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Training human resources to meet job positions in enterprises in the digital transformation period

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Abstract: In the context of the Fourth Industrial Revolution and rapid digital transformation, the need to align university training with enterprise job requirements has become increasingly urgent. Despite improvements in higher education in Vietnam, a significant gap remains between the competencies of graduates and the evolving expectations of employers. This study aims to develop a validated competency framework to assess the ability of university graduates to meet job positions in enterprises during the digital transformation period. The research integrates both theoretical models and empirical evidence, applying the ASK (Attitudes, Skills, Knowledge) competency framework and the CDIO (Conceive–Design–Implement–Operate) educational approach. Using a mixed-methods design, including expert consultation, in-depth interviews, and quantitative analysis with Cronbach's Alpha, EFA, CFA, and SEM, the study establishes a six-factor model. The model includes: (1) trained knowledge, (2) creative thinking ability, (3) professional skills, (4) communication and teamwork skills, (5) professional autonomy, and (6) ethics and responsibility. The empirical findings confirm that these factors are reliable and valid indicators of job readiness. The study also highlights the importance of university–enterprise collaboration in curriculum design, experiential learning, and resource sharing to enhance graduates' adaptability to digital technologies such as AI, IoT, and Big Data. The research contributes a scientifically grounded tool for measuring competency alignment with labor market demands and offers practical implications for higher education institutions aiming to modernize training programs. Ultimately, the study provides a foundation for universities to reform education in response to the demands of Industry 4.0 and the digital economy, thereby improving employability and sustainable workforce development.

Keyword: Digital transformation, Human resource training, University–enterprise cooperation, Graduate competencies, Industry 4.0

INTRODUCTION

In recent years, the quality of human resources trained from universities has gradually been raised and improved significantly; trained workers have partly met the requirements of businesses and the market; Vietnam's technical workforce has mastered science and technology, taking on many complex job positions in companies that previously had to hire foreign experts (Nguyen Huu Hao & Nguyen Thi My Dieu, 2016). However, Vietnamese enterprises currently

lack skilled workers, high-level technical workers, and low foreign language proficiency workers, so they face many difficulties in the integration process (Nguyen Chu Du & Nguyen Thuy Dung, 2019). The processing and manufacturing industries are the key sectors in the industrialization and modernization process. They account for only 9% of the total number of highly skilled workers, while in developed countries, this rate accounts for 40–60% (Nguyen Thu Thuy, 2020). In general, the rate of trained workers is still low. There is a shortage of highly skilled workers, and the quality of workers still does not meet the market's needs. As a result, the country is unable to adapt to the context of digital transformation. Therefore, the gap between professional education and the needs of the labor market is growing. Graduates are generally weak in both knowledge and skills, not meeting the needs of employers, and businesses still lack labor in both quantity and quality (Do Khac Thanh & Hoang Cong Kien, 2020).

Additionally, the ability to adjust to changes in technology, practical skills and awareness, and the working style of graduates are not highly valued by companies. This is one reason that makes businesses hesitant and unsure about the quality of the workforce trained at universities (Nguyen Thi Hang, 2021a). For universities, the main goal of their training process is to produce graduates who can meet the needs of employers. To achieve this, it is important to properly manage the relationship between the "two sides": the school and the employer.

As a result, connecting universities and businesses is seen as a common trend worldwide. It is an effective way to enhance the quality of education, scientific research, and technology transfer. This model is quite popular in the US.

In the United States, higher education institutions focus mainly on teaching necessary skills tied to economic growth (Becker & Lewis, 1992). Germany is also recognized as a leader in joining universities and businesses. The German University of Sciences FH Mainz is part of SAP, a leading company in providing business management solutions and software, and collaborates with more than 500 enterprises of different sizes across several countries worldwide. In the UK, most universities have a special department that connects and negotiates between universities and businesses regarding research and the commercial value of research activities. Many universities in the UK have started companies to invest in research, conduct experiments, perform trial production, manage intellectual property rights, and profit from commercializing research outcomes. Mitev and Venters (2009) highlighted the crucial role and value that companies bring to research activities and the scientific and technological applications of universities. Therefore, to enhance career flexibility for students, applied research centers should be created at universities (Colton, 2016); at the same time, it is necessary to incorporate the development principles of manufacturing industries into universities (Barker, 2016). In the current development trend, human resource training at universities needs to focus on broadening professional knowledge, investing in new technology for teaching, practice, and experimentation to build career adaptability skills for students so they can meet the rising demands of the job market and the trend of international economic integration.

