PenKoMi Journal: Education & Economic Studies

Journal Homepage: http://jurnal.stkipbima.ac.id/index.php/PK/index

RELEVANCE OF COMPETENCIES OF ECONOMIC EDUCATION GRADUATES IN THE ERA OF INDUSTRY 4.0: *TRACER STUDY* AND STAKEHOLDER PERSPECTIVES

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Info Article

Keywords:
Competence, Graduates, Economic Education

Abstract

The rapid development of the Industry 4.0 era demands that university graduates have competencies aligned with the needs of an increasingly dynamic and technology-based workforce. This study aims to analyze the relevance of the competencies of graduates of the Economics Education Undergraduate Program at Makassar State University for the 2015–2024 period from a tracer study and stakeholder perspective. The study used a quantitative descriptive approach involving 318 alumni and 15 stakeholders, including school principals. Data were collected through a structured questionnaire and analyzed using descriptive statistics and gap analysis. The results showed that the graduates' employment rate was relatively high and supported by practical and soft skills relevant to the demands of Industry 4.0. These findings emphasize the importance of aligning the curriculum with industry needs, enhancing practice-based learning, and strengthening collaboration with the business world and industry. This research is expected to be the basis for formulating curriculum development policies to increase the competitiveness and relevance of Economics Education graduates

I. INTRODUCTION

The massive digital transformation that has occurred over the past decade has fundamentally altered the global economic landscape. The Industry 4.0 era, characterized by the integration of cyber-physical systems, the internet of things, cloud computing, and artificial intelligence, has created a new paradigm in the world of work and education (Schwab, 2020). This shift has not only affected the manufacturing and service sectors but also has significant implications for the higher education system, particularly in preparing competent graduates to face the demands of an ever-evolving job market. In the context of economics education, this challenge is increasingly complex because the discipline of economics itself is undergoing a highly dynamic transformation in methodology and practical application (Xu et al., 2021). Higher education institutions now face a dual responsibility: maintaining a deep theoretical knowledge of economics while ensuring graduates possess technical and soft skills relevant to contemporary industry needs.

Economics education plays a strategic role in developing human resources capable of contributing to national economic development. In Indonesia, economics education study programs aim not only to produce qualified economics educators but also to produce professionals who understand global and local economic dynamics (Rahayu & Wirasti, 2021). Makassar State University (UNM), as one of the leading public universities in Eastern Indonesia, has a strategic responsibility to provide qualified economics educators and practitioners for the Sulawesi region and eastern Indonesia. UNM's undergraduate Economics Education study program has produced thousands of graduates since its inception, with a

significant increase in the number of graduates from 2015 to 2024 in line with the expansion of access to higher education in Indonesia. However, the acceleration of technological change and industry needs creates challenges for institutions to continuously adapt and ensure the relevance of their graduates to the needs of a dynamic job market.

The World Economic Forum (2020) predicts that by 2025, approximately 85 million jobs will be replaced by automation, while 97 million new roles will emerge that better fit the new division of labor between humans, machines, and algorithms. This prediction indicates that the competencies required by the job market are undergoing a fundamental shift from manual and routine skills to higher-order cognitive skills, creativity, and adaptability. For UNM Economics graduates, most of whom come from eastern Indonesia, this challenge is even more complex given the disparity in digital infrastructure and access to technology between western and eastern Indonesia (Nugroho & Wibowo, 2023). The 2015-2024 period is a crucial phase because it encompasses the transition from the pre-Industry 4.0 era to the full implementation of digital transformation, so graduates during this time span experience varying exposure to digital and technological competencies.

Recent research indicates a significant gap between the competencies possessed by university graduates and industry expectations. A study by Succi and Canovi (2020) identified that although graduates possess adequate theoretical knowledge, they often lack soft skills such as communication, teamwork, and complex problem-solving, which are critically needed in the workplace. In the context of economics education, this gap is even more striking as digital transformation has transformed the way economists and business practitioners work, moving from manual data analysis to the use of big data analytics, machine learning for economic prediction, and blockchain for financial systems (Prifti et al., 2021). Graduates of UNM's Economics Education program from 2015 to 2024 face different job market dynamics depending on their graduation year. Graduates from the early part of the program (2015-2018) entered the job market during the digital transition era, while graduates from the late part of the program (2020-2024) faced the disruption of the COVID-19 pandemic, which drastically accelerated digitalization.

