THE STATUS OF IT APPLICATION COMPETENCE OF STUDENTS OF THAI NGUYEN UNIVERSITY OF AGRICULTURE AND FORESTRY

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ABSTRACT

The ability to apply IT of students in the agriculture and forestry sector is the level achieved in terms of knowledge, skills and attitudes to use IT in order to effectively perform tasks related to learning and expertise of the trained profession. The objective of the article is to assess the level of competence accumulation in information technology (IT) applications achieved by TUAF students compared to the requirements of employers. Quantitative research method is applied to 58 employers in the agricultural field and 414 students who were about to graduate. Data analysis shows that the level of achievement of students has not met the needs of employers, especially those related to new technologies in agriculture, forms of communication and cooperation by technology, the proactive application of IT in practice. The research results are an important basis in the development of training programs and innovation of teaching methods in Informatics at TUAF in order to improve training quality and meet the needs of society.

Keyword: *Competence in applying IT and digital technology in agriculture, training agricultural students, competence framework, level of competence responsiveness.*

INTRODUCTION

The remarkable development of IT applications in all fields has changed all aspects of life. Agriculture is one of the areas with significant changes, especially after the introduction of the Prime Minister's Decision No. 749/QD-TTg dated June 3, 2020 on digital transformation, digital platforms and other technologies. Digital tools have been built, operated and widely deployed. Automation technologies such as sensors, tractors, harvesters, drones, etc., applied in the entire process from farming to harvesting, have significantly reduced costs and labor force, and improved productivity and quality at the same time. GIS and remote sensing technologies have brought high efficiency in crop management, resource management, disease forecasting and monitoring [1], [2], [3]. Along with the production process, digital technology is also promoted in processing and consuming products. E-commerce is becoming a new form of business and consumption [4]. This is one of the effective solutions to promote the consumption of agricultural products today.

IT application competence is also of particular interest and concretization in the general requirements of employees in society [5]. In Vietnam, employees in all fields must achieve basic IT qualifications as prescribed in Circular 03/2014/TT-BTTTT [6]. Besides general regulations, specific regulations for each field have also been implemented in many studies [7], [8], [9], [10], [11].

In the context of the changes of work in the professional field, university training in general and the training of agro-forestry bachelors and engineers in particular need timely updates to meet the general development. Assessing the current status of students' competence to apply IT in agriculture has also been carried out by many researchers in the world and in Viet Nam [12], [13]. According to the general assessment, this competence of students has not met the needs of employers yet. In order to contribute to the implementation of the development orientation of TUAF which is "Training human resources according to career orientation, meeting the requirements of domestic and foreign markets and the current needs of society for high quality human resources in the

agricultural sector". We carried out a study to assess the responsiveness of IT application competence of students at Thai Nguyen University of Agriculture and Forestry in comparison with professional practice in order to create a basis for the University in particular and other institutions in general to train bachelors and engineers in agriculture and forestry as a reference in the process of developing training programs, assessing outcomes for students as well as innovating teaching methods of Informatics in order to achieve training goals and meet the demand for quality human resources of today's society.

METHODOLOGY

To assess the cumulative level of students' achievement in IT application competence and the level of responsiveness compared to actual careers, we conducted a survey with 2 subjects: employers and students who are about to graduate. The survey table is the result of the research we have done with the IT application competence framework for students in the agriculture and forestry sector, including 7 main competences and 21 specific criteria as follows:

Table 1: The competence framework and specific criteria

Competence	Criteria
C1. Competence of knowledge about IT	C1.1. Understanding IT applications, trends, policies and regulations in the area of expertise
	C1.2. Having skills to update IT applications, trends, policies and regulations in the area of expertise
	C1.3. Understanding regulations of using and developing IT in the area of expertise
C2. Competence exploiting and using information	C2.4. Having the skills of Information security and prevention of risks when working on the Internet
	C2.5. Having the skills of searching, exploiting and selecting useful information on the Internet for professional activities
C3. Competence of discovering opportunities of IT application	CL3.6. Identifying activities that can be performed using IT applications
	C3.7. Selecting the appropriate IT applications to perform each specific activity
	C3.8. Offering opportunities to apply IT to perform specific activities
C4. Competence of using machines and technical means	C4.9. Understanding of the structure and maintenance of equipment such as computers, automatic control systems, measuring devices, remote monitoring devices
	C4.10. Having the skills of using computers and smart agricultural equipment
C5. Competence of applying software	C5.11. Having the skills of using utility software on operating systems, basic office software
	C5.12. Having the skills of using commercial software, automatic control software, remote monitoring
	C5.13. Having the skills of using specialized software for statistics, data processing, market analysis, index calculation
	C5.14. Having the skills of building, updating and managing specialized databases
	C5.15. Having the skills of using GIS and remote sensing software to solve problems in the field of agriculture and forestry
	C5.16. Having the skills of applying blockchain technology and forms of e-commerce in production and business
C6. Competence of professional development	C6.17. Having a sense of self-study, innovation, creativity and professional capacity building
	C6.18. Actively, proactively researching and updating new trends in the professional field
	C6.19. Proactively proposing solutions to improve work quality and efficiency through appropriate IT applications
C7. Competence	C7.20. Having communication and cooperation skills using technology in the media

