Assessing Graduate Competency Fit for the Workplace: A Tracer Study Investigation in Education

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Sections Info	ABSTRACT
	Objective: Effective curriculum programs depend on how well higher education programs prepare people for jobs and how well the job market offers employment opportunities. Unfortunately, many university graduates often work in roles that do not align with what they learned in their studies. This study aims to assess the compatibility between the competencies possessed by graduates of the Information Systems Program at Surabaya State University and the expectations of employers. **Method:** A tracer study was conducted to investigate the extent to which program graduates are absorbed into the workforce. This research was conducted on alums of the Information Systems Program at Surabaya State University who graduated in 2022. The research method was an online survey with a quantitative descriptive analysis approach. **Results:** The results revealed that 25.0% of the respondents found the relevance of the Information Systems program to their jobs to be very close, 25.0% considered it close, 37.5% found it quite close, and approximately 12.5% did not find it very close. This indicates that the learning experience provided by the Information Systems program aligns well with job requirements and can be effectively implemented. **Novelty:** This research focused on aligning the competencies acquired by the Information Systems Program graduates at Surabaya State University. This focused approach on a specific program and year of graduation adds a novel perspective to the broader discourse on the effectiveness of higher education in meeting the demands of the job market.

INTRODUCTION

Education at a high level holds an essential position as a center for developing superior human resources. As the leading providers, higher education institutions have a significant role in ensuring quality student graduation. One sign of the success of quality students, as determined by the Decree of the Minister of Education and Culture Number 754/P/2020, is their success in obtaining suitable work. The quality of university study programs, especially in producing successful graduates, is closely related. One indicator of the quality of a study program is the extent to which the study program can adapt to the needs of employment and provide the human resources needed by the industrial world. If there is a good connection between the study program and the needs of the world of work, graduates will be readily accepted into the industrial world. However, many college graduates still need help finding work that suits their competencies. This causes graduates to be unable to meet industry expectations (Rivaldo & Isabella, 2023; Sabuhari et al., 2020; Vahdat, 2022).

The mismatch between the competencies taught in the study program curriculum and the needs of the world of work may be caused by a less dynamic curriculum that does not keep up with current developments. Therefore, the curriculum must continue to be developed to keep up with developments in science and technology as well as job market dynamics (Aljohani et al., 2022; Goulart et al., 2021; Gürdür Broo et al., 2021, 2022;

Ramírez-Montoya et al., 2021). This will minimize the gap between the study program curriculum and the competencies needed in the industrial/work world and overcome the imbalance between demand and availability of human resources in the world of work. The advancement of knowledge, especially in information technology and exact sciences, has led to rapid changes in the competency requirements in the job market. Therefore, higher education institutions responsible for preparing a workforce ready for employment must continuously evaluate their existing learning processes (Ahmad, 2020; Akour & Alenezi, 2022; Chan, 2023; McGunagle & Zizka, 2020). This evaluation is crucial for these institutions to minimize the gap between the competencies required by the workforce and the actual societal job market needs (Lukita et al., 2020).

In discussions concerning the quantitative correlation between the number of graduates and labor market demands, attention is not solely focused on the total number of graduates and available jobs but also the relationship between fields of study and job categories, referred to as educational relevance. The most significant concern that has arisen relates to the mismatch between the competencies possessed by graduates and the demands of the job market (Aggarwal, 2021; Ibrahim & Mat Nashir, 2022; Low et al., 2021; Pietro, 2020; Sam, 2020). In an ideal situation, education should align with the job market's needs. Relevance in education refers to the connection between educational outcomes and societal life requirements. The concept of relevance consists of two parts: internal and external. Internal relevance pertains to the consistency among curriculum components such as objectives, content, learning processes, and evaluation (Abdulrahman et al., 2020; Schmid et al., 2020; Simanjuntak et al., 2022). In other words, internal relevance concerns the alignment of the components within the curriculum. Meanwhile, external relevance refers to the compatibility between the curriculum and society's demands, needs, and developments.

