

THE RELEVANCE OF VOCATIONAL AND HIGHER EDUCATION TO INDUSTRY NEEDS: A CRITICAL REVIEW OF THE SKILLS GAP AMONG GRADUATES AND 'LINK-AND-MATCH' STRATEGIES

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Abstract

The relevance of vocational and higher education to industry needs is a key issue in human resource development and enhancing national competitiveness. Technological change, digitalisation, automation and the dynamics of the world of work demand graduates who not only possess academic knowledge but also master technical competencies, digital literacy, communication skills, problem-solving abilities, collaboration and adaptability. However, a gap still exists between graduate competencies and industry needs, caused by curricula that are not yet responsive, limited practical facilities, educators' lack of industry experience, students' lack of work experience, and sub-optimal industry involvement in the educational process. This article aims to critically analyse the nature and causes of the graduate competency gap and to examine strategies for strengthening the '*link-and-match*' between educational institutions and industry. This study employs a literature review using a descriptive-qualitative approach. The findings indicate that strengthening '*link-and-match*' requires the alignment of curricula based on industry needs, project-based learning, relevant work placements, the involvement of practitioners, the enhancement of teachers' and lecturers' competencies, certification based on occupational standards, the strengthening of partnerships, and the utilisation of *tracer studies* and labour market data. '*Link-and-match*' must not be limited to administrative relationships but must be realised as a strategic partnership that is measurable, sustainable, and focused on graduate quality and career sustainability. In this way, vocational education and higher education can produce graduates who are competent, adaptable, innovative, ethical, and capable of responding to changing industry needs.

Keywords: vocational education; higher education; industry needs; skills gap; *link-and-match*; employability.

Introduction

Technological change, economic globalisation and the transformation of the structure of work have had significant consequences for the delivery of education (Fitroh & Aslan, 2026); (Pramesworo & Aslan, 2026). The industrial world today requires not only workers with formal qualifications, but also graduates who possess technical competencies, digital literacy, analytical skills, communication skills, collaboration skills, creativity, and the ability to adapt. Developments in automation, artificial intelligence, the digitalisation of production processes, and the use of data-driven systems have transformed the nature of work across various sectors. In this context, vocational

education and higher education are required to produce human resources who are not only capable of entering the labour market but also able to maintain the relevance of their skills throughout their career development. Consequently, the alignment between education and industry needs has become a strategic issue in the development of human resource quality and the enhancement of national competitiveness (Safitri, 2023).

Vocational education plays a vital role as it is specifically designed to produce graduates with practical skills, professional competencies, and readiness to enter specific fields of work. Through practice-based learning, laboratories, workshops, simulations and work experience, vocational education is expected to bridge the gap between the educational process and the needs of the world of work. Meanwhile, higher education serves a broader purpose through the advancement of science, technology, critical thinking, research and innovation. This difference in orientation does not imply that vocational education requires only practice or that higher education requires only theory. Both need to integrate knowledge, skills, professional attitudes, technological literacy and lifelong learning skills so that graduates are able to cope with changing job demands (Agusnaya & Nirmala, 2024).

The main problem that still persists is the gap between graduates' competencies and the needs of the business, industrial and labour sectors (DUDIKA). This gap arises when graduates have met the academic requirements but have not yet mastered the competencies actually required in the workplace. This may take the form of a mismatch between the field of study and the type of job, limited proficiency in using technology, a lack of experience in dealing with real-world problems, and weak communication and collaboration skills. This skills gap not only disadvantages graduates by prolonging their transition into employment but also places a burden on industry through the need for additional training, increased recruitment costs, and low productivity among new entrants. Therefore, the relevance of education must be assessed based on graduates' ability to perform their jobs and develop their careers, not merely on the number of graduates or graduation rates (McGuinness et al., 2018).

The gap between education and industry is becoming increasingly complex because changes in competency requirements are occurring faster than the curriculum update process. Educational curricula are typically developed through academic and administrative procedures that take time, whilst technology, business models and job standards can change within a relatively short period. The software, machinery, information systems and working methods used in industry may be updated before educational institutions have finished adapting their teaching materials. If curriculum updates are not carried out regularly, educational institutions risk producing graduates whose knowledge no longer aligns with the needs of the labour market. This situation highlights the need for curricula to be designed flexibly, based on learning outcomes, and updated in line with information regarding changes in the workplace and industry competency requirements (Safitri, 2023).

