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Graduate Employment Outcomes and Competency Alignment in Achieving SDG 4: An Empirical Study of Information Systems Graduates

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A B S T R A C T
The alignment between higher education outcomes and labor market demand has become an important indikator of educational quality and institutional ccountability. This study examine the relationship between graduate employment and competencies and their alignment to SDGs 4: Quality Education, focusing on academic relevance, job alignment, and employability skills. Using descriptive quantitative approach, data were collected from 91 graduates of Information Systems Study Program at Universitas Negeri Surabaya thourh tracer study system. The findings show that 71% of the graduates are employed and 7% are self-employed indicating strong adaptability to labor market needs. Most graduates work in relevant field such as System Developers and IT Consultants. Key strength include ethics, teamwork, and IT skills, while communication, english proficiency, and self development require improvement. The results highligt the importance of industry-responsive curricula and stronger university-industry collaboration to support sustainable education outcomes.

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INTRODUCTION

The linkage between higher education outcomes and labor market needs has become a central issue in assessing the effectiveness and quality of higher education globally. Universities not only have the role of imparting knowledge but also graduates who are skilled to meet the demands of the contemporary industry (Knight & Yorke, 2003; Succi & Canovi, 2020). In this context, employability serves as a key indicator of higher education success, reflecting the extent to which graduates possess the skills, attitudes, and attributes necessary to obtain and sustain meaningful employment (Tomlinson, 2017; Tran, 2022).

One of the most widely recognized approaches to measuring the relevance between education and the labor market is the graduate tracer study. This method tracks alumni transitions from education to employment and provides empirical insights into the effectiveness of curricula, adequacy of teaching methods, and the alignment of graduate competencies with labor market requirements (Schomburg, 2016; Teichler, 2003). Educational institutions can receive tangible inputs of academic programs effectiveness in training graduates to meet professional challenges in the digital world through tracer studies (OECD, 2022; Handajani & Takdir Jumaidi, 2020).

In Indonesia, tracer studies have been integrated as part of the higher education quality assurance system. However, their implementation often remains descriptive, limited to collecting data such as employment status, job-search duration, or field-of-study relevance. The results are rarely utilized strategically as a foundation for curriculum development and teaching quality enhancement (Nugraheni et al., 2020). In fact, tracer study data should serve as a vital basis for **evidence-based policy**, helping to evaluate the effectiveness of higher education in producing competitive and adaptable graduates (Schomburg, 2016).

Moreover, tracer studies are strategically promising to sustain the global agenda of sustainable development by being associated with the Sustainable Development Goals (SDGs) and SDG 4: Quality Education in particular. SDG 4 focuses on the need of inclusive, equitable, and high-quality education as basis to improve competencies and work-related skills that would be applicable in economic and social development (United Nations, 2023). The interconnection of the findings of tracer studies in the SDG 4 framework offers a holistic view of assessing the quality of higher education; not merely regarding graduate employability, but, indeed, the role of higher education in sustainable learning and society as a whole (Andrews & Higson, 2008; Handajani & Takdir Jumaidi, 2020).

In this context, the Information Systems Study Program at Universitas Negeri Surabaya (Unesa) conducted a tracer study in 2024 to analyze the alignment between graduate competencies and industry needs. The initial findings revealed that approximately 85% of alumni were employed in fields relevant to their studies, with the majority working as system developers and system analysts. While these results reflect good curriculum relevance, the study also identified gaps in soft skills, particularly in communication, English

proficiency, and personal development—competencies that have become increasingly critical in the global labor market (Succi & Canovi, 2020).

Therefore, this study aims to expand the function of tracer studies from merely serving as a mapping tool for employment outcomes into a strategic instrument for evaluating higher education's contribution to sustainable development. This approach emphasizes the importance of analyzing the relationship between graduate employment and expected competencies, as well as their connection to the achievement of SDG 4 (Quality Education). Accordingly, this research is expected to provide both empirical and conceptual insights into how higher education can enhance its accountability to industry needs while simultaneously supporting the sustainable education agenda at national and global levels. This study formulates two key research questions: 1) How is the relationship between graduates' employment outcomes and the competencies expected from higher education? 2) How is the relationship between graduates' employment outcomes and the implementation of SDG 4 (Quality Education)? The findings of this research are expected to make a strategic contribution to curriculum development, data-driven higher education policy formulation, and the strengthening of tracer studies as a continuous evaluation tool focused on quality and relevance in education.