To evaluate the extent to which graduates from a study program can be absorbed into the world of work, a tracking study called a tracer study can be carried out. Tracer study is a method for tracking information about the number of study program alums successfully absorbed into the world of work. A Tracer study serves as an evaluative instrument for gauging the alignment between academic institutions and the practical demands of the workforce. The tracer study results serve as a potent tool that records employment characteristics, the transition to employment, and the graduates' satisfaction levels regarding University services, the learning environment, and facilities (Palay & Garcia, 2021; Salindo & Salindo, 2023). Tracer study involves two main activities, namely tracking graduates and tracking graduate users.

At the commencement of the academic year, universities shape higher education policies based on the input derived from the circumstances, experiences, and motivations of incoming students. These factors are pivotal in influencing the implementation of education systems and management practices across various facets, such as teaching and learning methodologies, research endeavors, practical applications, workshops, laboratories, studios, and investigative processes (Shelly et al., 2021). The alum tracking study, commonly referred to as a tracer study, is a research initiative designed to monitor the post-graduation paths of former students to gain insights into their success within the professional sphere (Nudzor & Ansah, 2020; Hasibuan et al., 2022). The Tracer Study offers a comprehensive examination of job compatibility, both horizontally (across various knowledge domains) and vertically (across different educational levels) (Fenta et al., 2019), providing in-depth and detailed information on alums's career trajectories.

Conducting a tracer study enables educational institutions to evaluate the quality of educational services they provide based on assessments provided by their alums. This type of study offers several benefits to educational institutions, such as serving as an evaluative tool to enhance the quality of educational services, strengthening the relationship between graduates and the educational institution, and as a means to gauge the satisfaction of the users of these graduates (Ramaditya & Effendi, 2020). Graduates asserted that their job performance was notably enhanced by the knowledge, skills, and competencies acquired through their academic endeavors.

Alum tracking studies constitute a dynamic system that can be relied upon to gather information about graduates from a higher education institution. Tracer studies are conducted through surveys employing questionnaires to collect information. The information typically obtained from such surveys encompasses the pre-university characteristics and social backgrounds, on-campus learning activities, the transition into the professional world, job types, and competencies related to the chosen academic program. Higher education institutions, particularly academic programs, should conduct tracer studies to obtain feedback from their graduates and the users of these graduates regarding the relevance of the learning processes they have undergone (Fenton et al., 2023). Therefore, the tracer study results are significant for study programs as evaluation material for developing the curriculum to consistently meet the demands of the work/industry world (Haq et al., 2020).
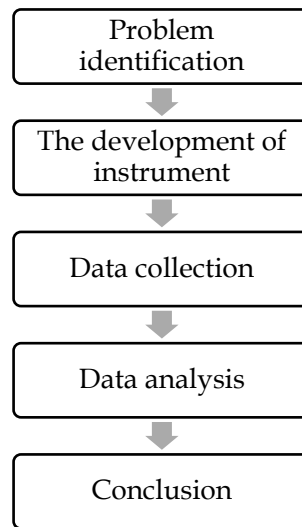
This research presents a novel approach to exploring the relevance of competencies acquired through higher education within the dynamic landscape of the job market. By employing a tracer study methodology focusing on alums, this study delves into the practical application of skills and knowledge obtained during their academic tenure. Unlike traditional assessments of graduate competency, which often rely on self-reporting or theoretical frameworks, this investigation offers a unique insight by directly tracing the trajectories of graduates in real-world employment scenarios. Through this innovative approach, the research aims to bridge the gap between educational outcomes and workplace demands, providing valuable insights for curriculum development, career services, and the overall enhancement of higher education quality.

This research aims to evaluate the suitability between the competencies of graduates of the Information Systems Study Program at Surabaya State University and the expectations of graduate users. The results of this research can provide recommendations for improving the quality of educational services in the Information Systems Study Program at Surabaya State University. Therefore, based on the background provided, the formulated problem is how well the profile of graduates from the Information Systems Program matches the careers found by graduates in the working world.