of socializing	C7.21. Applying the rules of conduct in the digital environment to have appropriate awareness and employment

For students, the survey was conducted during the university's graduation exams with the help of teachers of English and Informatics. For employers, most of the survey questionnaires were handed to them when they participated in an interview in the evaluation of the AUN training program at TUAF in April 2022. The remainder is collected at the employers' office.

In the survey, the Likert scale is used with 5 levels: Very Poor, Poor, Average, Good, Very Good, corresponding to the score from 1 to 5. After the survey, we obtained 65 answer sheets of employers and 485 answer sheets of students. After the data cleaning process, the number of votes included in the resulting analysis was 58 votes from employers and 414 votes from students. The rejected sheets are questionnaires with missing information.

Collected data after the survey was put into Excel and processed on IBM SPSS statistics 20 software. First, we carried out categorical statistics by coded variables, calculated the mean and standard deviation of the answers in the survey collected. Then the scale is tested for reliability through Cronbach's Alpha coefficient. This is a method to help eliminate inappropriate variables and evaluate the reliability of the scale. The scale is considered reliable if the correlation coefficient of the total variable (Corrected Item – Total Correlation) ≥ 0.3 and coefficient Cronbach's Alpha ≥ 0.7.

RESULTS AND DISCUSSION

1. Descriptive statistics of the study samples

1.1. For employers

The sample structure used for employers in 58 valid answer sheets is described in the following statistical table:

Table 2: Information on surveying employers

Survey information	Subject	Number	Percentage %
Gender	Male	46	79.3%
	Female	12	20.7%
Position	Director	10	17.2%
	Vice director	15	25.9%
	Manager	21	36.2%
	Vice manager	12	20.7%
Academic level	College	0	0.0%
	University	30	51.7%
	Post-graduate	28	48.3%
Seniority	Under 5 years	5	8.6%
	5-10 years	23	39.7%
	Over 10 years	30	51.7%

As can be seen in the table, the gender proportion is quite different. In fact, managers in this field are mostly male. Therefore, the ratio is appropriate. The positions of the survey subjects are similar, in which the majority of the directors participating in the survey are from small and medium enterprises; managers mainly work in government agencies. All of the employers who participated in the survey had a university degree or post-graduate degrees, nearly half of whom had a post-graduate degree. This shows that managers in the agricultural

sector have quite high qualifications. More than half of the respondents have been working for more than 10 years, the rest of whom have been working from 5 to 10 years.

Thus, the structure of gender, position, academic level and seniority of the surveyed employers are appropriate and highly representative. They are all highly educated people with long working time. Therefore, they can all answer questions well, and the information they provide is suitable for use and analysis.

1.2. For final-year students

The sample structure used for students in 414 valid answer sheets is described in the following statistical table:

Table 3: Information on surveying final-year students

Survey information	Subject	Number	Percentage %
Gender	Male	202	48.8%
	Female	212	51.2%
Owned IT equipment	Smart phones, tablets	414	100.0%
	PC	37	8.9%
	Laptop	302	72.9%
	Mobile phones	12	2.9%
Purpose of using IT equipment	Studying	354	85.5%
	Working	187	45.2%
	Entertaining	310	74.9%
	Running their business	81	19.6%
	Exchanging information	352	85.0%
Time of using IT equipment	<2 hours	48	11.6%
	2-4 hours	126	30.4%
	4-6 hours	144	34.8%
	> 6 hours	96	23.2%
Information often searched on the Internet	Information for studying	321	77.5%
	Job/start-up	186	44.9%
	News	235	56.8%
	Entertainment	303	73.2%
	New technology in expertise	157	37.9%
	Other information	175	42.3%

As can be seen in the table, most students have personal computers and 100% of students use smartphones. Students often use these devices with a considerable amount of time. Students pay much attention to activities such as: studying, entertaining and exchanging information. Besides the main task of studying, many students now work

part-time. Many students participate in jobs using IT equipment, a few carry out self-employment forms with the support of these devices. Thus, students have the conditions, time and have had a lot of interest in IT applications.