The phenomenon of skills mismatch, or the mismatch between graduates' skills and industry needs, has become a serious concern in various countries. The Organization for Economic Co-operation and Development (OECD) (2021) reported that nearly one-third of workers in member countries experience a skills mismatch, either in the form of over- or under-qualification. In Indonesia, data from the Ministry of Manpower indicates that the open unemployment rate for university graduates will reach 5.6% in 2023, with one of the main factors being the mismatch between graduate competencies and job market needs (Central Bureau of Statistics, 2023). Specifically, data from the Statistics Indonesia (BPS) of South Sulawesi Province shows that the education sector absorbs approximately 12.4% of the tertiary-educated workforce, while the remainder is spread across the finance, trade, and services sectors. For UNM Economics graduates, the challenges become more complex as they compete not only for positions as economics educators in schools but also in the banking sector, microfinance institutions, business consultants, entrepreneurs, and various industries that require an understanding of applied economics.

The geographic and demographic characteristics of eastern Indonesia add a unique dimension to the competency gap analysis of UNM Economics graduates. South Sulawesi, as the primary base for UNM graduates, has an economic structure dominated by agriculture, trade, and services, with the digital economy only beginning to develop significantly since 2018 (Rahayu et al., 2023). Makassar, as the economic hub of eastern Indonesia, is experiencing rapid growth in fintech, e-commerce, and digital startups, creating both new opportunities and challenges for Economics graduates. Data from the Indonesian Fintech

Association shows that fintech penetration in Sulawesi increased 127% between 2019 and 2023, indicating a shift in the regional economic landscape that requires new competencies from Economics graduates. However, whether the UNM Economics curriculum for the 2015-2024 period is responsive to these changes remains a question that needs to be answered through empirical research.

Tracer studies, or graduate tracking studies, are important tools for identifying competency gaps and evaluating the relevance of higher education curricula. Research by Mora et al. (2020) shows that comprehensive tracer studies can provide valuable insights into graduates' transition from education to the workforce, the level of user satisfaction, and areas requiring improvement in the curriculum. UNM has conducted periodic tracer studies as mandated by the Ministry of Education, Culture, Research, and Technology as part of its internal higher education quality assurance system. However, existing tracer study data is generally aggregated at the university level and does not provide in-depth analysis specific to the Economics Education Study Program (Riyanti & Nurchayati, 2022). Furthermore, the majority of tracer studies conducted tend to focus on quantitative aspects such as graduate absorption rates and job waiting periods, while in-depth analysis of competency alignment with actual job needs, user satisfaction, and challenges faced by alumni in the workforce remains very limited.

The stakeholder perspective is crucial in understanding competency gaps holistically. Stakeholders in the context of UNM's Economics Education encompass various parties: schools in South Sulawesi and eastern Indonesia as primary users of graduates who become teachers; the banking and finance industry that employs graduates for non-teaching positions; local governments as regulators and regional education policymakers; professional associations such as the Indonesian Economists Association (ISEI) and the Indonesian Teachers Association (IGI); and the rapidly growing micro, small, and medium enterprises (MSMEs) in eastern Indonesia (Tight, 2020). Research by Jackson and Bridgstock (2021) emphasizes the importance of ongoing dialogue between educational institutions and stakeholders to ensure the curriculum remains relevant and responsive to changing industry needs. In the UNM context, local stakeholder engagement is crucial given that the majority of graduates (over 70% based on preliminary UNM tracer study data) work in Sulawesi and eastern Indonesia. Therefore, the needs and characteristics of the regional labor market must be a primary consideration in curriculum design.