RESEARCH METHOD

This research employs a survey method with a quantitative descriptive approach. The quantitative descriptive analysis is based on the previous research. The aim is to collect and present facts about the demographics of graduates and investigate their perceptions regarding the competencies and values developed by the Information Systems Program, as well as the skills that need improvement. Respondents in this study consist of alums from the Information Systems Program at Surabaya State University who graduated in 2022. The instruments used in this research are tracer studies developed by the University Tracer Study Team. They have been revised and adapted as necessary to align with the specific needs of the Program of Study being investigated, following the tracer study

guidelines. However, this circumstance limits the research, as the author could not modify the survey instrument to the established guidelines and protocols governing tracer studies. Hence, the author refrained from conducting tests on the validity or reliability of the instrument.

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Figure 1. provides a general overview of the research activities.

The tracer study instruments used consist of two types, namely instruments for graduates and instruments for users of graduates. The graduate instruments are divided into three parts: general information about the graduates, data on graduates' employment, and evaluations of the learning or training received by the graduates. To collect graduate data, this research employs filling out the tracer study instruments available on alums.unesa.ac.id. These instruments are distributed via links sent to the email addresses of registered alums. Data analysis will encompass variables such as the time it took for graduates to secure employment, the relevance of their jobs to their program of study, and their initial salary upon employment. This analysis will demonstrate how alums' jobs align with the competencies they acquired during their studies. In the data analysis process, tools such as Microsoft Excel. In the final stage of this research, conclusions and recommendations will be drawn in alignment with the analysis of the tracer study survey results for the Information Systems Program at Surabaya State University.

RESULTS AND DISCUSSION
Results
This research aims to investigate the results of the tracer study conducted on the Bachelor's in Information Systems program graduates at Surabaya State University, specifically in the year 2022. The total number of Bachelor's in Information Systems graduates who have completed the tracer study is 37 respondents. A total of 37 graduates completed the questionnaire, likely in Figure 2.
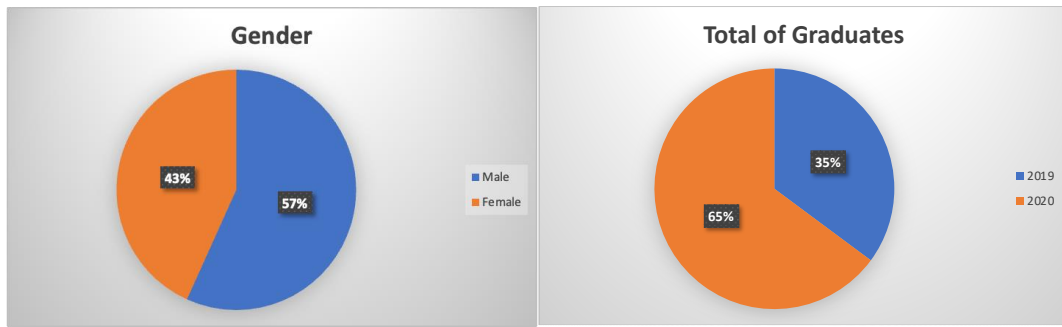
Figure 2. Profile summary of the graduates related to gender and year of graduation.