Research Overview

The problem of training people to fill job positions in companies involves improving the ability to connect and work together between businesses and universities. This is influenced by several factors, but the main focus is on meeting the needs of all parties involved (Geisler & Rubenstein, 1989). Geisler and Rubenstein (1989) identified 12 key reasons why companies choose to work with universities, including helping companies gain access to skilled students and professors, improve access to technology for problem-solving or applying advanced technology, boost prestige, save resources, offer excellent technical support, increase access to scientific areas, provide students with real-world problem experiences, and utilize government funding.

At the same time, Geisler and Rubenstein (1989) explained why universities collaborate with businesses. These reasons stem from the missions and goals, organizational structures and policies of universities, job guidance for students after graduation, and the need for funding to support and conduct basic research. In recent years, many researchers, like Inzelt (2004), Elmuti et al. (2005), and Todeva and Knoke (2005), have studied the relationship and cooperation between university companies and businesses.

Thus, the connection between universities and companies involves interactions between parties in similar activities, fields, or research, all aiming for shared goals and benefits. Martin (2000), Martino (1996), and Scott (1998) noted the advantages that the cooperation process from universities offers to companies, such as reducing costs and minimizing risks when applying research results. Additionally, collaborating with companies provides universities with chances to improve teacher skills, increase funding for school activities, and offer students access to practical experiences in businesses. This relationship also helps enhance university management and boosts both innovation and creativity within companies (Koschatzky & Stahlecker, 2010). However, this partnership has not reached its full potential due to outside obstacles that the parties cannot address. To enhance this relationship, a third party needs to bridge the gap, creating a supportive environment for everyone involved (Howells, 1986).

In their research on the links between companies and universities, Etzkowitz (1993) and Etzkowitz and Leydesdorff (1995) introduced the “Tripartite” model. This model shifts the focus from the relationship between companies and the State in industrial society to the relationship among universities, companies, and the State in the knowledge society. The main aim of this model is to create new social frameworks for producing, sharing, and applying knowledge practically, highlighting the important role of universities in advancing research and innovation to grow the knowledge economy.

In reality, collaboration between businesses and universities for research and technology transfer usually happens in four main ways, including (1) Research support, where businesses provide funding and resources for universities to carry out research; (2) research cooperation, where universities and businesses work together on research to tackle agreed-upon issues and enhance the skills of both sides; (3) knowledge transfer, which involves training and exchanging experiences between individual researchers and businesses; and (4) technology transfer, where there is a partnership to apply university research in developing and selling new products and production processes at the businesses they collaborate with (Santoro, 2000).

In today’s world, the partnership between universities and businesses has greatly improved, and university training activities have been changed to match the needs for workers in the digital change era. So, training at universities must be closely connected to what companies need. In the digital change context, businesses need workers who can adapt and use modern digital technologies. Thus, during training, universities can invite companies to lead and teach programs (Modules) that relate to real-life situations to give learners new knowledge (Nguyen Thi Hang, 2021c). Companies have also helped schools with training activities by providing equipment for practice, accepting interns, and advising on how to adjust training programs to fit their actual conditions (Pham Thi Thuy Trang et al., 2019). This is an effective way to connect, allowing universities to gain more resources to enhance quality and meet the growing needs of the job market during the current digital change.

Therefore, to effectively help university graduates find jobs today, it is essential to connect training activities with what companies actually need. Universities must provide knowledge and develop consulting skills for learners in operation and business management. This will help learners think technologically to operate and use modern information systems effectively in businesses (Nguyen Thi Hang, 2021b).

