
The Relationship between the level of Choosing Competences of Operational Employees and the Acceptance of Work in an Automated Warehouse

Submitted 14/05/22, 1st revision 18/06/22, 2nd revision 16/07/22, accepted 30/07/22

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Abstract:

Purpose: The aim of the paper is to determine the relationship between the level of employees' competences in the field of ability to use interfaces, adaptability and flexibility, creativity / initiative, critical thinking, laying out logical structures, quick response to change in the process, spatial imagination / orientation in space and their level of acceptance of work in an automated environment interpreted on the basis of the degree of their interest in work and cooperation with technology.

Design/Methodology/Approach: The research model and research constructs were developed on the basis of the survey results. Employees completing the questionnaire made a self-assessment in terms of the level of their competence and interest in technology. To test the research model and proposed hypothesis, this study applies Partial Least Squares Path Modelling (PLS), a variance-based structural equation modelling technique (SEM) that aims to maximise the explained variance of the dependent latent constructs. SmartPLS version 3 was used to analyze the data in this study following a two-step analysis approach.

Findings: The level of acceptance of work in an automated environment depends on the level of competence, the ability to use interfaces and Quick of response to change in the process. People with a higher level of these competencies also show a higher interest in technology and its use both in private and professional life. These people are also characterized by a higher level of acceptance of work in an automated environment.

Practical implications: The conducted research made it possible to identify the relationship between employees' competencies and the degree of their acceptance of work in an automated environment. Thanks to the results, it is possible to identify whether the employee will feel comfortable working in an automated environment or not.

Originality/Value: Thanks to the identification of the relationship between competencies, there is no need to test all, but only selected ones, which will greatly facilitate the diagnosis.

Keywords: Partial Least Squares Path Modelling (PLS), work competencies, Industry 4.0, UTAUT model, warehouse, automation.

JEL codes: L81.

Paper Type: Research study.

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Acknowledgement: *The research presented in this paper was financed by the project „Opracowanie metodyki wdrożenia rozwiązań zautomatyzowanych w procesach magazynowych w branży ecommerce uwzględniających postulaty 3 RIS - Innowacyjny przemysł - Zrównoważony rozwój” [Development of a methodology for the implementation of automated solutions in warehouse processes in the e-commerce industry taking into account the postulates of 3 RIS - Innovative industry - Sustainable development]. Project no.: RPLB.01.01.00-08-0016/19 and project KEGA No. 021STU- 4/2021.*

The publication was financed by Poznań University of Technology, Faculty of Engineering Management – project number 0812/SBAD/4203 of the NEXTLOG project (supported by the EU Erasmus + Programme 2019-1-PL01-KA203-065731).

1. Introduction

The traditional definition of an operational warehouse worker is, “The warehouse operators may work in a particular area or may be classed as multifunctional. They normally receive deliveries of goods and check them against the relevant documentation, which may include scanning incoming goods. They may use a forklift truck to load, unload and move goods and have responsibility for replenishing stock. The work may also include order picking, inspection, weighing and packing ordered goods.” (<http://www.logisticsqualifications.eu>). This definition only applies to the tasks performed by warehouse workers. Increasingly, however, the tasks of warehouse operational employees are performed with the participation of technological solutions such as robots or automatic devices. Changes taking place in the equipment of warehouses require changes in the scope of employees' competencies.

The term competence will be used to refer to the capacity of an individual (or a collective) to successfully (according to certain formal or informal criteria, set by oneself or by somebody else) handle certain situations or complete a certain task or job (Ellström, 1997).

Veteška and Tureckiová (2008) present the basic characteristics of competence which are: Competence is always contextualized - set in a certain environment or situation that are co-created by previous experiences, knowledge, interests and needs of others participants in the situation. Competence is multidimensional - composed of various information, knowledge, skills, ideas, attitudes, etc. Competence is defined by a standard - the level of mastery of competence is determined in advance also with a set of performance criteria (expected performance standards). Competence has the potential for action and development - it is acquired and developed through education and learning in the lifelong process.

The main goal of the paper is to determine the relationship between the competences of warehouse operational employees and the level of their acceptance of work in an automated environment. The achievement of the goal will be possible through the verification of the research hypothesis: Employees characterized by a higher level of competence have a higher level of acceptance of work in an automated warehouse.