Research gaps have also been identified in terms of temporal scope and methodology. Most previous studies examining economics graduates tend to use a cross-sectional approach, focusing on graduates from one or two specific years, without conducting longitudinal analyses that could identify trends in competency changes and industry needs over time (Nugroho & Wibowo, 2023). The 2015-2024 period encompasses a decade characterized by significant changes in education policy, technological developments, and labor market dynamics. Therefore, a longitudinal analysis of graduates during this period could provide a more comprehensive understanding of how the competency gap evolved and how educational institutions responded to it. Furthermore, previous studies examining the competency gap among economics graduates in Indonesia have generally been descriptive in nature and have not yet explored in depth the factors contributing to this gap and its implications for graduates' employability and career progression (Wulandari et al., 2021).

The dimensions of Industry 4.0 itself bring additional complexities that have not been widely explored in the context of UNM's Economics Education graduates. The transformations brought by Industry 4.0 are not only technological in nature, but also fundamentally change business models, organizational structures, and ways of working (Muhuri et al., 2021). In the context of economics education, this means graduates need to understand not only traditional

economic concepts such as micro-macroeconomics, accounting, and management, but also the phenomena of the digital economy, the sharing economy, cryptocurrency, fintech, and other disruptive business models that are increasingly relevant in eastern Indonesia. Research by Lase (2020) identified that higher education institutions in Indonesia still face challenges in integrating Industry 4.0 content into their curricula due to limited infrastructure, faculty competency, and resistance to change. However, in-depth studies on how this gap manifests specifically within the UNM Economics Education Study Program, how graduates from the 2015-2024 period experience and overcome this gap in their transition to the workforce, and how regional stakeholders assess the preparedness of UNM graduates compared to graduates from other universities, are still very limited.

The urgency of this research is heightened given UNM's strategic position as a barometer of higher education in eastern Indonesia and the projected growth of the region's digital economy. The McKinsey Global Institute (2023) projects that Indonesia's digital economy will reach USD 330 billion by 2030, with significant contributions from regions outside Java, including Sulawesi. The South Sulawesi Provincial Government is targeting 15% annual digital economic growth until 2030, creating thousands of new jobs requiring digital economy and entrepreneurial competencies. In this context, UNM Economics graduates have a significant opportunity to contribute not only as educators preparing a digitally literate generation, but also as practitioners in the fintech sector, digital MSME consultants, regional startup ecosystem developers, and various new roles emerging in the digital economy era. However, to capitalize on these opportunities, a clear, data-driven understanding of the current competency gaps, the factors contributing to them, and concrete strategies to bridge them is required.

This study aims to fill the identified knowledge gap by comprehensively analyzing the competency gap of UNM's Bachelor of Economics Education graduates for the 2015-2024 period in the Industry 4.0 era through a dual perspective: a tracer study involving alumni and a needs assessment involving various regional stakeholders. Specifically, this study will: (1) identify the profiles and career patterns of UNM's Bachelor of Economics Education graduates for the 2015-2024 period; (2) analyze the gap between the competencies possessed by graduates and the competencies required in the Industry 4.0 era of work; (3) identify stakeholder expectations and evaluations of graduate competencies; (4) analyze factors contributing to the competency gap; and (5) formulate recommendations for improving the relevance of the curriculum and the quality of UNM's Bachelor of Economics Education graduates. The findings of this study are expected to provide theoretical contributions in understanding the skills mismatch phenomenon in the context of economics education in eastern Indonesia, while also providing practical recommendations for the UNM Bachelor of Economics Education Study Program in designing a curriculum that is more responsive to the needs of Industry 4.0 and the characteristics of the regional labor market. In addition, this research is also expected to provide valuable input for Makassar State University as an institution, the Higher Education Service Institution (LLDikti) Region IX, and higher education policy makers in eastern Indonesia in formulating graduate competency standards that are in line with the demands of the digital economy and support regional competitiveness in the Industry 4.0 era.

II . RESEARCH METHOD

Study This use design descriptive quantitative purposeful describe in a way systematic gap competence Bachelor of Economics Education graduates from Makassar State University for the period 2015-2024 in face demands of Industry 4.0. Approach quantitative chosen For obtain numeric data that can be measured and analyzed in a way statistics about profile graduates , level absorption work , suitability competence , as well as expectation stakeholders

interests . Research descriptive This No test hypothesis but give description factual and accurate about characteristics , conditions , and phenomena gap competencies that occur (Creswell & Creswell, 2018).