Based on changes in today's work environment, Helyer (2011) states that, in addition to book knowledge, practical experience and knowledge from businesses are very important for graduates. Thus, besides core knowledge in their training field, universities should also give learners practical skills to adjust well to the real work environment.

Hang and Huan (2020) also confirmed that employers usually judge candidates based on three things: knowledge, skills, and attitudes. In particular, attitudes, self-awareness, and initiative to fit into the real work environment are always highly regarded by employers when selecting candidates.

Forsyth and Cowap (2017) highlighted that professional skills and practical knowledge are crucial to meeting employer requirements. Therefore, connecting theory with practice is very important. However, the limitation of Forsyth and Cowap's (2017) study is that it focused only on one faculty member at one university.

Furthermore, in 2017, Carter and Yeo's study on students from the Faculty of Accounting, Finance, and Business at HEI University (Malaysia) found that understanding the knowledge, skills, and competencies needed for practical work by marketers is vital. The requirements for knowledge, skills, and competencies can vary based on the student's level of study and the experience of workers depending on the type of training. The study suggests that developing the curriculum should focus on problem-solving and helping learners adapt to meet employer needs. Additionally, developing professional skills is necessary, especially through interdisciplinary collaboration, teaching, and learning basic concepts in student education.

The research has generally described the ideas and actions of teamwork between universities and businesses in addressing human resource issues. At the same time, the studies have highlighted the types of collaboration, some challenges, and ways to improve the relationship between universities and businesses. In today's world, the Fourth Industrial Revolution is happening quickly and strongly, greatly affecting all areas of society, so it is important to deeply explore the partnership model between educational institutions and companies, not just focus on immediate gains. Universities need to provide students with various types of thinking, professional abilities, and specific knowledge related to their field of study. In the digital age, higher education will need to change significantly in the learning environment, the roles of teachers and students, and teaching approaches. To meet the growing demands of the job market, it is important to change how we think about and develop higher education. Universities should update their training programs and methods following the CDIO approach: Conceive, design, implement, and operate complex products and systems with added value in a modern setting, working in teams and focusing on training that meets the needs of businesses and employers.

To analyze the factors that influence how well students can meet job requirements, the authors created a scale based on the ASK individual competency assessment model (Bloom, 1982). This model states that the job standards for positions in an organization depend on three main aspects: Attitude, Skills, and Knowledge. Rothwell and Lindholm (1999) offered a competency model to evaluate workers' ability to meet job demands in US organizations, which includes training in knowledge and skills; this model outlines the basic needs for training activities in human resources to meet societal job requirements. Wheelahan (2009) believes that educational development trends and the technological revolution have established specific needs in the new era. Therefore, to evaluate a learner's ability to fulfill job roles, we must mainly consider factors of understanding (knowledge) and skills that help them integrate into society through communication and teamwork abilities.

When researching how to create training programs for engineering fields based on the CDIO approach, Crawley et al. (2009) argued that to meet today's employment standards, graduates should achieve: Knowledge, skills, qualities/attitudes; technological understanding and knowledge; professional abilities and personal characteristics; and skills related to personality (teamwork and communication). The model provided by Crawley et al. (2009) laid

out quite detailed requirements for the human resource training process to adjust to the labor market.

Most of the studies mentioned above have highlighted important groups of factors when looking at each resource market. However, the trend of globalization has created overall needs for human resources to satisfy employers. In this new context, where globalization and digital changes are greatly affecting many areas and industries, learners must fully develop skills to quickly adapt to the changing work environment in businesses. This also means that learners need to gather specialized knowledge and combine working skills to fulfill the demands of employers. Therefore, based on the views of experts, university managers, and business employers, and using the three-factor theoretical model ASK from Bloom (1982), Crawley et al. (2009), and other research, the group of authors created a scale that includes 6 groups of suggested factors as shown below.