In addition to curriculum issues, the skills gap is also influenced by limitations in learning facilities (Elmiwati & Aslan, 2025); (Aslan & Ishom, 2025). Some educational institutions do not yet have laboratories, practical equipment, software, or simulated

work environments that correspond to industrial conditions. Learners may understand concepts in theory, but do not necessarily have the opportunity to operate the same technology as that used in companies. These differences in facilities have the potential to create a gap between the competencies taught and the expected work standards. This issue is also linked to the ability of teachers, lecturers and instructors to keep pace with technological developments. Educators who do not receive regular training or gain industry experience will find it difficult to integrate the latest workplace practices into the learning process (Agusnaya & Nirmala, 2024).

Industry involvement in the delivery of education is also still sub-optimal. In a number of cases, the relationship between educational institutions and industry is limited to the signing of memoranda of understanding, the organisation of work placements, or recruitment activities. Industry is not always involved in curriculum development, the setting of competency standards, the development of teaching materials, the provision of instructors, or the assessment of students' abilities. Yet, industry possesses first-hand knowledge of technological changes, performance standards, work culture, and job competencies. Aligning the curriculum with DUDIKA is one of the key challenges in the development of vocational higher education (Setyawan et al., 2026). This indicates that industry involvement needs to be steered away from purely administrative relationships towards substantive and sustainable partnerships.

In response to this issue, the government has developed the '*link-and-match*' policy as a strategy to strengthen the links between educational institutions and the world of work. Conceptually, '*link-and-match*' requires alignment between the competences taught in educational institutions and those required by industry. This strategy encompasses curriculum alignment, project-based learning, improving the quality of work placements, practitioner involvement, competence certification, capacity building for educators, and enhancing recruitment opportunities for graduates. In vocational education policy, the 8+i approach emphasises the importance of industry involvement in various aspects, including joint curriculum development, the strengthening of *soft* and *hard skills*, project-based learning, work placements, and a commitment to the employment of graduates (V. R. Astuti et al., 2025).

Although it has strategic objectives, the implementation of '*link-and-match*' requires critical scrutiny. Formal relationships between educational institutions and industry do not automatically result in a match in competencies. Partnerships can prove ineffective if they are not accompanied by measurable objectives, a clear division of roles, resource support, and transparent evaluation mechanisms. Furthermore, there is a risk that education will be directed solely towards meeting short-term labour needs, thereby neglecting the role of education in developing critical thinking skills, character, professional ethics, and capacity for innovation. Graduates who possess only specific technical skills may face difficulties when technology or job models change. Therefore, '*link-and-match*' must be understood as an alignment process that maintains a balance between industry needs, academic development, and the social interests of learners (Biesta, 2015).

Another challenge relates to the diversity of Indonesia's industrial sectors and geographical conditions. The competence requirements of large-scale manufacturing companies differ from those of the service, construction, agriculture, health, tourism, creative economy and micro-enterprise sectors. Similarly, educational institutions located in industrial areas have different partnership opportunities compared to those in regions with more limited economic structures. A one-size-fits-all '*link-and-match*' model risks failing to meet local needs and may widen regional quality gaps. Consequently, national policy must provide general direction and standards, but its implementation must allow educational institutions the flexibility to adapt their curricula and partnerships to local economic potential. A region-based approach is also important so that education can support the development of local key sectors and reduce dependence on employment outside the region (Pillay, 2017).

The relevance of education is also determined by the balance between technical and non-technical competences. Industry requires graduates who are able to use equipment and work applications, but who are also able to communicate, work in teams, solve problems, manage conflicts, make decisions and demonstrate integrity. Non-technical skills are becoming increasingly important as modern work involves cross-disciplinary collaboration, interaction with customers and information-based decision-making (Muharrom et al., 2023). Furthermore, technological changes mean that graduates need to be able to learn independently and update their skills. Therefore, vocational and higher education must not only teach skills specific to a particular role, but must also foster adaptive abilities that enable graduates to transition, develop, and create new employment opportunities (Damayanti et al., 2023).

