DOI: 10.12700/AIS.2025.037

Exploring Industry Perspectives on Dual Education

Monika Pogátsnik
Alba Regia Faculty
Obuda University
Székesfehérvár
0000-0002-2698-7291

Judit Módné Takács
Alba Regia Faculty
Obuda University
Székesfehérvár
0000-0001-8463-4032

Éva Takács
Alba Regia Faculty
Obuda University
Székesfehérvár
0009-0008-7232-000X

***Abstract*— The aim of this study is to present the operational experiences of dual education at the Alba Regia Faculty of Obuda University, with particular emphasis on the perspectives of corporate partners. The empirical research analyzes responses from corporate partners using a questionnaire-based methodology. According to corporate feedback, dual education contributes in the long term to the supply of skilled labor, the shaping of organizational culture, and the development of operational competencies. However, the implementation of the system poses structural and resource-related challenges, especially in the areas of mentoring and student retention. The findings of the research highlight that the effectiveness of dual education can be further enhanced through closer university-industry collaboration, more flexible training structures, and targeted competency development.**

Keywords—Dual Education, Industry-University Partnership, Work-Based Learning, Corporate Feedback

I. Introduction

Collaboration between higher education and industry has become increasingly prominent in recent years, particularly in the fields of engineering and information technology, where practical knowledge and labor market relevance play a crucial role. Dual education emerged in Hungary in 2015 as an educational model that enables the integration of theoretical knowledge with corporate practice. The Alba Regia Faculty of Obuda University was among the first institutions to implement this training format [1], [2], [3], which has since become one of the faculty's key educational pillars.

Students participating in dual education pursue their studies simultaneously at the university and with a corporate partner, thereby gaining real work experience during their academic training. This not only facilitates the development of professional competencies but also eases the transition into the labor market [4]. For corporate partners, dual education offers an opportunity to become familiar with students' work ethic, mindset, and professional development during the training period, thereby reducing recruitment risks and enhancing employee loyalty.

The aim of the present study is to explore, through empirical research, the experiences, evaluations, and development proposals of corporate partners involved in dual education. The questionnaire-based data collection enabled the structured gathering of companies' opinions regarding the benefits, challenges, and future cooperation opportunities related to the training model. The results of the research may contribute to the further development of the dual education model and to strengthening the relationship between the university and industry.

II. Higher Education and Economic Collaboration

Collaboration between higher education institutions and industrial stakeholders has become a key factor in ensuring the quality and labor market relevance of academic programs. The rapidly changing demands of the economy, the pace of technological advancement, and labor market expectations present complex challenges that universities alone can hardly address quickly and effectively. Close cooperation with industry partners enables training content to remain up to date, provides students with practical knowledge, and ensures that graduates enter the workforce with truly marketable competencies [5], [6].

In the fields of engineering, information technology, and applied sciences, industrial collaboration is particularly crucial, as these sectors require the rapid integration of technological innovations, the use of modern tools, and an understanding of real-world industrial challenges to support students' professional development [2], [6]. Involving industry partners in curriculum development, project-based learning, and the organization of internships significantly enhances the practical orientation and credibility of academic programs [8].

One of the most structured forms of such collaboration is dual education, in which theoretical instruction and corporate practice are closely integrated [5]. This model provides students with the opportunity to gain experience in real work environments during their studies, while companies actively participate in training future professionals [6], [7]. This not only facilitates professional socialization but also contributes to understanding corporate culture, shaping employee attitudes, and, in the long term, strengthening workforce retention [8], [10].

Based on the preferences of Generation Z engineering students, flexibility, a technologically advanced environment, and work-life balance are key considerations in shaping future workplaces [1]. In this context, dual education serves not only as a platform for developing professional skills but also for enhancing social competencies, particularly when corporate partners are actively involved in the training process [2], [7].

According to corporate feedback, practical training becomes more effective when companies and universities jointly design the curriculum and training structure [6]. This tripartite collaboration between the student, the university, and the company enables the training system to respond flexibly to economic and technological changes, while students acquire professional competencies through engagement with real-world problems [5], [9].