2. Evaluating the reliability of the survey results

Based on the criteria in the Competence Framework, we use 21 main criteria to measure the level of competence that students have accumulated and the employer's requirements for the level of IT application skills that need to be achieved to handle the jobs. After processing data with SPSS software, the results of testing the reliability of all criteria through Cronbach's Alpha coefficient for employers and students are 0.877 and 0.854, respectively. In which, the reliability and correlation coefficient of the total variable for each criterion are as follows:

Table 4: Reliability and total correlation coefficient of each variable in survey data related to employers

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
C1	75.33	46.961	.547	.	.869
C2	75.31	47.691	.436	.	.873
C3	75.29	48.141	.409	.	.874
C4	75.50	47.868	.422	.	.873
C5	74.84	47.151	.379	.	.876
C6	75.24	48.186	.308	.	.878
C7	75.71	47.755	.480	.	.871
C8	75.81	48.507	.468	.	.872
C9	75.17	47.584	.422	.	.873
C10	75.07	47.153	.523	.	.870
C11	74.81	46.753	.472	.	.872
C12	75.41	47.580	.458	.	.872
C13	75.34	47.388	.465	.	.872
C14	75.47	47.762	.459	.	.872
C15	75.36	48.025	.410	.	.873
C16	75.45	47.971	.433	.	.873
C17	74.88	47.371	.508	.	.871
C18	74.98	46.754	.653	.	.867
C19	74.93	46.592	.656	.	.866
C20	74.69	45.867	.526	.	.870
C21	74.71	46.141	.593	.	.867

Table 5: Reliability and total correlation coefficient of all variables in the survey data related to students

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
C1	73.60	52.827	.446	.236	.847
C2	73.70	53.873	.387	.243	.849
C3	73.59	52.916	.441	.232	.847
C4	74.00	52.889	.397	.222	.849
C5	73.56	52.848	.509	.355	.845
C6	73.73	54.123	.395	.379	.849

C7	73.98	53.186	.423	.313	.848
C8	73.97	51.449	.527	.895	.843
C9	73.56	52.508	.489	.428	.845
C10	73.80	52.388	.462	.404	.846
C11	73.52	53.306	.375	.421	.850
C12	73.93	51.760	.505	.377	.844
C13	73.99	53.794	.329	.249	.852
C14	73.95	53.380	.366	.283	.850
C15	73.85	54.263	.356	.286	.850
C16	73.92	51.311	.545	.903	.843
C17	73.34	52.977	.479	.305	.846
C18	73.41	53.259	.446	.411	.847
C19	73.63	53.895	.372	.270	.850
C20	73.33	53.770	.334	.265	.851
C21	73.25	53.213	.455	.305	.847

Data from Tables 4 and 5 show that: The Cronbach alpha values of the total variables and all of the component variables are >0.8; the value of the total correlation coefficient (Corrected Item - Total Correlation) of all component variables is > 0.3. Therefore, the scale has high reliability, the observed variables have a high contribution to the scale.

3. Evaluating the results of the survey related to students

The average score and difference of each competence in the survey table after running on the software are as follows:

Table 6: The average score of each competence and the difference between the two survey groups

Tiêu chí	Employers	Students	Difference
C1.1. Understanding IT applications, trends, policies and regulations in the area of expertise	3.67	3.7	-0.03
C1.2. Having skills to update IT applications, trends, policies and regulations in the area of expertise	3.68	3.6	0.08
C1.3. Understanding regulations of using and developing IT in the area of expertise	3.70	3.68	0.02
C2.4. Having the skills of Information security and prevention of risks when working on the Internet	3.48	3.38	0.1
C2.5. Having the skills of searching, exploiting and selecting useful information on the Internet for professional activities	4.12	3.82	0.3
CL3.6. Identifying activities that can be performed using IT applications	3.75	3.44	0.31
C3.7. Selecting the appropriate IT applications to perform each specific activity	3.30	3.40	-0.1
C3.8. Offering opportunities to apply IT to perform specific activities	3.18	3.31	-0.13
C4.9. Understanding of the structure and maintenance of equipment such as computers, automatic control systems, measuring devices, remote monitoring devices	3.90	3.82	0.08
C4.10. Having the skills of using computers and smart agricultural equipment	3.90	3.58	0.32
C5.11. Having the skills of using utility software on operating systems, basic office software	4.17	3.86	0.31
C5.12. Having the skills of using commercial software, automatic control software, remote monitoring	3.58	3.45	0.13