Of the 37 surveyed graduates, 24, or 64.86 percent, have been employed in companies since the data collection. In addition, four other graduates have chosen to be self-employed, citing reasons such as continuing family-owned businesses or pursuing their ventures. Nine (9) respondents, or 24.32 percent, are currently unemployed, with two respondents deciding not to seek employment due to furthering their studies. The remaining seven respondents, or 18.9 percent, have never been employed since graduation due to a lack of job opportunities matching their expertise and work experience.
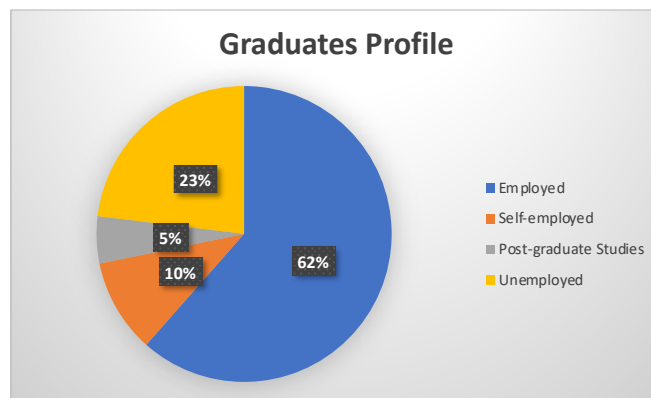
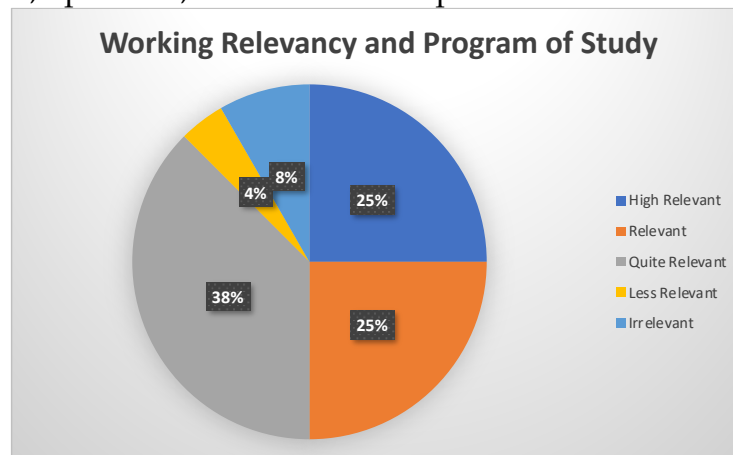**Figure 3**. Graduate profile.

Currently, graduates of the Information Systems program at Unesa are employed in various companies, including manufacturing, telecommunications, import-export trade, banks, hospitals, government offices, and educational institutions. Graduates of the Information Systems program at Unesa can be employed due to their information technology skills, knowledge, and work values.

Type of Company

GOVERNMENT AGENCY · PRIVATE SECTOR · STATE-OWNED ENTERPRISE · INSTITUTION · OTHERS
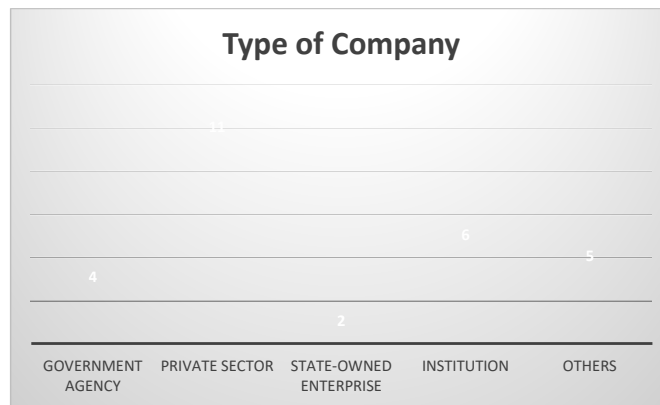
Figure 4. Graduates' workplace and first jobs after graduation.

The extent of the relevance of the program of study to the graduates' jobs is explained in Figure 4. Based on Figure 5, it is evident that the relationship between the program of study and the jobs held by most working graduates is close, amounting to 87.5 percent. The remaining jobs graduates hold are either less closely related or unrelated to the program of study. Most jobs held by graduates with a very close relationship with the program of study are positions such as programmers and systems analysts. On the other hand, jobs with a low level of relevance to the program of study include call center, administrative staff, operators, and service staff positions.

Working Relevancy and Program of Study

High Relevant · Relevant · Quite Relevant · Less Relevant · Irrelevant

25% · 25% · 38% · 4% · 8%

Figure 5. The extent of the relevance of the program of study to the graduates' jobs.