LITERATURE REVIEW

Tracer study research has demonstrated that, this tool is important in assessing the effectiveness of the curriculum and the relevance of higher education to the labor market needs. Tracer studies have the capacity to reveal the disconnect between academic and professional needs, and in the case of (Schomburg, 2016), their results serve as the basis for the development of the evidence-based policy of education. In the same manner, (OECD, 2022) pays attention to the importance of tracer studies in increasing the transparency of educational quality and institutional responsibility based on graduate employability data.

In a wider sense of the employability studies, (Knight & Yorke, 2003) identify employability as the outcome of knowledge, skills, and attitudes acquired during higher education. (Tomlinson, 2017) builds on this idea by introducing the concept of graduate capital that puts more emphasis on social and cultural capital as elements that encourage career success. Cross-country research, including that by (Andrews & Higson, 2008), shows that one of the enduring problems in higher education is that it is still difficult to build on the soft skills and responsiveness that are yet to be well accommodated in formal education.

In the meantime, the adaptation of tracer study findings to Sustainable Development Goal 4 (SDG 4) is a concept that is relatively recent in the scholarly community. According to the (United Nations, 2023) quality education includes equitable access, skill development, and professional sustenance. Also, (Handajani & Takdir Jumaidi, 2020) stress the necessity of applying the results of tracer studies as indicators of the contribution of higher education to sustainable

development as opposed to statistical data on the level of employment of graduates.

METHODOLOGY

This study employed a survey method with a descriptive quantitative approach, aimed at illustrating the trends and perceptions of alumni regarding job relevance, graduate competencies, and their alignment with Sustainable Development Goal 4 (Quality Education). The descriptive approach was chosen as it is appropriate for analyzing existing data from the tracer study system without conducting statistical hypothesis testing.

RESEARCH RESULT AND DISCUSSION

From a total of 91 graduates in 2024, 71% were employed, either full-time or part-time, indicating a high level of employability and adaptability to labor market dynamics. Meanwhile, 20% of graduates were actively seeking employment, and 7% pursued entrepreneurial paths, reflecting a strong sense of independence and innovation in their career development. Additionally, 2% were not yet employed due to personal reasons. Overall, this profile illustrates that most graduates are career-oriented and possess strong potential for professional growth and readiness to meet modern workforce demands.

This was found in the job mapping results which showed that 38 percent of the graduates work as System Developers showing that this is the most relevant area to the core competencies of the Information Systems Study Program. The remaining 36 percent work in the category of Other, which includes the use of digital literacy as IT staff, technicians, and non-IT jobs. Furthermore, 36% are employed in the “Other” category, encompassing roles such as IT staff, technicians, and non-IT positions that still utilize digital literacy. Meanwhile, 20% work as IT Consultants and 6% as IS Analysts. No graduates were found in the categories of Database Administrator or Project Manager, suggesting a potential area for curriculum enhancement. The graduates are also absorbed in various professions, and the top concentration is on the system development and technical jobs which indicates that the technical skills and work experience they acquire during their studies are directly beneficial in their entry into the work force. This conclusion aligns with (Finch et al., 2013) and supported by (Jackson, 2016) and (OECD, 2022) who highlight the fact that one of the primary factors of graduate employability in the information technology sector is the combination of hard skills with the experience of an internship or job.