Practical experience is one of the key tools for bridging this skills gap. Project-based learning, *teaching factories*, industrial simulations, practical sessions, case studies and work placements can provide learners with the experience to apply theory in more realistic work situations. However, the implementation of practical training must be designed based on clear competency outcomes, not merely to fulfil administrative requirements. Work placement programmes need to have learning objectives, job descriptions, supervisors from both educational institutions and industry, assessment tools, and feedback mechanisms. If students are only assigned routine tasks unrelated to their field of expertise, work placements will not make an adequate contribution to the development of their competences. Consequently, the quality of the design and supervision of work placements is more important than merely the duration of the placement (Rahmah et al., 2026).

Strengthening the relevance of education also requires a data-driven evaluation system. Educational institutions need to utilise *tracer studies*, graduate user surveys, labour market needs analyses, and information on industrial sector developments to assess the success of educational programmes. The indicators used should not be limited to employment rates, but should also include the time taken to find employment, the alignment of jobs with fields of study, starting salaries, the application of skills, graduate satisfaction, career progression, and the need for further training. This data can be used to update the curriculum, improve the quality of educators, develop facilities, and refine

partnership designs. Government programmes relating to the *'link-and-match'* curriculum with DUDIKA demonstrate efforts to strengthen the relationship between vocational study programmes and industry partners through policy support and funding for the 'programme.

Consequently, the relevance of vocational education and higher education to the needs of industry is a multidimensional issue. The skills gap is caused not only by the shortcomings of graduates, but also by an inflexible curriculum, limited facilities, educators' lack of industry experience, weak engagement with the world of work, and the sub-optimal use of data in educational evaluation. *Link-and-match* policies can serve as a key strategy to address these issues if implemented as genuine, measurable and sustainable partnerships. Consequently, this article aims to provide a critical review of the nature and causes of the skills gap among graduates, whilst analysing *link-and-match* strategies that can strengthen the alignment between education, the world of work and the needs of economic development. This article emphasises that relevant education is not merely education that produces graduates ready for work, but rather education that shapes individuals who are competent, adaptable, ethical, innovative, and capable of continuous learning in the face of change.

Research Methodology

This study employs a *literature review* method with a descriptive-qualitative approach to analyse the relevance of vocational education and higher education to the needs of industry, the skills gap among graduates, and *'link-and-match'* strategies. Research data were obtained from various secondary sources, including scientific journal articles, academic books, reports from national and international institutions, government policy documents, and official publications relevant to vocational education, higher education, work-related competencies, and education-industry partnerships. Data collection was carried out through a literature review based on keywords such as vocational education, higher education, industry needs, skills gaps, work skills, and *'link-and-match'* (Snyder, 2019). The selected literature was analysed based on thematic relevance, source credibility, the recency of the information, and its contribution to the research focus. The analysis was conducted through the stages of identification, selection, categorisation, interpretation, and synthesis of information to identify patterns, issues, and strategies that could strengthen the alignment between graduates' competencies and industry needs. The results of the analysis were then presented in a critical-narrative manner by comparing various perspectives and research findings to produce comprehensive conclusions (Elijah & Aslan, 2025).

Results and Discussion

The Gap Between Graduates' Competencies and Industry Needs

The gap between graduate competencies and industry needs is one of the key issues in human resource development in Indonesia. This gap arises when the knowledge, skills, attitudes and experience possessed by graduates do not fully align with the job standards set by the business sector, industry and the world of work. Ideally, vocational

education and higher education should be able to produce graduates with competencies that meet the needs of the labour market. However, in practice, graduates often face difficulties in securing employment that matches their field of expertise. This issue indicates that the possession of a qualification does not always correlate directly with graduates' employability, productivity and ability to adapt to changes in the industrial environment (McGuinness et al., 2018).

The skills gap can be observed through the mismatch between graduates' fields of study and the jobs they secure. Some graduates work in sectors not directly related to their degree programmes or the skills acquired during their studies. This situation may arise due to a limited number of job vacancies in their field of expertise, a lack of information regarding the labour market, changing industry needs, or graduates' inability to effectively present their skills to potential employers. This mismatch does not necessarily mean that graduates lack ability, but rather indicates that the competencies they possess have not been fully utilised or translated into the requirements of specific roles. In the long term, this job mismatch can affect graduates' job satisfaction, productivity, income and career progression (McGuinness et al., 2018).