Comparative academic performance data indicate that students enrolled in dual education programs tend to achieve better results and exhibit lower dropout rates [5], [9]. For companies, this translates into access to more motivated and goal-oriented young professionals who become familiar with corporate culture and expectations during their studies. The effectiveness of dual education is thus reflected not only in the quality of education but also in the successful integration of graduates into the labor market [10].

Research examining efficiency and satisfaction suggests that dual education can be a sustainable model in the long term, especially when companies go beyond providing internship placements and actively engage in mentoring and evaluating students [8]. This type of collaboration benefits not only students but also companies, as fresh knowledge and innovative perspectives can be directly integrated into corporate operations [6], [11].

III. Sample Characteristics and Sectoral Representation

This section presents the sample of corporate partners participating in the survey, focusing on their evaluations of dual education experiences. The aim was to assess how companies perceive the time spent by dual students at their organizations, including the perceived advantages and disadvantages of the training model. The questionnaire addressed the range of skills and competencies considered important and fostered through dual education, as well as satisfaction with students' preparedness and university-acquired knowledge. Respondents were also invited to suggest improvements to enhance the effectiveness of the dual education system.

A total of $N = 44$ responses were collected, all from professionals directly involved with dual students. The survey was conducted anonymously, and therefore no personal or company-specific identifiers were recorded. However, respondents provided information on company size, categorized as follows:

- Large enterprises (more than 250 employees): 75% ($N = 33$)
- Medium-sized enterprises (50–249 employees): 18.2% ($N = 8$)
- Small enterprises (10–49 employees): 6.8% ($N = 3$)

The companies' fields of activity were classified into eight categories. The most represented sectors were:

- Transportation and logistics: 36.4% ($N = 16$)
- IT services, operations, and development: 20.5% ($N = 9$)
- Manufacturing and processing industries: 15.9% ($N = 7$)

Moderate representation was observed in:

- Public administration and services: 11.4% ($N = 5$)
- Other engineering activities: 6.8% ($N = 3$)

Lower representation was found in:

- Utilities: 4.5% ($N = 2$)
- Financial institutions and sports federations: each 2.3% ($N = 1$)

IV. Findings on the Effectiveness and Challenges of Dual Education

A. Strategic Advantages of Dual Education from the Corporate Perspective

The benefits of dual education from the viewpoint of corporate partners can be grouped into three main categories. A significant majority of respondents (75%, $N = 33$) identified the long-term provision of skilled labor as the primary advantage, particularly among large enterprises (78%) and medium-sized companies (75%), across nearly all sectors.

The second most frequently cited benefit (64%, $N = 28$) was the transfer of organizational culture and company-specific knowledge during the dual education period, serving as a medium-term competency development goal. Statistical analysis revealed a significant relationship between company size and the perceived importance of company-specific knowledge transfer, as confirmed by both the Pearson chi-square test ($\chi^2(2) = 6.351$, $p = 0.042$) and Spearman's rank correlation ($r_s = .300$, $p = 0.048$). Both large enterprises (72.7%) and small businesses (66.7%) emphasized the importance of transmitting company-specific knowledge to students as potential future employees, while medium-sized enterprises considered this aspect less critical (25.0%). The emphasis on company-specific knowledge is justified by the complex organizational structures and specialized processes of large enterprises, and by the need to maintain competitiveness in small businesses.

A moderately emphasized benefit (48%, $N = 21$), primarily reported by respondents from large enterprises (55%, $N = 18$), was the potential of practically trained, immediately deployable employees, reflecting short-term operational skill development. The presence of practically skilled personnel is particularly valuable in large organizational environments, where the operational resolution of everyday tasks and challenges is essential.

Overall, the corporate value proposition of dual education is multi-layered, ranging from long-term human resource strategies (75%), through medium-term organizational knowledge management goals (64%), to short-term operational skill development (48%). Dual education not only holds societal and economic significance but also offers a proactive response to labor market challenges. The responses clearly indicate strong corporate commitment to the dual education model and a recognition of its forward-looking benefits.