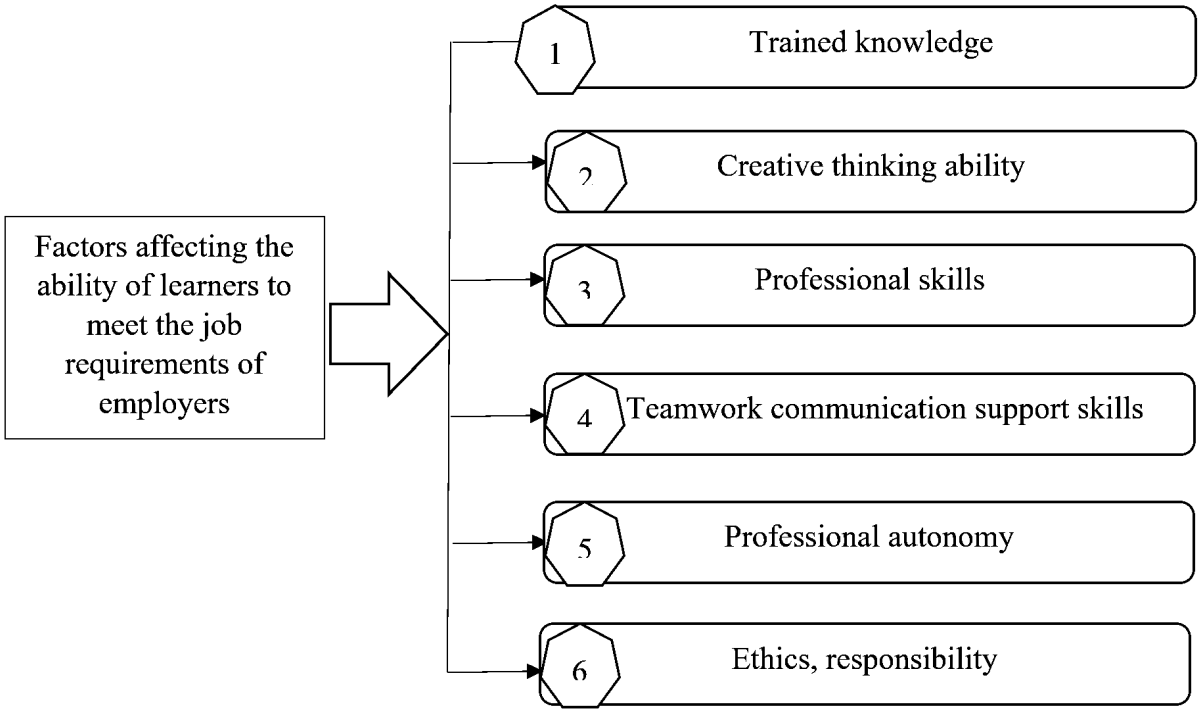

Figure 1. Model of necessary factors for graduates to meet the requirements of employers

The model of factors affecting the ability of graduates to meet the requirements of employers in the current development context includes 6 factors: (1) Trained knowledge (Rothwell & Lindholm, 1999); (2) thinking and creative abilities; (3) professional skills; (4) complementary skills in communication and teamwork (Wheelahan, 2009); (5) professional autonomy; and (6) ethics and responsibility (Crawley et al., 2009)

METHOD

Human resource development is a plan for the social and economic growth of the country. To address society's needs for human resource development, connecting higher education institutions with businesses is one of the main points to improve the quality of higher education. Through this cooperation, universities will get feedback from businesses to enhance their training programs and align them with workplace practices. Universities that train students based on business needs will create job opportunities in their fields for graduates, aiming to balance the supply and demand for workers. To effectively manage this connection, the authors take a holistic approach, based on detailed research and the viewpoints and policies of the Party, as well as the system of laws related to the collaboration between schools and businesses to assess and guide the research content. With a focus on the fundamental theory related to how

businesses and universities work together, this article will examine real-world research to identify the current types of collaboration between businesses and universities. Additionally, the study will conduct field surveys at universities and businesses to evaluate the level of connection between the two. With this method, the study will collect and analyze the results, which can help refine the research theories and suggest suitable solutions.