Population study This is all over Bachelor of Economics Education graduates from Makassar State University for the period 2015-2024, totaling not enough more than 1,250 people based on data from part academic Faculty of Economics, UNM. The sample was determined use Slovin's formula with level 5% error , resulting in size Minimum sample of 303 respondents . Sampling technique sample using stratified random sampling with stratification based on year graduation (2015-2017, 2018-2020, 2021-2024) for ensure representation from every period different curriculum . Selection sample done in a way random from each stratum uses table random numbers for minimize selection bias .

Perspective stakeholders interests , population covers head high school /vocational school in South Sulawesi that employs UNM Economics Education graduates . Sample stakeholders interest determined using purposive sampling with criteria : (1) has employ at least 2 UNM Economics Education graduates within 5 years last ; (2) willing participate in research . Minimum sample target stakeholders interest are 20 respondents consisting of from 15 heads school . Data collection was carried out through three method For maximize the response rate, namely online survey using Google Forms which was distributed through alumni email databases, alumni WhatsApp groups , and social media. Period data collection was carried out for 1 month with periodic reminders every 2 weeks For increase participation . Before filling questionnaire , respondents given informed consent explaining objective research , data confidentiality , and volunteerism participation in accordance ethics research . The collected data coded and entered to in a Microsoft Excel database for Then processed using SPSS software version 26.

Data collected analyzed use statistics descriptive For describe characteristics and distribution variables research . Stages analysis includes : First , analysis profile respondents use distribution frequency and percentage For describe characteristics demographic (type gender , year graduation , GPA), employment status , type work , and waiting period work . The results are presented in table frequency and bar charts . Second , the analysis suitability field Work with education counted use percentage graduates who work in accordance field (*vertical match*) and level horizontal conformity based on relatedness substance work with education economy . Third , analysis level competence using mean score and standard deviation For every indicator competence Good from alumni perspective as well stakeholders interest .

III. RESULTS AND DISCUSSION

Profile Respondents Study

Study This involving 318 respondents who were alumni of the Bachelor of Economics Education program at Makassar State University for the period 2015-2024 and 85 respondents stakeholders interests . Of the 318 alumni, 198 people (62.3%) are of the same type sex women and 120 people (37.7%) were homosexual sex male . Distribution based on year graduation show that 108 respondents (34.0%) graduated in the 2015-2017 period , 112 respondents (35.2%) graduated in the 2018-2020 period , and 98 respondents (30.8%) graduated in the 2021-2024 period .

Table 1. Respondents Study

Characteristics	Category	Frequency	Percentage (%)
Gender	Woman	198	62.3
	Man	120	37.7
Graduation Year	2015–2017	108	34.0
	2018–2020	112	35.2
	2021–2024	98	30.8
Cumulative Grade Point Average (GPA)	2.51–3.00	42	13.2
	3.01–3.50	156	49.1
	3.51–4.00	112	35.2
	> 3.75	8	2.5

Reviewed from Index Performance Cumulative (GPA), majority graduate of 156 students (49.1%) had a GPA in the range of 3.01-3.50 , followed by 112 students (35.2%) with a GPA of 3.51-4.00, 42 students (13.2%) with a GPA of 2.51-3.00, and 8 students (2.5%) with a GPA above 3.75 . stakeholders interest consists of head high school /vocational school with demographic This show adequate representation from various group respondents in accordance stratification that has been set .

Status and Waiting Period Work Graduate of

Research result show that Of the 318 respondents , 287 people (90.3%) have working , 18 people (5.7%) continued study , and 13 people (4.0%) have not Work or currently look for employment . Absorption rate this 90.3% work relatively high and in line with findings of Rahayu et al. (2023) who reported that graduate of education The Indonesian economy has an employability rate above 85 %. However , it is necessary examined that level high absorption No automatic indicates suitability competence with need work .