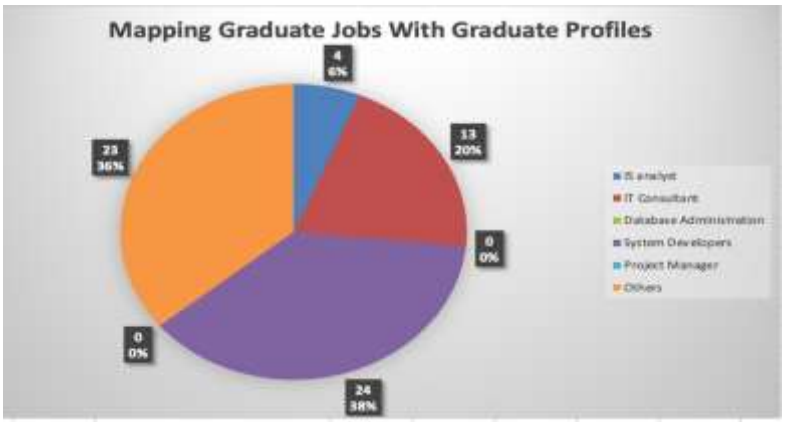

Figure 1. Mapping Graduate Jobs with Graduate Profiles

Moreover, considering the transition to the labor market, among 91 respondents, they were found to be actively seeking a job 80 graduates (87.9%), whereas 11 graduates (12.1%), will not be searching their jobs as they were already employed prior to graduation, were an entrepreneur or had other reasons. Of the 45% of the employed individuals who would initiate their job search, the proportion of them who started their job search before graduation would be 27 graduates in 0–6 months and 9 graduates in 712 months before graduation. In the meantime, 55 percent of the students began their job search upon graduation (34 graduates within 0-6 months of graduation and 10 graduates within 7-12 months of graduation). The results show that the majority of the graduates exhibited high career readiness and proactive intentions towards the employment opportunity, which is viewed as the main variable of graduate employability and career adaptability (Tomlinson, 2017; Tran, 2022).

Table 1. Time For Graduate Looking for Jobs

Time	After Graduate	Before Graduate
0 - 6 Months	27	34
7 - 12 Months	9	10
13 - 18 Months	0	0
19 - 24 Months	0	0

The correlation between career readiness and the economic consequences of graduates may be seen in terms of data on income distribution (Table 2). According to the analysis, the average starting salary of graduates was some IDR 4,375,033, that is approximately 1.2 times the Provincial Minimum Wage (UMP) of East Java. The income distribution reveals that, 54 percent of the graduates earned IDR 2-6 million, 6% earned IDR 6-8 million, and 3% earned IDR 10 million and above with 3% earning lower than IDR 2 million. Graduates are now able to earn competitive first-time wages, which is in line with the (OECD, 2022) report that indicated that digital aptitude and adaptive skills are directly correlated with higher starting wages among graduates of higher education. The income level differences also indicate the influence of different abilities and job areas, wherein adaptive skills and digital literacy will highly affect the wage levels (Alam et al., 2025; Holland, 2021). This trend in income shows that the Information Systems Study Program graduates have been successfully integrated into the job market

where they have secured remunerated packages that are competitive and in line with the region industry standards. The acquired competencies at higher education not only affect employment but also the economic outcomes, which is a very important measure of success in higher education (UNESCO, 2023).

Table 2. Graduate Monthly Salary

Mothly Salary	Total	Persentase
< Rp 2.000.000	2	3%
Rp 2000001 - Rp 4000000	34	54%
Rp 4.000.001 - Rp 6000000	21	33%
Rp 6.000.001 - Rp 8.000.000	4	6%
Rp 8.000.001 - Rp 10.000.000	0	0%
> Rp 10.000.000	2	3%

Table 3. Benefit Learning Method from Graduate

Learning Method	Benefit					
	Very Large (5)	Large(4)	Fairly Large (3)	Less Large (2)	Not at All (1)	Total Score (Multiplying scores by frequency)
Demonstration	7	12	30	24	14	235
Participation in research projects	6	11	21	23	26	209
Internship	14	7	5	25	36	199
Practical Work	12	7	24	24	20	228
Field Work	10	5	15	23	34	195
Discussion	11	11	19	28	18	230

According to the evaluation of different learning methods carried out by graduates (Table 3) on the Information Systems Study Program, it was noted that the various methods had varying degrees of perceived usefulness. The demonstration method scored the most (235) meaning that this method was taken to be the most efficient in the conceptual understanding. The second-ranked method was the discussion method with the score of 230, which implied that the classroom communication and the exchange of ideas contributed to the understanding considerably. Moreover, the practicum approach achieved 228 points, which means that experience is still one of the most useful things about education. Involvement in research projects (score 209) and in internships (score 199) were also seen to be helpful but not so effective as the main instructional strategies. In the meantime, the fieldwork was the lowest rated (195), which suggests that a portion of the graduates felt that its advantages were somewhat insignificant relative to other practices. These results imply that experiential methods of learning, including demonstrations, discussions, and practicums, are essential in increasing career preparedness and graduate employability (Awadhiya, 2025; Tran, 2022).