2. Literature Review

Observing the trends in the development of logistics systems, including warehouse systems, we can more and more often notice the implementation of solutions in the field of Industry 4.0. These are solutions based on the introduction of network-linked intelligent systems, which perform self-regulating production: people, machines, equipment, and products will communicate to one another (Kovacs and Kot, 2016). The challenge in implementing Industry 4.0 is the qualification of employees, including the readiness to work in human-robot cooperation (Maslarić *et al.*, 2016).

Some have already become part of dynamic human capital due to the overlap of online and offline social skills (Wooglar, 2004). New applications for communication and integration of the real world with artificial objects within Industry 4.0 bring significant benefits calculated especially in logistics services (Straka *et al.*, 2017) and in the field of production for decision-making processes. (Hrablik Chovanová *et al.*, 2019). However, several factors on the part of the user, the influence of age, the extent of previous user experience of the worker play an important role (Quint, 2015; Bolstadt, 2016).

The user acceptance of information technology and automation as part of the Industry 4.0 concept, is described as the unified theory of technology acceptance and use of technology (further UTAUT). UTAUT is integration of several theories and models such as the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behaviour (TPB), Combined TAM-TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT) (Turkle, 2011).

UTAT was formulated with four core determinants of interaction and usage - performance expectancy, effort expectancy, social influence, and facilitating condition- and up to four core determinants of key relationships - gender, age, experience, voluntariness of use.

In new introduced UTAUT model extension were new endogenous factors included in the models of technology adoption and use, namely emotional attitude (trust towards technology, perceived threat) and new moderators as a location of organization and type of work-place based training in an organization (Porubcinova and Fidlerova, 2020).

The subject of employee competencies in the field of the fourth industrial revolution (as well as its version in logistics) is described in the literature very widely (Tubis and Poturaj, 2021). These competencies can be divided into four main groups: professional competencies, methodological competencies, personal competencies, and social competencies. Among the competencies most frequently indicated in the literature in the field of adapting to work in an automated environment are,

Willingness to learn, Overall process understanding, Interdisciplinarity and Communication skills (Sapper *et al.*, 2021).

3. Research Methodology

In order to identify the impact of selected competencies of operational employees on their job acceptance in an automated environment, a survey was carried out among warehouse employees of one of the logistics company specializing in the implementation of logistics services for e-commerce. The selected enterprise is a dynamically developing company from the sector of small and medium-sized enterprises. It operates in Poland, but its clients are companies from all over the world.

Most of the shipments are made outside Poland, mainly to Central and Eastern European countries. The warehouse of the analyzed company is equipped with numerous automated devices, including a fully automated storage area. Storage takes place with the participation of robots moving the racks on which the goods are stored. All operational employees working on a one shift were examined. 53 employees participated in the survey. The characteristics of the tested sample are presented in Table 1.

Table 1. Characteristics of the research sample

Criterion	Options	n	%
Gender	male	23	43,4%
	female	30	56,6%
Age	<25	23	43,4%
	26-40	24	45,3%
	41-55	5	9,4%
	56-65	1	1,9%
Education	professional education	9	17,0%
	secondary education	31	58,5%
	higher education	13	24,5%

Source: Own study.

A total of 53 valid questionnaires were collected between September and October 2021. The survey questionnaire was developed based on the results of the conducted literature research. In the questionnaire, questions were asked to determine the level of employees' competencies. The level of the following competencies was examined, the ability to use interfaces, adaptability and flexibility, creativity / initiative, critical thinking, laying out logical structures, quick response to change in the process, spatial imagination / orientation in space. The study consisted of self-

assessment. In order to increase the reliability of the survey, the respondents were not asked directly about competencies but through 5 indicators for each competency.

An indicator is understood as a behaviour or statement that is relevant or relevant to the competence. The respondents assessed their levels of skills to each indicator on a five-point Likert scale, where 1 meant low-level of skill, and 5 - high level of skill. Additionally, using the same scale, respondents were asked about their attitude to modern technology. Again, in order to increase the credibility of the study, this question was not asked directly, but using a series of indirect questions relating to the interest in technology both in private and professional life. The variable derived from these indicators is the scale of interest in technology.