Graduate Status	Frequency	Percentage (%)
Work	287	90.3
Continuing Studies	18	5.7
Not Working/Looking for Work	13	4.0
Total	318	100.0

Waiting period average employment of graduates is 3.8 months with standard deviation of 2.1 months . Distribution of waiting period show that 42.0% of graduates get work First in time not enough from 3 months , 35.5% got work in range 3-6 months , 16.7% require 6-12 months , and 5.8% needed time more of 12 months . Findings This A little more Good compared to research by Suryani et al. (2022) which found the average waiting period graduate of economic and business in Indonesia is 4.5 months . The difference This possibility due to the regional context of South Sulawesi which has sufficient demand tall to power educator economy along expansion school middle class in the region the .

Table 3. Waiting Period

Job Waiting Period	Frequency	Percentage (%)
< 3 months	121	42.0
3–6 months	102	35.5
6–12 months	48	16.7
> 12 months	16	5.8
Total	**287**	**100.0**

Analysis more carry on show difference in waiting period between period graduation . Graduates The 2015-2017 period had an average waiting period of 3.2 months , the 2018-2020 period was 3.9 months , and the 2021-2024 period was 4.3 months . The trend is increasing waiting periods . This can associated with impact The COVID-19 pandemic that hit in 2020-2022 caused slowdown recruitment in various sector specifically education . This is consistent with findings of Jackson and Bridgstock (2021) who reported that graduate of period pandemic face challenge more big in transition to the world of work compared to period previously .

Compliance Field of Work with Education

Of the 287 alumni who are working , 189 people (65.9%) work in the field of education as an economics teacher or accounting , 52 people (18.1%) work in the sector banking and institutions finance , 28 people (9.8%) are entrepreneurs , and 18 people (6.2%) work in other sectors such as state-owned enterprises, companies non- financial private sector , and government . The proportion graduates who work as teachers (65.9%) showed that majority graduate of Still choose career in accordance with mission main study program as printer power educator economy .

Analysis horizontal fit shows a clearer picture complex . Of the 189 graduates who work as teachers, only 142 people (75.1%) stated that that substance work they fit perfectly with education received , while 47 people (24.9%) stated Enough according to findings This indicates that although working in the field education economy , partly graduate of Still feel there is a gap between knowledge gained during studying with demands practical teaching at school . Phenomenon similar found by Hidayat and Patmanthara (2021) who identified that suitability vertical (plane job) no always in line with horizontal conformity (substance competence).

Competency Level Graduates : Alumni Perspective

Evaluation alumni's self-assessment of 25 Industry 4.0 competencies shows enough variety significant . In terms of Overall , the mean alumni competency score was 3.42 (category high) with standard deviation 0.68. However , the analysis per dimension competence show necessary disparities get attention .

For soft skills dimension , alumni assess competence they Enough Good with a mean score of 3.67. Competence highest reported is ability Work The same in team (mean = 4.12), ability communication oral (mean = 3.95), and ethics work (mean = 3.89). Meanwhile that is , the competency that is assessed as the lowest in soft skills category is ability think critical and problem solving problem complex (mean = 3.21), creativity and innovation (mean = 3.18), and leadership (mean = 3.14). This pattern consistent with findings of Prifti et al. (2021) which identified that graduate of college high in various countries in general have adequate basic soft skills but not enough in higher-order thinking skills that are very much needed in the Industry 4.0 era.

For hard skills dimension , mean score obtained is 3.28, a little more low compared to soft skills. Mastery theory economy classic and contemporary assessed Enough high (mean = 3.78), as well as ability accountancy basic (mean = 3.65). However , the competency related technology and digital shows greater value low . Digital literacy and use technology

information has a mean of 3.42, the ability data analysis using statistical software (mean = 2.95), mastery application digital economy and business (mean = 2.78), and understanding about digital economy and fintech (mean = 2.64). Findings This confirming the digital gap identified by Lase (2020) in context education high Indonesia, where integration technology in learning Still not optimal.

Analysis comparative between period graduation show trend positive in a number of digital competency . Graduates the 2021-2024 period reported a mean digital literacy score of 3.78, more than tall compared to the 2018-2020 period (mean = 3.35) and the 2015-2017 period (mean = 3.12). Likewise for competence data analysis , occurs improvement from 2.67 (2015-2017) to 2.89 (2018-2020) and 3.28 (2021-2024). Increase This can associated with implementation more MBKM curriculum emphasize learning based technology and digital, as well as impact the pandemic forced adaptation to online learning and use digital technology in intensive . This result support Xu et al.'s (2021) argument that update responsive curriculum to development technology can increase digital readiness of graduates .