B. Structural and Operational Challenges in Implementing Dual Education

Despite the numerous benefits of dual education, its implementation and supervision on the corporate side present several structural and operational challenges. One of the most significant difficulties is integrating the mentoring and training of young, often inexperienced students into the daily routines of company employees. This responsibility places a considerable burden on mentors, particularly during the initial phase of the training period.

Survey responses reflect this reality: 75% of respondents ($N = 33$) identified the time and resource demands of mentoring as the primary challenge. This issue was especially

emphasized by medium-sized enterprises, where the availability of qualified mentors and the time they can dedicate to student supervision may be limited.

The second most frequently mentioned challenge (41%, $N = 18$) was student attrition after graduation. Although correlation analysis revealed only marginal statistical significance between company size and student attrition ($r_p = .290$, $p = 0.056$; $r_s = .279$, $p = 0.067$; $\chi^2 = 3.698$, $p = 0.157$), a clear trend emerged: large enterprises reported higher rates of post-graduation attrition (49%, $N = 33$), while small enterprises retained all their dual students (0% attrition, $N = 3$). This paradox highlights a key tension: although large companies view dual education as a strategic tool for long-term talent acquisition (75%), nearly half report losing students after graduation.

This discrepancy may be explained by differences in organizational culture. Smaller firms often offer a more personal, family-like work environment that fosters stronger emotional bonds, while larger firms, despite offering more structured training, may struggle with retention due to less personal engagement and greater external competition for skilled graduates. Additionally, some large companies may not have open positions available at the end of the training period, even if they are satisfied with the students' performance. This structural limitation is often tied to longer planning cycles in large organizations.

To address this issue, an institutional recommendation has been proposed: allowing students to complete their final academic year under an individual study schedule. This flexible arrangement could enable students to transition more easily into full-time employment if a relevant position becomes available before graduation.

The least frequently cited challenge (11%, $N = 5$) was the insufficient theoretical knowledge of students. Overall, the theoretical preparation of dual students was rated positively, which is an encouraging reflection on the quality of university education. However, this issue was more concentrated in the manufacturing, IT, and transportation sectors, where specific technical knowledge is often critical.

C. *Development Priorities of Key Competencies in the Dual Education Framework*

One of the objectives of the survey was to identify which skills and competencies corporate stakeholders consider most important to develop within the dual education framework. Respondents were asked to evaluate eight key competencies grouped into four broader categories:

- Technical competencies: professional knowledge and practical skills
- Cognitive competencies: problem-solving and critical thinking
- Interpersonal competencies: communication and teamwork
- Personal development: responsibility and autonomy

The results show a clear dominance of technical competencies, which were prioritized by 51% of respondents, particularly among medium-sized enterprises (50%, $N = 4$) and within the public administration and services sector (80%, $N = 4$). Cognitive competencies were the second most emphasized category (36%), especially in large enterprises and the transportation and logistics sector, where both problem-solving and critical thinking were simultaneously highlighted (18%, $N = 3$). Personal development (32%) was most relevant in large enterprises, particularly in the IT sector, while interpersonal competencies (31%) showed a relatively balanced distribution across company sizes and sectors. These findings reflect the practice-oriented nature of dual education, where technical expertise is considered the most critical outcome.

The most highly valued competencies were problem-solving (64%, $N = 28$) and professional knowledge (61%, $N = 27$), significantly ahead of other skill areas. Professional knowledge was especially emphasized in medium-sized enterprises (75%, $N = 6$) and in public administration (100%, $N = 5$), utilities (100%, $N = 2$), manufacturing (72%, $N = 5$), and financial sectors (100%, $N = 1$). Similarly, problem-solving was strongly prioritized by medium-sized enterprises (75%, $N = 6$), particularly in manufacturing (72%, $N = 5$) and transportation (81%, $N = 13$).