Here, we will discuss the duration of job searches for graduates and the reasons they had for accepting their jobs. The data regarding the time respondents spent searching for employment is presented in Table 1.

Table 1. The length of job search for graduates and reasons for accepting employment.

Duration	Before Graduating	After Graduating
1-2 Month(s)	2	11
3-4 Month(s)	0	3
5-6 Month(s)	3	0
7-8 Month(s)	1	2
9-10 Month(s)	0	1
>10 Month(s)	1	0

A total of 5 respondents, approximately 20.8%, began their job search 1-6 months before graduating. Meanwhile, 14 respondents, roughly 58.3%, only started looking for employment 1-6 months after graduation. The data on the time it took for respondents to secure a job is presented in Table 2.

Table 2. The time it took for respondents to secure a job.

Duration	Frequency	Percentage
<= 6 Month(s)	15	62.5%
> 6 Month(s)	9	37.5%

Table 2 shows that most respondents, approximately 62.5%, secured their jobs within six months or less after graduation. The remaining 37.5% obtained employment more than six months after graduating. Recent graduates eagerly anticipate income, just like anyone else, which is why many start job hunting immediately after graduating.

Table 3. Monthly income.

Monthly Income	Frequency	Percentage
Under Rp 2,000,000	2	8.3%
Rp 2,000,000-Rp 4,000,000	8	33.3%
Rp 4,000,000-Rp 6,000,000	13	54.1%
Above Rp 6,000,000	1	4.1%

In this study, as indicated in the table above, the monthly gross income of employed graduates ranges from Rp 4,000,000 to Rp 6,000,000, with the majority of respondents at 54.1%, followed by Rp 2,000,000 to Rp 4,000,000 with 33.3% of respondents, and below Rp 2,000,000 with 8.3% of respondents. The fewest respondents, only 4.1%, receive a monthly gross income exceeding Rp 6,000,000. This is a promising start for most respondents to earn more than Rp 4,000,000 per month in professional, technical, or supervisory positions, and some administrative roles also fall within the same salary range. Very few graduates still earn more than Rp 6,000,000 per month, primarily because they have not been in the workforce for an extended period. The Significance of Teaching Methodology in the Academic Program, as Perceived by Graduates, and Its Profound Utility in Their Initial Post-Graduation Employment. In this study, we also examine the extent to which the emphasis is placed on teaching methodologies applied within the Information Systems Program at Unesa. Various teaching methods are implemented within the Information Systems Program, including lectures, demonstrations, participation in research projects, internships, practical work, fieldwork, and discussions. The teaching methods that graduates have assessed as highly beneficial for their current jobs are presented in Table 4.

Table 4. The significance of teaching methodology in the academic program, as perceived by graduates, and its profound utility in their initial post-graduation employment.

Learning Method	Benefit					Total Score (Score multiplied by frequency)
	Not at all (1)	Less (2)	Sufficient (3)	Large (4)	Very Large (5)	
Lecture	0	1	6	9	8	96

Learning Method	Benefit					Total Score (Score multiplied by frequency)
	Not at all (1)	Less (2)	Sufficient (3)	Large (4)	Very Large (5)	
Demonstration	1	4	2	10	7	90
Research Participation	0	2	7	9	6	91
Internship	0	1	4	10	9	99
Practicum	0	4	2	9	9	95
Fieldwork	0	3	2	12	7	95
Discussion	0	2	6	7	9	95

Table 4 shows that the method plays the most significant role and provides excellent benefits to graduates' current jobs. Two outcomes were obtained in the analysis of graduates' competencies: the score of competencies possessed by graduates at the time of graduation and the score of competencies highly beneficial in their first jobs. These results are presented in Table 5.

Table 5. The competencies possessed by graduates compared to those highly beneficial in their first jobs after graduation.