Another indicator highlighting the issue of educational relevance is the persistently high unemployment rate amongst certain graduate groups. Data from the Central Statistics Agency shows that in August 2025, the open unemployment rate for vocational school (SMK) graduates stood at 8.63 per cent, making it one of the highest compared to other educational groups (Central Statistics Agency, 2026). This data must be interpreted with caution, as unemployment is not solely caused by a lack of skills. Other factors, such as limited job opportunities, the location of jobs, economic growth, starting wages, work experience and graduates' preferences, also play a role. Nevertheless, the high unemployment rate among vocational education graduates remains a significant indicator that the educational objective of fostering employability has not yet been fully achieved.

The first gap frequently identified is the technical skills gap. Industry requires workers capable of operating equipment, machinery, applications and work procedures in accordance with operational standards. However, graduates do not always gain experience using the same technologies during their studies. Limitations in practical facilities, differences between school or university equipment and industrial equipment, and a lack of updates to teaching materials can result in graduates' technical competencies falling behind. The gap in the quality and relevance of education is one of the main reasons why companies struggle to recruit workers with the appropriate skills. This gap is also reflected in companies' need to provide training or retraining to new graduates after they have been recruited (Damayanti et al., 2023); (Haddar et al., 2023); (Widjaja & Aslan, 2022).

The skills gap is becoming increasingly apparent in sectors undergoing rapid digitalisation. Companies are now utilising automation systems, management software, cloud-based technologies, the Internet of Things, data analytics and artificial intelligence in various operational activities. Graduates equipped solely with manual skills or knowledge of outdated technology will find it difficult to adapt. These changes are taking

place not only in the information technology sector, but also in manufacturing, construction, banking, trade, healthcare, logistics, agriculture and the creative industries. Therefore, digital competence must be understood as a fundamental, cross-professional skill, rather than merely a specialised expertise for computer science graduates (Mudianto et al., 2026).

In addition to technical and digital competencies, the industry also demands adequate mastery of *soft skills*. Graduates need to be able to communicate effectively, work in teams, solve problems, manage time, accept criticism, make decisions, and adapt to organisational culture. In a modern working environment, a worker rarely works individually without coordination with others. Work is often carried out through multidisciplinary teams involving technical staff, managers, customers, suppliers and other stakeholders. Research on the vocational workforce indicates that gaps exist not only in technological skills but also in adaptability, critical thinking, complex problem-solving and advanced digital literacy (Tessa & Humaedi, 2023).

Limitations *in soft skills* are often influenced by teaching methods that remain focused on the delivery of subject matter and the assessment of rote learning. Learners may achieve good academic grades, but this does not necessarily mean they have experience in solving open-ended problems that do not have a single definitive answer. In fact, the world of work demands the ability to analyse situations, identify alternatives, weigh up risks, and make decisions under constrained conditions. Project-based learning, case studies, simulations, group discussions and problem-solving can be used to develop these abilities. Such learning provides students with the opportunity to link concepts to practice and to develop a sense of responsibility for the outcomes of their work (Rahmah et al., 2026).

The skills gap is also linked to graduates' lack of real-world work experience. Learning experiences in the classroom or laboratory do not always adequately reflect the pressures, targets, procedures and work culture found in industry. Graduates need to understand how to work to a schedule, maintain quality, comply with safety standards, communicate with line managers and coordinate with colleagues. Work placement programmes can be a vital means of building such experience, but their implementation must be carefully designed. Internships that merely assign students to administrative tasks or work that does not align with their competencies will not result in optimal employability. Therefore, work placement programmes must include learning objectives, a mentor, relevant tasks, assessment criteria, and feedback from industry (Juhairiah et al., 2024).

Another contributing factor is the delay in updating the curriculum. A curriculum that is not updated regularly can result in learning materials that are out of step with technological developments and the requirements of the profession. Several studies indicate that structural gaps persist due to the predominance of theoretical content, limited industry involvement in curriculum development, sub-optimal implementation of *teaching factories*, and uneven teacher competence in applying industry-driven learning (Wulansih et al., 2023); (Renyaan et al., 2025); (Aslan, 2026). A relevant curriculum should be designed based on observable and measurable learning outcomes, and linked

to occupational competence standards, the needs of the industrial sector, and technological developments.

Industry involvement in education is a key factor in ensuring that the competences taught have practical relevance. Industry can play a role in providing information on job requirements, developing the curriculum, providing practitioners as lecturers, assisting with the development of facilities, taking on interns, and conducting competence assessments. However, partnerships between educational institutions and industry are often still merely formal and have not yet resulted in sustainable activities. Memoranda of understanding are insufficient unless they are translated into learning programmes, applied research, certification and recruitment. Therefore, education-industry relationships need to be built on the basis of shared interests, performance indicators, a division of responsibilities and clear evaluation mechanisms (V. R. Astuti et al., 2025).