In the mid-priority range, autonomy (41%, $N = 18$), practical skills (41%, $N = 18$), communication (32%, $N = 14$), and teamwork (30%, $N = 13$) were identified. Autonomy was most emphasized by small enterprises (67%, $N = 2$), with the IT services and operations sector showing the highest demand (78%, $N = 7$). A statistically significant relationship was found between practical skills and company size ($\chi^2 = 6.205$, $p = 0.045$), with medium-sized enterprises showing the highest demand (75%, $N = 6$), compared to large enterprises (36%, $N = 12$) and small enterprises (0%, $N = 0$). The public administration sector also showed a strong preference for practical skills (80%, $N = 4$). Communication and teamwork were evenly distributed across company sizes and sectors. The lowest priority competencies were responsibility (23%, $N = 10$) and critical thinking (9%, $N = 4$).

D. *Corporate Evaluation of Student Preparedness in Dual Education*

Corporate partners expressed a high level of satisfaction with the preparedness of students participating in dual education programs ($N = 44$). On a 5-point Likert scale, the average satisfaction score was $\bar{\chi} = 4.30$ ($SD = 0.553$), indicating a position between the “satisfied” and “fully satisfied” categories.

Importantly, no negative responses were recorded; all ratings fell within the 3-5 range. These results underscore the perceived effectiveness of the dual education model from the corporate perspective. According to the respondents, students' preparedness aligns well with labor market expectations, and no major deficiencies were identified.

Neither company size nor sectoral affiliation showed statistically significant correlations with satisfaction levels. However, a more differentiated pattern was observed among large enterprises, while small and medium-sized companies tended to provide more homogeneous and consistently positive evaluations. Sectoral differences may reflect specific training needs, suggesting that certain industries place greater emphasis on aspects of student preparedness.

E. *Recommendations for Enhancing the Effectiveness of the Dual Education System*

In the survey, 66% of respondents ($N = 29$) shared suggestions for improving the effectiveness of the dual

education model. These responses were analyzed using content analysis and categorized into thematic groups. The most frequently mentioned category (28%, $N = 8$) focused on structural and scheduling improvements to the practical training component. Respondents proposed extending the duration of practical training during the academic term, currently limited to one day per week, and suggested implementing continuous practical blocks, if timetables allow. This would facilitate more meaningful student involvement in real work tasks and help overcome initial adaptation challenges more efficiently.

The second most common recommendation (24%, $N = 7$) emphasized the need for closer collaboration between universities and companies, including the development of communication channels and the institutionalization of regular faculty and mentor visits to both academic and corporate environments.

A significant portion of respondents (21%, $N = 6$) proposed curriculum development, calling for the introduction of more company-specific courses, increased emphasis on practice-oriented teaching, and a better balance between theoretical and practical content. While theoretical instruction still dominates in higher education, there is a growing demand for applied learning methods and content.

Another group of suggestions (17%, $N = 5$) highlighted the importance of developing soft skills and workplace attitudes, such as precision, motivation, and responsibility, competencies often associated with generational characteristics in the labor market. A smaller group (10%, $N = 3$) addressed administrative burdens and recommended improvements to information and support systems to streamline processes for both students and companies.

Overall, the findings confirm that dual education creates clear value for companies, particularly in terms of long-term workforce development, company-specific knowledge transfer, and operational skill-building. However, challenges such as resource-intensive mentoring and post-graduation student attrition point to the need for strategic responses.

The identified competency development priorities and collaboration proposals suggest that the future of dual education lies in more flexible training structures, stronger university-industry partnerships, and enhanced practice-oriented instruction. Personalization of programs and the refinement of incentive systems are expected to further strengthen cooperation among stakeholders in the coming years.

V. Conclusion and Strategic Outlook

The findings of this study confirm that dual education represents a strategically valuable model for aligning higher education with the evolving needs of the labor market. From the perspective of corporate partners, the system offers clear advantages in terms of long-term workforce development, the transmission of company-specific knowledge, and the cultivation of operational competencies. These benefits are particularly pronounced in sectors where technological innovation and practical expertise are critical to competitiveness.

At the same time, the research has revealed several structural and operational challenges that must be addressed to ensure the sustainability and scalability of the model. The mentoring of students, especially those with limited prior experience, places a significant burden on company staff, particularly in medium-sized enterprises where human resources are often stretched. Furthermore, the issue of student attrition after graduation, especially in large organizations, highlights the need for more effective retention strategies and better alignment between training outcomes and employment opportunities.