Expertise achieved upon graduation	Total Score (Score multiplied by frequency)	Job-relevant competencies	Total Score (Score multiplied by frequency)
Problem-solving	122	Information technology skills	132
Teamwork	121	Analytical skills	131
Adaptability	120	Discipline-specific knowledge	130
Integrity	119	Teamwork	129
Time management	118	Problem-solving	128
Loyalty	118	Communication	127
Leadership	118	Self-development	127
Tolerance	117	Critical thinking	127
Working under pressure	116	Leadership	127
Initiative	116	Integrity	126
Information technology skills	115	Project Management	126
Analytical skills	115	Working under pressure	125
Self-motivation	115	Time management	125
Report writing skills	115	Loyalty	125
Self-development	114	Learning ability	124
Learning ability	114	Tolerance	124
Communication	113	Adaptability	124
Discipline-specific knowledge	113	Initiative	123
Critical thinking	113	Presentation	123
Project Management	113	Self-motivation	122
Presentation	113	Report writing skills	120
Responsibility	112	Responsibility	119
General knowledge	111	Cross-disciplinary knowledge	118
Cross-disciplinary knowledge	108	General knowledge	117

Expertise achieved upon graduation	Total Score (Score multiplied by frequency)	Job-relevant competencies	Total Score (Score multiplied by frequency)
English language proficiency	101	English language proficiency	113

Based on the results of multiplying scores by frequencies for the competencies possessed by graduates of the Information Systems program, problem-solving skills are the most widely acquired skills by graduates at the time of their graduation, with a total score of 122. This is followed by teamwork skills with a score of 121 and adaptability skills with a score of 120. These three competencies are the skills most acquired by graduates at the time of their graduation. However, the core skills that graduates of the Information Systems program should ideally possess, such as information technology expertise, discipline-specific knowledge in Information Systems, and project management, do not rank as competencies with high scores, scoring 115, 113, and 113, respectively.In contrast, based on multiplying scores by frequencies for the competencies considered highly important by graduates of the Information Systems program, information technology expertise is rated as the most valuable competency in graduates' jobs, with a score of 132. The following competencies perceived as highly valuable in their jobs are analytical skills and competence in the discipline-specific knowledge of the Information Systems program, scoring 131 and 130, respectively.

Discussion
The analysis of graduates' competencies yielded two distinct outcomes: the scores reflecting the competencies acquired at graduation and those indicating the competencies considered highly beneficial in their initial jobs. These dual perspectives offer valuable insights into the alignment between the educational approach and the practical demands of the workforce. The emphasis on the internship teaching method as the most significant contributor suggests the efficacy of hands-on, practical experiences in preparing graduates for the challenges of their careers. Internships provide hands-on experience that helps students apply theoretical knowledge from their academic studies to real-world professional settings. In practical terms, the correlation between academic education and workplace training has evolved in response to the demand from both employers and students to augment the highly theoretical curriculum of higher education institutions with practical applicability. The two sets of competency scores provide a nuanced understanding of the graduates' preparedness for the workforce. The competencies possessed at the time of graduation lay the foundation, while the competencies highly beneficial in their first jobs reflect the practical relevance of the educational approach. Employers appreciate an education that equips learners for future employment, improving their career skills and readiness for the labor market.

These findings underscore the importance of incorporating internship experiences into academic programs, emphasizing the substantial impact of hands-on learning in shaping graduates' competencies. As educational institutions refine their teaching methods, prioritizing practical experiences through internships can significantly enhance graduates' readiness for the dynamic challenges of their professional journeys (Ranabahu et al., 2020; Baird & Mollen, 2023). Graduates do not possess the competencies that should be highly needed in their jobs, including information technology expertise. Information technology expertise is considered highly valuable in their jobs because the

majority of respondents, 87.5%, have jobs closely related to the Information Systems program. However, graduates still need to possess this expertise truly. The mismatch we observed hints at a possible disconnect between what the program teaches and what the job market needs. While graduates show strong abilities in soft skills, like communication and teamwork, there is room for improvement in the technical skills required for Information Systems professions. It highlights the importance of reassessing the curriculum to ensure a balanced emphasis on soft skills and technical proficiency. Focusing more on technical aspects could better prepare graduates for the specific requirements of the job market in Information Systems, thereby improving their overall readiness for success in their professional pursuits.