Competency gaps are also influenced by differences in quality between regions and between educational institutions. Schools or higher education institutions located in regions with a high concentration of industry tend to have greater access to partnerships, facilities, practitioners and internship opportunities. Conversely, institutions in regions far from industrial centres face limitations in establishing direct links with companies. These disparities can lead to differences in the quality of graduates, even though they follow the same national education levels and curriculum. Therefore, strategies to enhance the relevance of education must take into account local economic conditions, regional potential, the availability of industry, and the use of digital technology to expand learning collaborations. Vocational education in regional areas also needs to be directed towards supporting local key sectors, such as agriculture, fisheries, tourism, construction, logistics, or industries based on local resources (Pillay, 2017).

The impact of the skills gap is felt not only by graduates but also by industry and the economy as a whole. For graduates, the gap can increase the risk of unemployment, informal employment, jobs that do not match their field of expertise, and low starting salaries. For companies, the gap increases the costs of recruitment, training, supervision and the onboarding of new staff. For the state, this situation indicates inefficiency in educational investment, as the resources deployed have not yet yielded optimal labour productivity. If left unaddressed, the skills gap may widen the divide between highly educated workers with relevant skills and those left behind by technological change (Wulansih et al., 2023).

Consequently, the skills gap between graduates and industry needs is a multidimensional issue that cannot be resolved simply by increasing the amount of practical training. Resolving it requires curriculum reform, the upgrading of facilities, the enhancement of educators' competencies, the expansion of high-quality work placements, the development of certification schemes, the strengthening of *soft skills*, and industry involvement throughout the entire education cycle. The '*link-and-match*' strategy must be implemented as a genuine partnership, not merely an administrative relationship. Its success must be measured through job suitability, performance quality, productivity, career sustainability, and graduate employer satisfaction. With this approach, vocational education and higher education can produce graduates who are not

only ready to enter the workforce but are also capable of adapting, innovating, and continuously developing their competencies in line with changing industry needs.

Strategies for Strengthening the *Link-and-Match Between Education and Industry*

Strategies to strengthen *the link-and-match* between education and industry must be positioned as a systematic effort to build alignment between the educational process, graduate competencies, and the needs of the world of work. *Link-and-match* should not be understood merely as an administrative relationship through memoranda of understanding between schools or higher education institutions and companies, but must be realised through tangible collaboration from curriculum development right through to graduate evaluation. Vocational education has close ties with the world of work and thus has the potential to equip learners with a combination of practical and workplace skills that support the transition to employment and the ability to adapt to change (Mudianto et al., 2026). Therefore, strengthening *link-and-match* requires the active involvement of the government, educational institutions, industry, professional associations, and learners.

The first strategy that needs to be implemented is to regularly align the curriculum with industry needs. The curriculum must be designed based on job analysis, competency standards, technological developments, and labour demand projections. Industry involvement should not be limited to the consultation stage but must encompass competency mapping, the formulation of learning outcomes, the development of teaching materials, and the determination of assessment methods. A relevant curriculum must integrate technical skills, digital literacy, communication skills, problem-solving, creativity, professional ethics and adaptability. Partnerships with employers can ensure that vocational education remains relevant through industry-validated curricula and work-based learning (Albar & Amsal, 2026).

Curriculum alignment must also be carried out flexibly, taking into account changes in the nature of work. The curriculum should not only be designed to meet the needs of industry at a specific point in time, but also equip graduates with skills that can be applied in a variety of work situations. If the curriculum is too specific to a single type of machine or software, graduates' competencies may quickly become irrelevant as technology changes. Therefore, in addition to teaching operational skills, educational institutions need to develop fundamental abilities such as critical thinking, data analysis, problem-solving, professional communication and independent learning. This approach ensures that graduates are not only prepared to carry out their current jobs, but are also capable of learning new technologies and procedures in the future (Albar & Amsal, 2026).