The authors use the following specific research methods:

- Document collection method: The authors gather and assess information related to the scientific foundation of the research model.

- Theoretical research method: This is used to gather scientific information from research projects about human resource training to meet job positions in both local and international businesses, as well as data from reports by government agencies like the Department of Labor, War Invalids and Social Affairs, Department of Planning and Investment, Department of Education and Training, and others such as the Department of Statistics and Industrial Park Management Board.

- Analysis and synthesis method: This method analyzes and combines data from documents of both local and international research projects related to training human resources for job positions in businesses. Furthermore, to enhance the research content, the authors also use qualitative research methods alongside quantitative research.

- Qualitative research method: The authors use this to develop criteria for assessing factors that influence learners' ability to fit into job positions, creating and refining a scale suitable for the article and research context. This scale is made as a five-point scale (from level 1 as poor to level 5 as excellent) and a questionnaire for quantitative research. Qualitative research is also done through in-depth interviews, seminars, and group discussions with key stakeholders, including experts in the research field, to gather opinions on evaluating the current situation and the feasibility of the proposed model.

- Quantitative research method: This method is used to survey and gather data. The specific steps are as follows:

(1) Creating scales and surveys: To make sure all research information is gathered completely and fairly, the surveys, which are based on the scales, will be sent to experts and managers with deep knowledge at universities and businesses for feedback.

(2) Handling survey data: Analyze and process the data using SPSS version 20 software to check the factors along with the values and reliability of the created scales. Scale testing is done using Cronbach's Alpha reliability measurement, EFA analysis, and CFA analysis. Testing of models and research ideas is done using SEM linear structural model analysis.

RESULTS AND DISCUSSION

Results of Cronbach's Alpha reliability test

The human resource market in the Northern mountainous provinces, particularly Vietnam, and in general, although abundant, has not met the expectations of employers. Therefore, based on the theoretical models presented in the overview, based on the analysis and assessment of the requirements of the labor market, the group of authors designed specific variables that are consistent with the content of the reference research theories and meet the practical requirements of the labor market in Vietnam today. A total of 32 observed variables are described specifically in Table 1.

Table 1. Design of observed variables of the scale

No	Variable encoding	Indicator
1	KNCM1	Recognize the movement and change of the real context
2	KNCM2	Apply information technology tools to solve professional tasks
3	KNCM3	Proficiently perform research, survey, and planning skills
4	KNCM4	Analyze opportunities and capabilities for personal career development
5	KNCM5	Recognize and adapt to changes in the working environment
6	KNCM6	Apply state and industry regulations to work practices.

7	KT1	Apply basic knowledge of information technology to solve work problems
8	KT2	Apply knowledge of national defense and security to practical life
9	KT3	Apply basic knowledge of Marxism-Leninism and Ho Chi Minh thought.
10	KT4	Apply in-depth knowledge of the trained profession to practical work;
11	KT5	Apply basic knowledge of the trained professional field
12	KT6	Have basic knowledge of law and social sciences
13	NLTDST1	Ability to analyze situations and contexts
14	NLTDST2	Apply state regulations to practical activities
15	NLTDST3	Apply integration contexts and new development trends to practical life
16	NLTDST4	Apply topical issues to practice.
17	NLTDST5	Ability to detect problems
18	NLTDST6	Ability to develop oneself.
19	KNBT1	Communication skills
20	KNBT2	Ability to participate in group activities
21	KNBT3	Skills to establish and manage groups
22	KNBT4	Group leadership skills
23	KNBT5	Ability to harmonize relationships within groups.
24	PCDD1	Respect the law
25	PCDD2	Have a positive lifestyle, be in harmony with the collective
26	PCDD3	Respect labor principles and discipline
27	PCDD4	Have a community spirit.
28	NLTCTN1	Time and resource management
29	NLTCTN2	Proactively defining vision and goals in life
30	NLTCTN3	Knowing how to behave professionally
31	NLTCTN4	Critical thinking ability.
32	NLTCTN5	Social responsibility