Table 4. Graduate Competencies Required for Work

Competence	Very High (5)	High (4)	Fair (3)	Low (2)	Very Low (1)	Total Score (Multiplying scores by frequency)
Ethics	69	16	2	0	0	415
Expertise by Field of Study	37	35	13	2	0	368
English	17	31	30	7	2	315
IT Utilization	48	33	6	0	0	390
Team Work	57	26	4	0	0	401

Table 5. Graduate Mastered Competencies

Competence	Very High (5)	High (4)	Fair (3)	Low (2)	Very Low (1)	Total Score (Multiplying scores by frequency)
Ethics	61	23	3	0	0	406
Expertise by Field of Study	24	46	14	3	0	352
English	7	28	43	9	0	294
IT Utilization	40	40	7	0	0	381
Team Work	37	39	10	1	0	373

Moreover, the competency gap analysis between industry demands and graduate capabilities offers tangible information in the curriculum evaluation and program development in the future. Ethics was ranked highest in terms of industry requirements (415) and then was Teamwork (401) and Information Technology Utilization (390). These results show that the labor market places a lot of value on integrity, teamwork, and technological skills as the key to career success. In the meantime, English Language Proficiency scored the lowest (315), which indicates that, at present, even though it is still relevant, the skills of the foreign language are not a key priority in the majority of job areas. When it comes to self-assessed competencies of the graduates, Ethics was rated the top choice (406), then there was Information Technology Utilization (381), then there was Teamwork (373). Instead, the Field-Specific Expertise (352) and English Language Proficiency (294) have lower ratings. These findings indicate that graduates have good ethical and team-oriented backgrounds, yet they have significant lapses in technical and language skills.

The given gap highlights the significance of industry-focused curriculum modifications (Handajani & Takdir Jumaidi, 2020) greater exposure to the international environment to make graduates internationally employable (Tushar & Sooraksa, 2023). It is also important to strengthen the collaboration between the university and industry by using work-integrated learning to bridge the gap between the skills (Awadhiya, 2025; Tran, 2022). Besides, teamwork, professional integrity, and digital literacy are now part of the global labor market competencies (OECD, 2022). The emerging professional identity in the course of higher education is an important concern towards improving the employability and flexibility in the contemporary labor market (Jackson, 2016).

The results of the competency gaps are further corroborated by discussing the applicability of the employment sectors of the graduates with respect to the academic background, in a bid to determine the degree to which the academic competencies are utilized at the place of work as per SDGs Indicator 4.1. The findings indicate that most graduates work in areas which are related to their studies. In particular, 33% of the respondents gave responses of Highly Relevant and another 33% gave responses of Relevant amounting to 66% of graduates holding jobs that are directly related to their academic competencies. Also, 26% were found to be moderately relevant to their job, with only 8% of them being less relevant to their job or not relevant at all. Such relevance is a positive sign that the curriculum of the study program has been successful in connecting academic and professional needs, and this point corresponds to SDG 4 concept of skills alignment and labor-education coherence (UNESCO, 2023).