The analysis of competency development priorities underscores the dominant role of technical and problem-solving skills in dual education, while also pointing to the growing importance of soft skills such as autonomy, communication, and teamwork. These findings suggest that the dual education model must continue to evolve in response to generational shifts in student expectations and workplace dynamics.

To enhance the effectiveness of the system, several directions for development have emerged. These include the extension and restructuring of practical training periods to allow for deeper integration into company workflows, the strengthening of university-industry collaboration through more regular and structured communication, and the refinement of curricula to better balance theoretical knowledge with practical application. Additionally, the development of soft skills and workplace attitudes should be more explicitly embedded in training programs, while administrative processes and support systems should be streamlined to reduce burdens on both students and companies.

In conclusion, dual education has proven to be a forward-looking and mutually beneficial model. Its continued success will depend on the willingness of academic and corporate stakeholders to engage in adaptive, collaborative, and innovation-driven practices. With targeted improvements and strategic alignment, dual education can play a pivotal role in shaping a resilient and future-ready workforce.

Acknowledgment

This research was supported by the project RRF-2.1.2-21-2022-00019, titled “Practice-Oriented Curriculum Development at Óbuda University in the Spirit of Industry 4.0.”

References

[1] M. Pogatsnik and É. Takács, Generation Z Engineering Students' Preferences of Dual and Future Workplace, in Proc. 2024 IEEE 6th Int. Symp. on Logistics and Industrial Informatics (LINDI 2024), Piscataway, NJ, USA: IEEE, 2024, pp. 35–40.

[2] M. Pogatsnik, “Dual Training in Engineering Education,” in Proc. IEEE 21st World Symp. Applied Machine Intelligence and Informatics (SAMI), Herlany, Slovakia, 2023, pp. 169–174.

[3] M. Pogatsnik, “Dual Education: The Win-Win Model of Collaboration between Universities and Industry,” Int. J. Eng. Pedagogy, vol. 8, no. 3, pp. 145–152, 2018.

[4] K. Bozic, “The analysis of the importance of implementing a dual education system for the development of business careers among young people,” Zbornik Radova Ekonomskog Fakulteta Brčko, vol. 18, no. 1, pp. 23–33, 2024.

[5] E. Török and E. Angeli, “Analysis of dual and non-dual student learning outcomes and student dropout data,” in Proc. IEEE Global Eng. Educ. Conf. (EDUCON 2022), Piscataway, NJ, USA: IEEE, 2022, pp. 1303–1309.

[6] A. Boldizsár, E. Török, and Z. Valentinyi, “Developing practical engineering training based on feedback from dual training partner companies,” in Futureproofing Engineering Education for Global Responsibility: Proc. 27th Int. Conf. Interactive Collaborative

Learning (ICL2024), M. E. Auer and T. Rüütmann, Eds., Cham, Switzerland: Springer, 2025, pp. 95–103, Ch. 10.

[7] H. Kara Erol, “Time for universities to think outside the box: University students' experiences of social skills development workshops,” Active Learning in Higher Education, vol. 26, no. 1, pp. 139–156, 2023.

[8] Zs. Kocsis and G. Pusztai, “A double road to success? Impact of dual education on effectiveness,” Research in Post-Compulsory Education, vol. 26, no. 2, pp. 164–188, 2021.

[9] E. Török, E. Angeli, and Gáborné Noel, “Hallgatói tanulmányi eredmények mérése és összehasonlítása duális - nem duális viszonylatban,” Gradus, vol. 7, no. 3, pp. 117–122, 2020.

[10] Zs. Kocsis, “A duális képzés eredményességre gyakorolt hatása,” Opus et Educatio: Munka és Nevelés, vol. 7, no. 1, pp. 80–91, 2020.

[11] Bertalan Beszedes. Artificial Education Process Environment for Electro-Pneumatic System. 2023 IEEE 6th International Conference and Workshop Óbuda on Electrical and Power Engineering (CANDO-EPE). Budapest, Hungary, 2023. pp. 000175-000180, doi: 10.1109/CANDO-EPE60507.2023.10418034.