3. Survey Study

To test the research model and proposed hypothesis, this study applies Partial Least Squares Path Modelling (PLS), a variance-based structural equation modelling technique (SEM) that aims to maximise the explained variance of the dependent latent constructs (Hair *et al.*, 2017). SmartPLS version 3 was used to analyze the data in this study following a two-step analysis approach. Due to the characteristics of the studied variables, it was necessary to check them for internal consistency, indicator reliability, convergent validity, and discriminant validity. Composite reliability (CR), Cronbach's alpha (α), and Dijkstra-Henseler's rho (ρ_A) were used to measure construct reliability. Heterotrait- monotrait- HTMT criteria were used to assess discriminant validity. *Construct reliability and validity* assessment is presented in Table 2.

Table 2. *Construct reliability and validity.*

Constructs	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Ability to use interfaces	0.773	0.824	0.849	0.538
Adaptability and flexibility	0.749	0.781	0.832	0.504
Creativity / initiative	0.718	0.768	0.803	0.464
Critical thinking	0.694	0.825	0.803	0.467
Laying out logical structures	0.809	0.820	0.870	0.575
Quick of response to change in the process	0.712	0.772	0.811	0.475
Spatial imagination / orientation in space	0.786	0.829	0.851	0.537
The scale of interest in technology	0.417	0.553	0.645	0.288

Source: Own study.

When evaluating construct reliability and validity, it should be noted that the Cronbach's Alpha value for each construct should be greater than 0.7 (Hair *et al.*, 2017). From the data presented in Table 2, Cronbach's Alpha values for the constructs: Critical thinking and The scale of interest in technology are lower than the assumed threshold value (it is marked in gray in the table). Not all constructs demonstrate internal consistency reliability.

The average variance extracted (AVE) is above the recommended threshold of 0.5 (Hair *et al.*, 2017), demonstrating an acceptable level of convergent validity. As in the case of Cronbach's Alpha, not all of the tested constructs demonstrating an acceptable level of convergent validity. But in case of AVE is less than 0.5 but composite reliability is higher than 0.6, the convergent validity of the construct is still adequate (Fornell and Larcker, 1981). Therefore, based on the data presented in Table 2, it is possible to make a statement, że convergent validity of all constructs is adequate. HTMT for discriminant validity assessment is presented in Table 3.

Table 3. HTMT for discriminant validity

Constructs	1	2	3	4	5	6	7	8
1. Ability to use interfaces	0.733							
2. Adaptability and flexibility	0.739	0.710						
3. Creativity / initiative	0.529	0.748	0.681					
4. Critical thinking	0.610	0.610	0.476	0.683				
5. Laying out logical structures	0.691	0.752	0.633	0.727	0.758			
6. Quick of response to change in the process	0.760	0.739	0.709	0.559	0.735	0.690		
7. Spatial imagination / orientation in space	0.674	0.502	0.455	0.576	0.567	0.581	0.733	
8. The scale of interest in technology	0.709	0.567	0.386	0.281	0.515	0.710	0.388	0.537

Source: Own study.

The Heterotrait-monotrait (HTMT) ratio of correlations is smaller than the suggested threshold of 0.85 for all constructs (Henseler *et al.*, 2015). To conclude the measurement model has been correctly assessed.

The coefficient of determination R^2 was calculated for each endogenous latent variable. This coefficient determines the predictive power of the model and must be greater than 0.1 (Falk and Miller, 1992). R^2 values for the developed model is presented in Table 4.

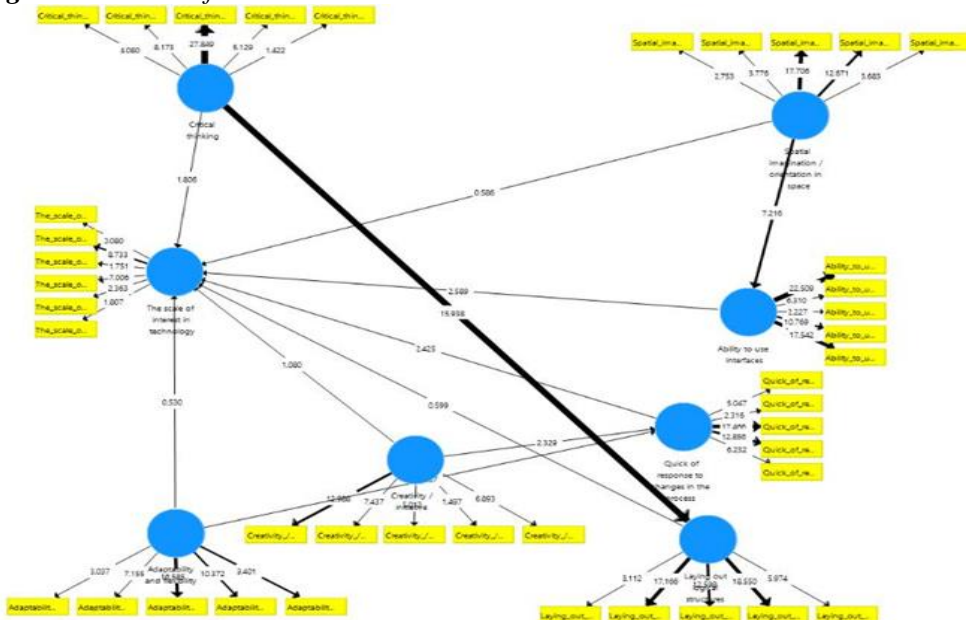
Table 4. R^2 for each endogenous latent variable