The second strategy is to expand practice-based learning and work experience. Practice-based learning can be implemented through *project-based learning*, *problem-based learning*, industry simulations, practical sessions, *teaching factories*, *teaching industries*, and collaborative projects with companies. Through these models, learners not only receive theoretical explanations but also learn to solve problems that have a specific context, time limits, quality standards and real-world consequences. Learners can be trained to draw up work plans, use tools or software, manage risks, work in teams,

produce reports and present results. This type of learning helps to develop technical skills as well as professional competencies that are difficult to acquire through lecture-based methods alone (Juhairiah et al., 2024).

Internship or industrial work placement programmes need to be strengthened so that they do not become merely formal activities to fulfil academic requirements. Internships must be designed as an integral part of the curriculum, with clear learning objectives, job descriptions, competencies to be achieved, mentoring mechanisms, and evaluation instruments. Each student needs to be placed in a role appropriate to their field of expertise and given the opportunity to undertake tasks that offer learning value. Cooperation between educational institutions and companies must also ensure ongoing communication throughout the placement, joint assessment, and feedback on students' progress. Local partnerships between vocational education providers and employers are a key prerequisite for ensuring that work placements take place and remain aligned with the educational programme (Maulana, 2023).

The third strategy is to strengthen the involvement of industry practitioners in the learning process. Practitioners can be involved as guest lecturers, guest teachers, instructors, competence assessors, project mentors, or members of the curriculum development team. The presence of practitioners provides learners with the opportunity to understand real-world working conditions, including organisational culture, safety standards, customer demands, the use of technology, and professional ethics. Practitioners can also help bridge the gap between theory and practice and provide insight into the competencies required to secure and retain employment. In the long term, practitioner involvement can narrow the gap between the knowledge taught in the classroom and actual work processes in industry (Fahmayani, 2021).

The involvement of practitioners must be accompanied by enhanced industry experience for teachers, lecturers and instructors. Educators need opportunities to undertake work placements, technology training, professional certification, industry visits or *industry attachment* programmes. Without updating their experience and knowledge, educators will find it difficult to teach current industry standards. Consequently, partnerships between educational institutions and employers are vital in building industry knowledge for prospective and current vocational education educators. Through such partnerships, educators can gain first-hand experience of the technology, production processes, work culture, and competencies required by companies (Maulana, 2023). Therefore, the professional development of educators must be a key component of the *'link-and-match'* strategy.

The fourth strategy is to establish a credible system of certification and recognition of competences. Certification can provide objective evidence of graduates' abilities, particularly if the certificates are based on national standards, professional standards or industry standards. However, certification must not merely test rote learning or theoretical knowledge. The certification process must assess learners' ability to carry out tasks, solve problems, use equipment, apply health and safety practices, and produce goods or services in accordance with standards (Nisa et al., 2021); (S. E. P. Astuti et al., 2023). Certification must also be integrated into the curriculum so that learners have the

opportunity to prepare themselves through relevant learning. Furthermore, the recognition of *micro-credentials*, portfolios and project experience can help graduates demonstrate their competencies in a more specific manner to prospective employers (Sulastri et al., 2023).

The fifth strategy is to develop results-oriented education-industry partnerships. A good partnership does not end with the signing of a cooperation agreement, but leads to activities such as joint curriculum development, laboratory development, the provision of practical facilities, applied research, innovation projects, work placements, certification and recruitment. Every collaboration must have measurable targets, such as the number of students undertaking work placements, the number of jointly developed courses, the number of industry practitioners involved, the number of industry projects, or the percentage of graduates recruited by partners. This type of partnership model enables both parties to benefit. Educational institutions gain access to industrial technology and expertise, whilst companies gain access to potential employees and solutions to their operational challenges (Setyawan et al., 2026).

Such partnerships need to take into account the characteristics of micro, small and medium-sized enterprises. Not all companies have the capacity to provide extensive internship facilities, instructors or training programmes. If cooperation is focused solely on large companies, the majority of students may miss out on opportunities to gain work experience. The government and educational institutions can establish industry consortia or joint partnership schemes so that several companies can share resources to provide learning experiences. This approach can also support local economic sectors and provide learners with the opportunity to understand various organisational models (Symaco & Hayden, 2024). Thus, *'link-and-match'* functions not only as a mechanism for channelling graduates into large companies, but also as a means of strengthening the regional economic ecosystem.

