://doi.org/10.1108/IJLM-06-2012-0054

Dawley, D., Houghton, J. D., & Bucklew, N. S. (2010). Perceived organizational support and turnover intention: The mediating effects of personal sacrifice and job fit. *The Journal of social psychology*, *150*(3), 238-257. https://doi.org/10.1080/00224540903365463

Evjemo, L. D., Gjerstad, T., Grøtli, E. I., & Sziebig, G. (2020). Trends in smart manufacturing: Role of humans and industrial robots in smart factories. Current Robotics Reports, 1, 35-41. https://doi.org/10.1007/s43154-020-00006-5

Gim, G. C., Desa, N. M., & Ramayah, T. (2015). Competitive psychological climate and turnover intention with the mediating role of affective commitment. *Procedia-Social and Behavioral Sciences*, *172*, 658-665. https://doi.org/10.1016/j.sbspro.2015.01.416

Grabowska, S. (2020). Smart factories in the age of Industry 4.0. *Management systems in production engineering*, *28*(2), 90-96. https://doi.org/10.2478/mspe-2020-0014

Hair, J.F., Tomas, G., Hult, M., Ringle, C.M. and Sarstedt, M. (2014), A Primer on Partial Least Square Structural Equations Modeling (PLS-SEM), Sage, Los Angeles, LA.

Hassan, M., Akram, A., & Naz, S. (2012). The relationship between person organization fit, person-job-fit and turnover intention in banking sector of Pakistan: The mediating role of psychological climate. *International Journal of Human Resource Studies*, *2*(3), 172. https://doi.org/10.5296/ijhrs.v2i3.2286

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, *43*, 115-135. https://doi.org/10.1007/s11747-014-0403-8

Khaliq, A., Waqas, A., Nisar, Q. A., Haider, S., & Asghar, Z. (2022). Application of AI and robotics in hospitality sector: A resource gain and resource loss perspective. *Technology in Society*, *68*, 101807. https://doi.org/10.1016/j.techsoc.2021.101807

Lasi, H., Fettke, P., Kemper, H. G., Feld, T., & Hoffmann, M. (2014). Industry 4.0. Business & information systems engineering, 6, 239-242. https://doi.org/10.1007/s11576-014-0424-4

Li, J. J., Bonn, M. A., & Ye, B. H. (2019). Hotel employee's artificial intelligence and robotics awareness and its impact on turnover intention: The moderating roles of perceived organizational support and competitive psychological climate. *Tourism Management*, *73*, 172-181. https://doi.org/10.1016/j.tourman.2019.02.006

Mendis, M. V. S. (2017). The impact of reward system on employee turnover intention: A study on logistics industry of Sri Lanka. *International journal of scientific & technology research*, *6*(9), 67-72.

Mehmann[1], J., Teuteberg, F., & Freye[1], D. (2013). Requirements on a 4PL-Platform in After-Crop Logistics.

Pavlić Skender, H., Mirković, P. A., & Prudky, I. (2017). The role of the 4PL model in a contemporary supply chain. *Pomorstvo*, *31*(2), 96-101. https://doi.org/10.31217/p.31.2.3

Potkonjak, V., Svetozarevic, B., Jovanovic, K., & Holland, O. (2011). The puller-follower control of compliant and noncompliant antagonistic tendon drives in robotic systems. International Journal of Advanced Robotic Systems, 8(5), 69.

Savela, N., Turja, T., Oksanen, A. (2018). Social Acceptance of Robots in Different Occupational Fields: A Systematic Literature Review, International Journal of Social Robotics, 10, 493–502. https://doi.org/10.1007/s12369-017-0452-5

Segovia-Perez, M., Jianu, B., Tussyadiah, I. (2023, January). Assessing Turnover Intentions of Algorithmically Managed Hospitality Workers. In ENTER22 e-Tourism Conference (pp. 349-354). Cham: Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-25752-0_39

Sumardjo, M., & Supriadi, Y. N. (2023). Perceived Organizational Commitment Mediates the Effect of Perceived Organizational Support and Organizational Culture on Organizational Citizenship Behavior. *Quality-Access to Success*, *24*(192), 376-384. https://doi.org/10.47750/QAS/24.192.45

Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *How to choose a sampling technique for research (April 10, 2016)*. https://doi.org/10.2139/ssrn.3205035

Takaya, R., & Ramli, A. H. (2020, September). Perceived organizational support and turnover intention. In *International Conference on Management, Accounting, and Economy (ICMAE 2020)* (pp. 59-63). Atlantis Press. https://doi.org/10.2991/aebmr.k.200915.015

Thu Suong, H. T. (2020). Impacts of job stress and dissatisfaction on turnover intention. A critical analasys of logistics industry–evidence from Vietnam.

Tupa, J., Simota, J., & Steiner, F. (2017). Aspects of risk management implementation for Industry 4.0. Procedia manufacturing, 11, 1223-1230. https://doi.org/10.1016/j.promfg.2017.07.248

Wang, Q., & Wang, C. (2020). Reducing turnover intention: perceived organizational support for frontline employees. Frontiers of Business Research in China, 14(1), 1-16. https://doi.org/10.1186/s11782-020-00074-6

Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS quarterly*, 177-195. https://doi.org/10.2307/20650284

Win, A. (2008). The value a 4PL provider can contribute to an organization. *International Journal of Physical Distribution & Logistics Management*, *38*(9), 674-684. https://doi.org/10.1108/09600030810925962

Yıldız, S. (2018). Turist rehberliği mesleğinde robot rehberlerin yükselişi. Süleyman Demirel University Visionary Journal, 10(23), 164-177. https://doi.org/10.21076/vizyoner.481225

Zacharia, Z. G., Sanders, N. R., Nix, N. W. (2011). The emerging role of the third-party logistics provider (3PL) as an orchestrator. *Journal of business logistics*, *32*(1), 40-54. https://doi.org/10.1111/j.2158-1592.2011.01004.x

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