To check how reliable a scale is, people usually look at two statistical measures: (1) Cronbach's Alpha coefficient and (2) the variable-total correlation coefficient. The variable-total correlation coefficient shows how much an observed variable relates to the other variables in a factor. It indicates how much a specific observed variable adds to the overall concept. To decide if a variable is actually valuable to the factor, the variable-total correlation coefficient needs to be higher than 0.3. If the observed variable has a variable-total correlation coefficient lower than 0.3, it should be removed from the evaluation factor. After analyzing scales with Cronbach's Alpha results above 0.5, it is acceptable to eliminate variables with a variable-total correlation coefficient below 0.3 to improve the reliability of the scale.

Table 2. Cronbach's Alpha test results for the scales

Scale	Trained knowledge (KT)	Professional skills (KNCM)	Supplementary skills in communication and teamwork (KNBT)	Thinking and creative ability (NLTDST)	Ethics and responsibility (PCDD)	Professional autonomy (NLTCTN)
Cronbach's Alpha	0.826	0.807	0.865	0.714	0.829	0.790
Number of observed variables	6	6	5	6	4	5
Number of valid observations included in statistics.	201	201	201	201	201	201
Invalid observations included in statistics	0	0	0	0	0	0

Total number of observations used for subsequent analysis steps.	201	201	201	201	201	201

The results of Cronbach's Alpha testing for the scales show that: For the scale of trained knowledge (KT), coded from KT1 to KT6, the Cronbach's Alpha coefficient reached a value of 0.826. The scale of professional skills (KNCM) includes 6 observed variables, coded from KNCM1 to KNCM6, with a Cronbach's Alpha coefficient of 0.807. The scale of meeting the requirements of employers with additional skills in communication and teamwork (KNBT): There are 5 observed variables, coded from KNBT1 to KNBT5, with a Cronbach's Alpha coefficient of 0.865. The scale of thinking and creativity capacity includes 6 observed variables, coded from NLTDST1 to NLTDST6, with a Cronbach's Alpha coefficient of 0.714. The scale of satisfaction of employers and employees with the learner's career autonomy capacity (NLTCTN) includes 5 observed variables, coded from NLTCTN1 to NLTCTN5, with a Cronbach's Alpha coefficient of 0.790. The total correlation coefficient of all observed variables in the above scales is greater than 0.3. Therefore, all observed variables are used for EFA analysis.

Results of exploratory factor analysis EFA

To validate the structure and suitability of the proposed measurement scale for assessing the ability of graduates to meet job requirements in the digital transformation era, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted. Before performing EFA, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity were employed to assess the adequacy of the data for factor analysis. These tests determine whether the sample size and correlation matrix among variables are sufficient for the extraction of meaningful factors. Table 3 presents the results of these diagnostic tests, which confirm the appropriateness of proceeding with factor analysis. Subsequently, factor loadings obtained from the rotated component matrix (Table 4) illustrate how the observed variables cluster under distinct latent factors, reinforcing the theoretical model. These analyses collectively provide empirical support for the construct validity of the six-factor model designed to evaluate key graduate competencies in the context of Industry 4.0.

Table 3. Results of KMO and Bartlett tests for independent variables

KMO coefficient		0.785
Bartlett test	x^2 value approximately	3,158.643
	Degrees of freedom (df)	448.000
	Significance level (Sig.)	0.000

The KMO test results show that the Kaiser-Meyer-Olkin Measure Adequacy coefficient = 0.785 > 0.5, so the factor analysis is considered appropriate. The significance level (Sig.) = 0.000 < 0.05, so the observed variables are correlated with each other. This satisfies the requirements for EFA analysis.

The results of running the EFA factor analysis show that the correlation matrix of the variables is appropriate; the rotation matrix converges and is not disturbed.