Furthermore, analytical skills and mastery of the discipline-specific knowledge of the Information Systems program are essential for graduates working in roles closely connected to the program, such as programmers and systems analysts. These skills are used to address IT-related issues based on the information and knowledge they possess. However, the results need to reflect the competencies possessed by the graduates in these areas. Curriculum improvements should address this gap, emphasizing technical skills that align with industry needs. Collaboration with industry partners and ongoing feedback mechanisms will be crucial for adapting the program to better prepare graduates for successful careers in information systems. Additionally, incorporating industry-relevant projects and internships into the curriculum can provide graduates with hands-on experiences that directly align with the demands of roles like programming and systems analysis. Regularly updating the curriculum to reflect emerging trends and technologies in the Information Systems field is also advised. By implementing these recommendations, the program can better ensure that graduates possess the necessary analytical skills and discipline-specific knowledge to excel in their professional roles (Albina & Sumagaysay, 2020).

Lastly, English language skills are considered the least useful and the least possessed by graduates among the listed indicators. This is because the majority of graduates work in domestic companies. English is not the primary skill, but it is essential as a supplementary skill for Indonesian IT specialists (Dewi, 2022). However, it is worth noting that English language skills were included in the old curriculum of the Information Systems program. Therefore, removing the English language from the new curriculum of the Information Systems program is recommended.

CONCLUSION
Fundamental Finding: Several conclusions could be drawn from the alum tracer study, including (1) Learning experience provided by the Information Systems program aligns well with job requirements and can be effectively implemented; (2) Graduates of the Information Systems program most commonly possess three competencies: Problem-solving skills, teamwork, and adaptability in the workplace. However, this contradicts the assessment of precious competencies in their jobs, including information technology expertise, analytical skills, and knowledge of information systems. (3) There is still a need to strengthen skills and competencies to make the curricular offerings more relevant to the current jobs of alums, especially in information technology expertise, analytical skills, and knowledge in the information systems discipline. **Implication**: The research underscores the critical need for higher education programs to align with the demands of the job market, ensuring that graduates are well-prepared for employment opportunities. Based on the tracer study of Information Systems Program alums from

Surabaya State University in 2022, the findings suggest that there is room for improvement in the alignment between the program's curriculum and employer expectations. The identified percentage variations in perceived relevance to jobs provide valuable insights for curriculum development and adjustments. By emphasizing the compatibility between graduate competencies and job requirements, the study implies the importance of refining educational approaches to enhance the effectiveness of preparing students for successful integration into the workforce. This has broader implications for the overall improvement of higher education programs in meeting the evolving needs of the job market and ensuring a more seamless transition for graduates from academia to employment. **Limitations:** (1) The study's focus on specific skills in the Information Systems program, such as information technology expertise and communication skills, may overlook other critical aspects of the curriculum that contribute to graduates' employability; (2) The study's specificity to Information Systems program alums from Surabaya State University in 2022 may limit the generalizability of the findings to other programs or institutions. Different fields of study and universities may exhibit variations in curriculum structure and regional job market dynamics. **Future Research :** (1) Review the curriculum offered in the Information Systems program to ensure the inclusion of more skills and competencies, explicitly focusing on information technology expertise, analytical skills, discipline-specific knowledge in information systems, and communication skills; (2) Reevaluate the inclusion of English language competency in the curriculum, as it is perceived as less valuable in graduates' jobs, given that the majority of graduates work in domestic companies; (3) Tracer studies should be supported by institutions to continuously monitor the progress of graduates and identify further initiatives in the curriculum and teaching methods to enhance the productivity and employability of graduates; (4) Expanding collaborations with private companies that can provide employment opportunities for Information Systems program graduates. This should be an ongoing process to maintain the graduates' high employability rate.

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