Constructs	R Square	R Square Adjusted
Ability to use interfaces	0.455	0.444
Laying out logical structures	0.528	0.519
Quick of response to change in the process	0.601	0.585
The scale of interest in technology	0.665	0.613

Source: Own study.

Results of the significance tests for the path coefficients of the structural model are presented in Figure 1 and Table 5.

Figure 1. Results of the structural model



Source: Own study.

Table 5. Hypothesis testing results (significant at the 0,05 level)

Paths	T statistics	P Values
Ability to use interfaces -> The scale of interest in technology	2.589	0.010
Adaptability and flexibility -> Quick of response to change in the process	2.867	0.004
Adaptability and flexibility -> The scale of interest in technology	0.530	0.597
Creativity / initiative -> Quick of response to change in the process	2.329	0.020
Creativity / initiative -> The scale of interest in technology	1.080	0.281
Critical thinking -> Laying out logical structures	15.938	0.000
Critical thinking -> The scale of interest in technology	1.806	0.071
Laying out logical structures -> The scale of interest in technology	0.599	0.549
Quick of response to change in the process -> The scale of interest in technology	2.425	0.016
Spatial imagination / orientation in space -> Ability to use interfaces	7.216	0.000
Spatial imagination / orientation in space -> The scale of interest in technology	0.586	0.558

Source: Own study.

In Table 5, those P Values are marked in gray, which do not allow positive verification of the hypothesis on the assumed significant at the 0.05 level.

4. Conclusions and Future Research

The conducted survey confirmed that there are dependencies between certain competencies of employees and their interest in modern technology in the work environment. Employees who are characterized by, ability to use interfaces and quick of response to change in the process also show a higher interest in technology and its use both in private and professional life. These people are characterized by a higher level of acceptance of work in an automated environment.

Another conclusion from the conducted research is the relationship between competencies. Employees with a higher level of adaptability and flexibility and

creativity / initiative competencies also have a higher level of quick of response to change in the process competencies.

Therefore, it is enough to examine only these two basic competencies to be able to conclude that the employee will be more willing to implement changes in the process and modify his work. Two other relationships were also noticed in the analysis of the results. Employees with a higher level of Critical thinking also have higher competencies in the field of Laying out logical structures.

An interesting relationship is also the impact of the competencies of Spatial imagination / orientation in space on the Ability to use interfaces. Combining this observation with those described above, it can be concluded that Spatial imagination / orientation in space also affects the interest in technology and the level of acceptance of work in an automated environment.

The above conclusions may be of great practical importance, especially in the area of employee recruitment. Thanks to them, it is possible to select employees to work in an automated environment based on their competencies. This will allow you to more effectively recruit employees who are more likely to adapt to an automated environment.

The conducted research has some limitations. First, they were conducted on a small group of respondents working in one company. Second, the study focused on self-assessment. There was no comparison of employees' competencies with their real efficiency on a job booster.

Subsequently, the authors would first like to focus on improving the research tool, especially in the area of constructs The scale of interest in technology and Critical thinking. Subsequently, it is planned to extend the research sample to a larger number of enterprises, and thus employees. It is important to select companies in which automatic and autonomous solutions already operate.

It is necessary to be able to examine the real relationship between the competencies of employees and their attitude to work in such an environment. The last of the planned steps is to examine the relationship between the results of the self-assessment and the actual effectiveness of employees.

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