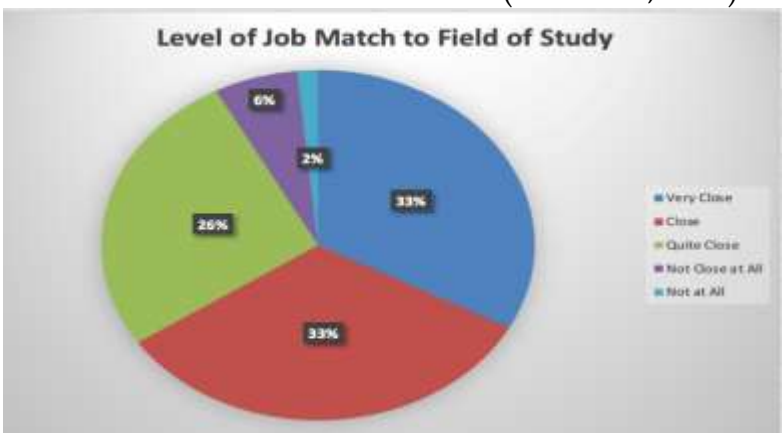

Figure 2. Level Job Match to Field Study

The analysis of job relevance is followed by a subsequent step devoted to the consideration of particular competencies that define the success of graduates in contemporary labor market, which is in line with SDGs Indicator 4.2. Evaluation of this indicator comprises seven competency attributes namely: (1) ethics, (2) field-specific expertise, (3) English proficiency, (4) information technology utilization, (5) communication, (6) teamwork, and (7) self-development as shown in Table 6 and Figure 3. According to the survey findings, the three competencies that are most demanded include ethics (score 4.77), communication (score 4.60), and information technology utilization (score 4.48). In the meantime, ethics (4.66), information technology utilization (4.37) and teamwork (4.32) are the three competencies mastered the most by graduates.

There is also noticeable competency gap through communication which is the most demanded competency in the workplace, yet it is not adequately mastered among graduates. Communication (0.32), self-development (0.31), and English proficiency (0.24) have the greatest gap values. The existing gap implies that interpersonal and cross-cultural skills in communication are the areas that still need improvement to improve the quality of employability among graduates (Jackson, 2016; Succi & Canovi, 2020). Thus, practice-based and collaborative learning strategies ought to be incorporated in the study programs to enhance communication competence and professional flexibility among the students (Tran, 2022).

Table 6. Application of competencies acquired during college in current work

	Ethics	Expertise by Field of Study	English	IT Utilization	Communication	Team Work	Self Development
Required	4,770115	4,229885057	3,62069	4,482759	4,609195	4,54023	4,137931
Mastered	4,666667	4,045977011	3,37931	4,37931	4,287356	4,321839	3,827586
	0,103448	0,183908046	0,241379	0,103448	0,321839	0,218391	0,310345

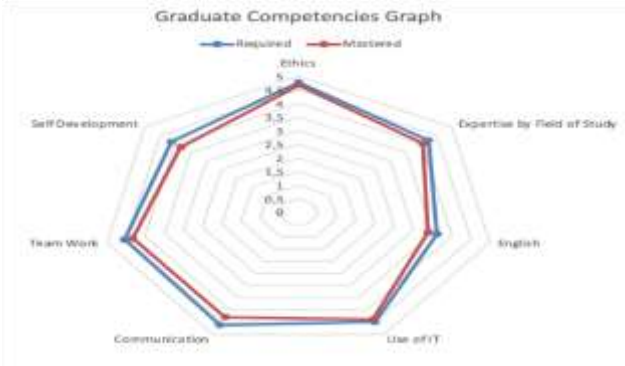

Figure 3. Level Job Match to Field Study

Along with competency and job relevance, it is also imperative to investigate the level of how educational attainment of graduates matches the job requirements, as an indicator of SDGs 4.3. The analysis has revealed that 83% of the graduates felt that the degree that they have (Under Graduate Degree) suited their current occupation needs, and in some cases, the analysis revealed that more education is necessary and, in some cases, less is necessary because of the position they held. Those results indicate a great correspondence between educational levels and labour market requirements, which shows the efficacy of higher education in equipping graduates with the relevant and competitive workers in the labour market. This finding aligns with the (UNESCO, 2023) and (OECD, 2022) reports since they highlight the need to balance higher education attainment, labor requirements, and access to affordable, high-quality education. Moreover, the network of collaboration between universities and industry and practice-driven curriculums are mentioned as the primary reasons to make sure that educational results remain consistent over time and meet the requirements of the changing job market (Khalid et al., 2025; Tran, 2022).