The sixth strategy is to strengthen the labour market information system and *tracer studies*. Educational institutions need to possess data on the types of jobs secured by graduates, the time taken to find employment, the degree of job fit, the competencies utilised, the need for additional training, and employers' assessments of graduates. This data needs to be combined with information on industry trends, emerging roles, new technologies, and regional labour force requirements (Ahmad & Tejawiani, 2026). The results of the analysis are used to update the curriculum, determine investment in facilities, design training for educators, and evaluate industry partnerships. With a robust information system, educational decisions are based not merely on assumptions or old habits, but on evidence regarding changing labour market needs.

The seventh strategy is to implement a more comprehensive *'link-and-match'* evaluation. The success of the programme cannot be measured solely by the number of cooperation agreements, the number of trainees, or the number of graduates in employment. The evaluation must cover the quality of work, the alignment of jobs with competencies, graduate productivity, employer satisfaction, career sustainability rates, graduates' ability to secure promotions, and their capacity to keep pace with technological developments. The evaluation must also identify the barriers faced by

learners from specific socio-economic groups or regions (Sudira et al., 2026). In this way, policies can be improved based on tangible outcomes, rather than merely on administrative achievements. A results-based evaluation approach also prevents *'link-and-match'* from becoming a mere ceremonial programme.

The eighth strategy is to build cross-stakeholder coordination and provide incentives for industry. The government plays a role in providing regulations, competency standards, funding, information systems, and incentives for companies involved in education. Educational institutions are responsible for designing and delivering relevant learning programmes, whilst industry provides work experience, practitioners, technology and input on competencies (Fristianingroem, 2025). Professional associations can help set occupational standards and certification, whilst local authorities can link educational institutions with key local economic sectors. Incentives are necessary because industry involvement requires costs, time and resources. Without such support, small and medium-sized enterprises may struggle to participate consistently (Bruri Triyono & Hariyanto, 2024); (Aslan & Soesanto, 2026); (Hamid & Aslan, 2025) .

Ultimately, efforts to strengthen *the 'link-and-match'* must be directed towards the creation of an education and industry ecosystem characterised by mutual learning and mutual benefit. Education must not merely act as a supplier of labour, whilst industry acts solely as a user of graduates. Both must collaborate in generating knowledge, technology, innovation, learning experiences and the development of competencies. This strategy must combine curriculum alignment, practice-based learning, high-quality work placements, practitioner involvement, teacher capacity building, certification, outcomes-based partnerships, and data-driven evaluation. Through this approach, *the 'link-and-match' model* can reduce skills gaps whilst ensuring that education retains its academic, social, and humanitarian functions. Ultimately, the relevance of education is determined not only by graduates' ability to secure employment, but also by their ability to adapt, innovate, work ethically and continue learning in an ever-changing world of work.

Conclusion

The relevance of vocational and higher education to the needs of industry is a strategic issue directly linked to the quality of human resources, economic competitiveness, and the success of graduates' transition into the world of work. The findings of the study indicate that there remains a gap between the competencies acquired by graduates and the qualifications required by industry. This gap encompasses technical competencies, digital literacy, practical experience, communication skills, problem-solving, collaboration, and the ability to adapt to technological change. This issue is not solely attributable to the shortcomings of graduates, but also to curricula that are not yet sufficiently responsive, limited facilities, an imbalance in the quality of teaching staff, and a weak information system regarding labour market needs.

The 'link-and-match' strategy can serve as a key approach to narrowing this gap if implemented substantively and sustainably. Strengthening this strategy requires the development of curricula in collaboration with industry, project-based learning, relevant work placements, the involvement of practitioners, the enhancement of teachers' and

lecturers' competencies, certification based on occupational standards, and the development of partnerships in research and innovation. However, *'link-and-match'* must not be limited to administrative cooperation or the signing of memoranda of understanding. Its success must be measured against the quality of the learning experience, the level of job fit, graduate productivity, employer satisfaction with graduates, career sustainability, and graduates' ability to keep pace with industry developments.

Consequently, vocational education and higher education need to be developed as part of an ecosystem linking educational institutions, industry, government, professional associations and the community. Education must not merely produce graduates who are ready for work, but must also shape individuals who are adaptable, critical, creative, ethical and capable of lifelong learning. At the same time, industry must be positioned not merely as a user of graduates, but as a partner in the planning, implementation and evaluation of education. If such collaboration is carried out on the basis of data, real needs and a clear division of responsibilities, *the 'link-and-match'* strategy can enhance the relevance of education whilst strengthening graduates' competitiveness in the face of changes in the world of work.

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