C5.13. Having the skills of using specialized software for statistics, data processing, market analysis, index calculation	3.65	3.39	0.26
C5.14. Having the skills of building, updating and managing specialized databases	3.53	3.33	0.2
C5.15. Having the skills of using GIS and remote sensing software to solve problems in the field of agriculture and forestry	3.62	3.43	0.19
C5.16. Having the skills of applying blockchain technology and forms of e-commerce in production and business	3.53	3.46	0.07
C6.17. Having a sense of self-study, innovation, creativity and professional capacity building	4.08	4.04	0.04
C6.18. Actively, proactively researching and updating new trends in the professional field	3.98	3.87	0.11
C6.19. Proactively proposing solutions to improve work quality and efficiency through appropriate IT applications	4.05	3.7	0.35
C7.20. Having communication and cooperation skills using technology in the media	4.28	3.9	0.38
C7.21. Applying the rules of conduct in the digital environment to have appropriate awareness and employment	4.27	4.13	0.14
Average	**3.78**	**3.63**	

The difference of each criterion is more clearly shown in the chart below:

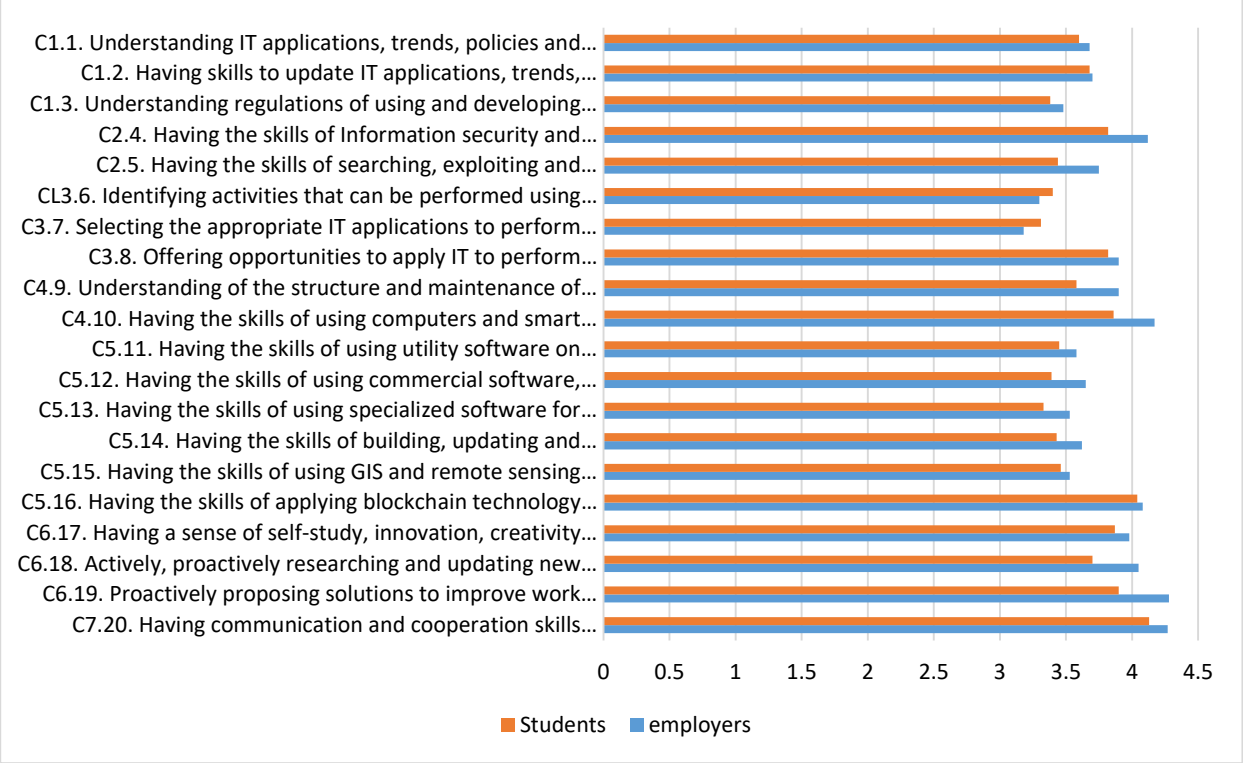

Chart 1: The level of competence achieved by students and employers' requirements

Looking at the statistics and chart, it can be seen that the average score required by employers for 18/21 competence criteria is higher than the cumulative level achieved by students. However, the number of criteria with insignificant difference (<0.1) is 5 criteria.