Table 4. Results of the rotation matrix analysis of the observed variables

Observed variables	Factor loadings					
	1	2	3	4	5	6
KNCM5	0,868					
KNCM4	0,819					
KNCM6	0,802					
KNCM2	0,673					
KNCM3	0,852					
KNCM1	0,482					
KT5		0,846				
KT4		0,728				
KT1		0,719				
KT6		0,712				
KT3		0,682				
KT2		0,601				
NLTDST5			0,871			
NLTDST1			0,792			
NLTDST2			0,774			
NLTDST4			0,680			
NLTDST3			0,668			
NLTDST6			0,655			
KNBT3				0,836		
KNBT1				0,821		
KNBT4				0,808		
KNBT2				0,661		
KNBT5				0,569		
PCDD3					0,903	
PCDD1					0,735	
PCDD2					0,628	
PCDD4					0,645	
NLTCTN2						0,884
NLTCTN3						0,873
NLTCTN5						0,831
NLTCTN1						0,752
NLTCTN4						0,627

Observations have shown that, in order to meet the requirements of employers in the context of the 4.0 Industrial Revolution, the quality of human resources must be improved along with the ability to adapt to technological changes. This is a new trend in the process of automating production and exchanging technological data. The convergence of observed variables in the analytical model shows that being trained based on a digital technology platform and having solid professional knowledge will help learners adapt and meet the needs of human resources serving digital transformation in today's businesses.

The core elements of digital in the 4.0 Industrial Revolution include: Artificial Intelligence (AI), Internet of Things (IoT), and Big Data. Therefore, learners need to be fully equipped with professional skills to exploit digital-based knowledge to analyze, evaluate, think, debate, innovate and solve problems in Logistics and supply chains. Therefore, learners need to develop creative thinking skills, practice additional skills, ethics, self-control, and self-responsibility to equip themselves with industrial style with many soft skills such as Presentation, communication, punctuality, adapting to the office environment, and working spirit... This will leave a good impression on businesses and meet the needs of employers.