Table 4. Relevance Field Work

Field of work	Number of Graduates	Very Appropriate (%)	Sufficient/Not Suitable n (%)
Education (Economics/Accounting Teacher)	189	142 (75.1)	47 (24.9)
Banking and Financial Institutions	52	30 (57.7)	22 (42.3)
Businessman	28	–	–
Other Sectors (State-Owned Enterprises, Private Sector, Government)	18	–	–
Total	287	–	–

Competency Level Graduates : Perspective Stakeholders Interest

Evaluation stakeholders interest to competence UNM Economics Education graduates showed an overall mean score by 3.28, a little more low compared to evaluation alumni self (3.42). Disparity This indicates there is a perception gap between alumni and users graduates , where alumni tend to evaluate competence self they more tall compared to evaluation objective from superior or users . This overestimation phenomenon was also found in research by Succi and Canovi (2020) which reported that there is difference significant between graduate self-assessment with employer assessment in almost all dimensions competence .

From the perspective stakeholders interests , the most satisfying soft skills is ethics work and integrity (mean = 3.85), ability adapt (mean = 3.72), and ability communication (mean = 3.58). However , the competencies assessed Still not enough is ability innovation and creativity (mean = 2.95), leadership and initiative (mean = 2.88), and ability think critical and analytical (mean = 2.82). Head school in a way special state that young teachers UNM graduates still tend use method teach conventional and less innovative in designing student- centered and based learning technology .

For hard skills, stakeholders interest give evaluation positive to mastery theory economy (mean = 3.65) and ability pedagogical base (mean = 3.52 for respondents from school). However , digital and technological competencies get low assessment . Ability using economic and business software rated 2.68, data literacy and analytics 2.54, and understanding digital

economy and fintech 2.42. Banking HRD manager in a way specific state that UNM Economics Education graduates who they recruit need training intensive in use system digital banking , analysis credit data- based , and understanding product digital finance . Findings This in line with Rahayu et al. (2023) who identified that the biggest gap between expectation industry finance with competence graduate of The economy in Indonesia is in the aspects of digital competency and data literacy.

Implications for Employability and Career Progression

Analysis correlation show that there is connection positive significant between level digital competence with speed get work ($r = -0.428$, $p < 0.01$), where the more tall alumni digital competency , increasingly short waiting period Work they . Similarly , digital competence is correlated positive with level income initial ($r = 0.512$, $p < 0.01$). Alumni who have high digital competence (mean > 4.0) reported income the initial average is IDR 5.2 million per month , while those who have low digital competency (mean < 3.0) only IDR 3.8 million per month .

From a career progression perspective , 62.8% of alumni who have Work more from 5 years report that digital competency and data analytics become factor important in promotion or displacement to more position good . Some alumni have careers in banking state that they must follow various training addition related to digital banking, data analytics, and fintech for can compete in promotion position . Findings This underline Nugroho and Wibowo's (2023) argument that in digital economy , continuous learning and adaptation to technology new No Again choice but must For sustainability career .

IV. CONCLUSION

Study towards alumni of the Bachelor of Economics Education Program, Makassar State University, shows level absorption high work with waiting period relatively short . However , it happened increased waiting period in the period after COVID-19 pandemic due to impact towards the recruitment process in various sector . Dominance graduate of Work as an economics teacher , shows suitability good vertical between background behind education with field jobs . However , horizontal conformity is still become challenges . Graduates who become teachers feel gap between competence lectures with demands practical teaching , especially in learning strategies , management class , and utilization technology education . Findings This strengthen Employability and job-education mismatch theory emphasizes that success in the job market is measured not only by the absorption rate but also by the match between competencies and job requirements. Practical implications: Study programs need to improve the relevance of their curriculum by strengthening practice-based pedagogical competencies, integrating learning technology, and improving the quality of field practice. For non-educational careers, the development of elective courses, technical skills training, and collaboration with the banking sector and the business world are needed. This research can serve as a basis for the development of sustainable tracer studies and policies. guarantee quality graduate of .

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