The criteria that students have met the requirements of employers are: (C1.1) Understanding of IT applications, IT trends, policies and laws in the professional field; (C3.7) Selecting suitable IT applications to

perform each specific activity; (NL3.8) Provide opportunities to apply IT to perform specific activities. Among the content requirements related to this criterion, employers have higher requirements for skills related to updating new applications, trends, and policies on IT application in the areas of expertise and how to identify activities that can be performed using IT applications. This is appropriate, because when students have the skills to detect and implement IT applications, they are able to apply them well when encountering different situations in reality.

The remaining criteria do not meet the needs of employers with the difference being between 0.02 and 0.38. The criteria with low difference include: (C1.2) Skills in updating applications, new policy trends in IT application in the areas of expertise; (C1.3) Understanding the regulations on the use and development of IT in the professional field; (C4.9) Understanding of the structure and maintenance of equipment such as computers, automation control systems, measuring devices, remote monitoring devices; (C5.16) Skills in applying blockchain technology and forms of e-commerce in production and business and (C6.17) Having a sense of self-study, innovation, creativity and professional development. The trend of applying digital technology in all activities of social life today has helped students have more interest in new technologies. However, because the level and time of exposure to IT applications in practice is still not much, many students have not yet seen the role of IT applications in their careers, so the level of achievement is still not high.

The criteria with a high degree of difference (from 0.3 or above) belong to 6 criteria: (C2.5) Skills of searching, exploiting and selecting useful information on the Internet for professional activities. ; (C3.6) Identifying activities that can be performed using IT applications; (C4.10) Using computer and smart agricultural equipment; (C6.19) Proactively proposing solutions to improve work quality and efficiency through the appropriate application of IT applications; (C7.20) Communication and cooperation via technology on media. Although the cumulative results of students are quite high in the criteria C2.5, C6.19 and C7.20, they still have not reached the level required by employers. The need to promote, analyze and forecast the current agricultural market situation is one of the issues of great concern in the agricultural sector. Therefore, employers are interested and quite demanding with these criteria, especially employers from enterprises. Besides, in the opinion of many students, they have not had the opportunity to interact with many smart agricultural equipment commonly used in agriculture today.

The table below provides a general comparison of the difference between employer requirements and student accumulation:

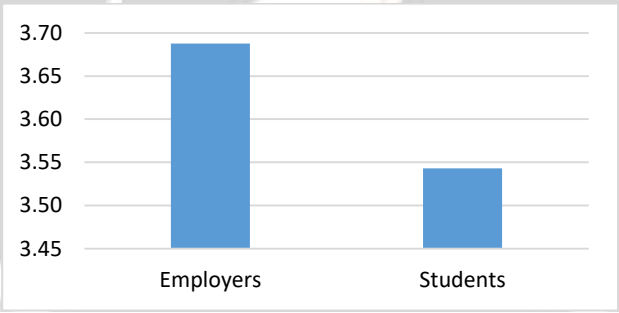

Chart 2: Level of difference in mean scores of competences assessed by 2 subjects

Looking at the chart, it can be seen that the difference between the requirements of the employers and the level of achievement of the final year student is 0.15. Thus, it can be said that the IT application skills that students have accumulated have not yet met the needs of employers. While employers have high requirements for skills related to the use of new technologies in agriculture, communication skills, product promotion and consumption, the level of achievement of students is quite low. In addition to the reasons stemming from the teachers and learners, this result is also influenced by the current training program. In the opinion of students, they have not been exposed to new technologies during the training process. The level of difference between the two survey subjects poses a problem that TUAF needs to have a plan to solve in a timely manner in order to create training products that meet the urgent need for highly skillful human resources in the field of agriculture today.

CONCLUSIONS

In the current 4.0 revolution, when technology is constantly developing and innovating, the assessment of the cumulative level of students' achievements and the survey of requirements from employers must be carried out on a regular and continuous basis. These are important bases for educational institutions to make timely adjustments in the process of developing training programs and innovating training methods. The process of assessing the responsiveness of IT application capacity of students at TUAF has shown inadequacies in the training program and

training content at the university. The limited access to the development trend of technology in agriculture and exploiting the advantages of technology and communication in teaching is one of the main reasons leading to this situation. In the future, we will go on evaluating the current situation of teaching and learning at TUAF to come up with specific solutions to improve the quality of Informatics training at TUAF in particular and other institutions training human resources in agriculture and forestry in Viet Nam in general.

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