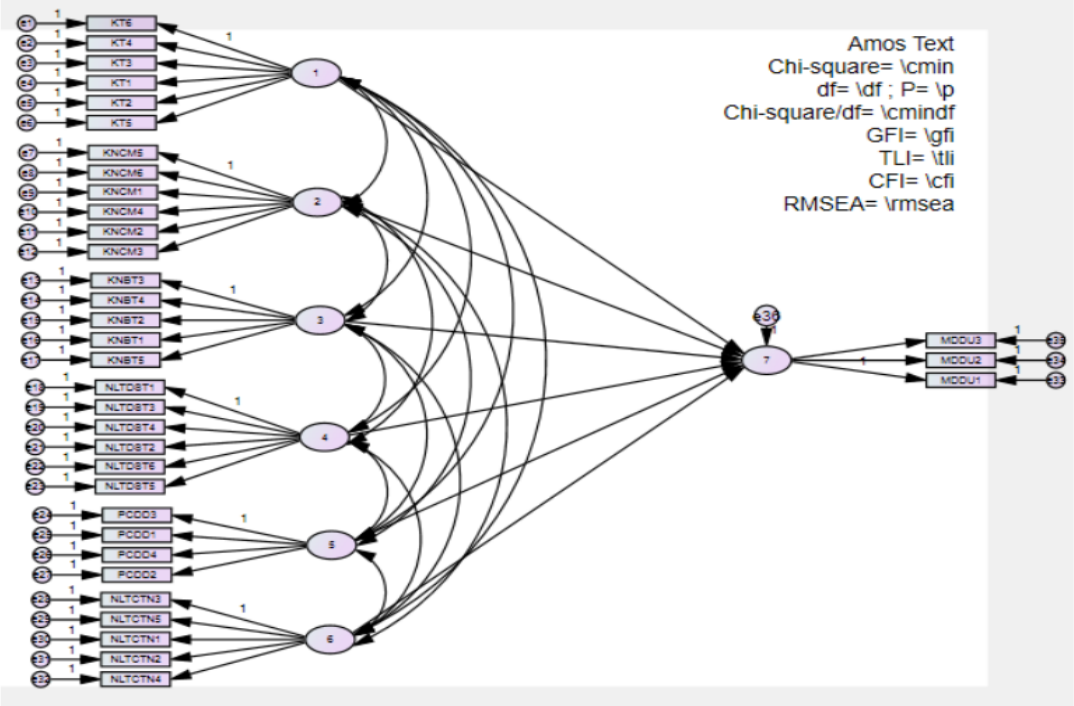

Figure 2. CFA results and SEM standardized model

Regarding the overall fit, the CFA analysis results show the following results: Chi-square is 943.212 with 766 degrees of freedom and p-value = 0.000. Chi-square adjusted by degrees of freedom (CMIN/df) is 1,657.2 (< 2), CFI = 0.916 (> 0.9), TLI = 0.902 (> 0.9), and RMSEA = 0.61 (< 0.08), so this model fits the research data and meets the analysis requirements. The reliability values of the analysis are all greater than 0.6, so the scales meet the requirements, demonstrating that the output standards required for graduates from universities in the current context must demonstrate an integration of knowledge and thinking skills, professional skills, as well as the capacity for autonomy and self-responsibility.

CONCLUSION

The study has evaluated the scale of factors that influence the ability to fill job positions in businesses during digital transformation. This marks a noticeable shift in educational goals today compared to the past. To adapt to digital transformation, learners need not only to gain knowledge, skills, and attitudes, but also to have both basic and advanced knowledge of their training field along with comprehensive skills. Based on research and data analysis, the quality of education in higher institutions must meet 6 factors: (1) Knowledge provided; (2) critical thinking and creativity; (3) professional skills; (4) additional skills in communication and teamwork; (5) professional independence; and (6) ethics and responsibility. The elements of the scale provide valuable information for evaluating and surveying employers, particularly businesses in the setting of digital transformation, to adjust training content and methods flexibly. This serves as a foundation for suggesting ways to enhance the quality of education at universities, aiming to develop digital universities to prepare digital citizens to fulfill society's needs. To meet the growing demands of businesses in the context of digital transformation, workers must equip themselves with the essential knowledge and capabilities. Specifically, they need to focus on fulfilling the following basic requirements:

- In terms of knowledge, learners need to be equipped with and have the ability to master basic and specialized knowledge related to the training profession to apply to solving work problems.

- In terms of skills, it is necessary to equip basic professional skills such as Research, application of information technology in professional activities, self-study and research capacity, problem-solving, and creative capacity, ability to form ideas related to the profession and conduct research; effective management and work organization capacity; capacity to analyze, evaluate and synthesize socio-economic data; capacity to forecast and plan strategies. In addition, soft skills such as Communication skills, teamwork coordination, flexibility in responding to situations, and discipline... also need to be enhanced, contributing to improving the quality of human resources and meeting the requirements of the labor market. Soft skills also include certain abilities such as Communication, problem-solving, self-motivation, decision-making, and time management. For workers, soft skills are becoming increasingly important, especially in the current context. Along with fundamental knowledge and coping skills, creativity, discipline, and application of information technology, workers will practice professional skills more conveniently, quickly, and flexibly.

In addition, in the context of integration, countries are promoting digital transformation in socio-economic fields, and human resources need to form the capacity for autonomy and self-responsibility to adapt to the new situation.

Thus, in the context of digital transformation, all countries need to create a workforce with essential qualities. Therefore, providing learners with a framework of knowledge along with necessary skills to help them adapt quickly to the realities of integration and digital life is a crucial need. The goal of training workers to achieve core competencies, basic skills, and essential qualities for them to become valuable members of society connects educational activities with the needs of job positions in businesses. This is a focus for universities today, aiming to adjust training activities flexibly towards CDIO to achieve a goal of comprehensive digital education, aligning with the growth of the digital economy.

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