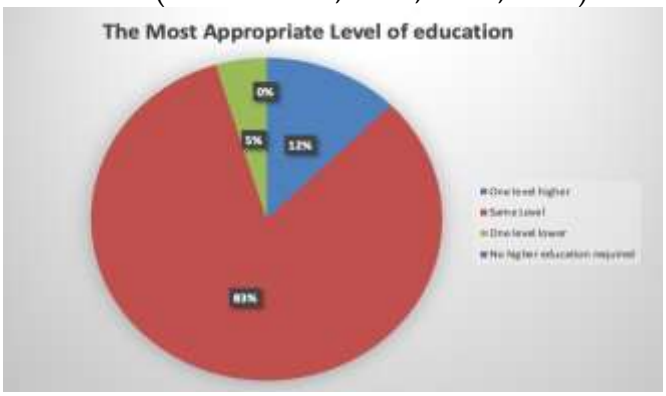

Figure 4. The Most Appropriate Level of Education

Moreover, the correlation between the tracer results and SDGs Indicator 4.4 is also noticed in the profile of graduates because 7% of graduates majored in entrepreneurship. The fact that this is the case shows that some of the graduates are not just absorbed into the formal labor market but also exhibit flexibility and creativity in the provision of self-employment. In the meantime, most other graduates used digital, analytical, and collaborative skills gained in the course of studies in their practice. This situation highlights the importance of higher education in providing the relevant skills to students to work in a decent job and to be an entrepreneur, which is highlighted in SDG 4.4 (OECD, 2022).

Comprehensively, the results indicate that the correlation between the employment and the target skills of graduates correlates with the concepts of contemporary employability and the larger SDGs 4 (Quality Education) targets. The applicability of professional disciplines, the correctness of educational stages and the meeting of competences altogether demonstrate how higher education can make graduates flexible, moral and competitive in the world market.

CONCLUSIONS AND RECOMMENDATIONS

The results of the present research approve the strong correlation between the employment of graduates and desired competencies. Most Information Systems Study Program, Universitas Negeri Surabaya, graduates had been employed (71%), and 7% were self-employed (indicating that graduates are quite flexible to both formal labour market processes and self-employment). The majority of the graduates worked in areas that were relevant to their studies especially as System Developers and IT Consultants and this makes it clear that the technical skills that students acquire through the curriculum are highly relevant to the demands of the current digital industry. The competency analysis has also shown ethics, teamwork and information technology proficiency to be the greatest strength of the graduates and improvement is still needed in communication, English proficiency and self development. These results suggest the necessity of industry-sensitive curriculum changes and better university-industry partnerships to improve the skills in soft skills and general employability of graduates.

The connection with SDGs 4 (Quality Education) is manifested in four major indicators. Under the Indicator 4.1, there is high level of applicability of the field of study done by the graduates and what they are currently doing in their job. The indicator 4.2 demonstrates that, in their work, graduates use both non-technical and technical competencies. According to Indicator 4.3, the majority of graduates feel that their bachelor's degree (S1) would suit the job needs. In the meantime, Indicator 4.4 provides the focus on the entrepreneurial abilities and digital skills of the graduates, and this factor helps to attain the decent and sustainable employment. All in all, this paper confirms that higher education is a dual purpose, i.e. not only it is a source of work-ready graduates, but also it is a source of SDGs 4 implementation as an improved quality, relevance and sustainability of education. The tracer study has already been a strategic tool of assessing the competency alignment, curriculum performance and the

contribution of higher education in developing adaptive, ethical and globally competitive human resources.

Based on these findings, several recommendations can be proposed. First, higher education institution should strengthen practice-oriented learning approaches, such as internship, industry projects, and collaborative learning, to enhance students' communication and professional skills. Second, integrating English language development and international exposure into the curriculum is essential to improve graduates' global competitiveness. Third, Universities should intensify collaboration with industry partners to ensure that the curriculum content remains aligned rapidly evolving technological and labor market demands. Finally, tracer study results should be systematically utilized as evidence-based input for continuous curriculum improvement and educational policy development to support sustainable higher education outcomes.

ADVANCED RESEARCH

This study has several limitations. First, the research relied on cross-sectional data from graduates of the Information Systems Study Program at Universitas Negeri Surabaya, which may limit the generalizability of the findings to other disciplines or institutions. Second, the analysis mainly focused on the alignment between employment outcomes and graduate competencies without considering other contextual factors such as institutional support or labor market dynamics. Future research is recommended to employ longitudinal approaches and include broader samples from different universities or study programs to provide a more comprehensive understanding of graduate employability and competency alignment in higher education.

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