DIARKAZ

External Evaluation of the Project

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Project acronym:	DIARKAZ
Project full title:	Dual Education for Industrial Automatization and Robotics in Kazakhstan
Project No:	609757-EPP-1-2019-1-RS-EPPKA2-CBHE-JP
Funding scheme:	ERASMUS+
Project start date:	January 15, 2020
Project duration:	36 months

Abstract	2nd external evaluation was conducted by an expert from the outside of consortium. He was engaged in order to evaluate the quality of the developed undergraduate program and LLL seminar.

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1. Project information

Project Acronym: DIARKAZ

Project Name: Dual Education for Industrial Automatization and Robotics in Kazakhstan

Project number: 609757-EPP-1-2019-1-RS-EPPKA2-CBHE-JP

Project Duration: 3 years

Coordinator: University of Novi Sad (Serbia, Project Grant Holder)

Partners:

- University of Novi Sad (Serbia)
- Duale Hochschule Baden-Württemberg (Germany)
- FH JOANNEUM (Austria)

From the Republic of Kazakhstan:

- Kostanay Engineering and Economics named after M. Dulatov (country project coordinator)
- Innovative University of Eurasia
- West Kazakhstan Agrarian and Technical University named after Zhangir Khan
- SaryarkaAvtoProm LLP
- Ural Transformer Plant LLP

2. Executive summary

The Erasmus+ project "Dual Education for Industrial Automatization and Robotics in Kazakhstan " was initiated to address the need for aligning higher education curricula with the evolving demands of industrial companies in the context of dual education in robotics and automatization. This report presents the findings of an external evaluation conducted to assess the project's achievements, impact, and sustainability.

The project achieved its objectives, including curriculum development, industry involvement, best practice transfer, tool creation, and piloting of adapted curricula. The dual education in robotics and automatization in higher education has shown promise as a model for aligning academic learning with industry requirements.

Stakeholder perspectives reflected overall satisfaction with the initiative and the project's outcomes, and the potential for long-term sustainability of dual education in robotics and automatization in Kazakhstan's higher education system appears positive. Nevertheless, there are challenges, particularly in scaling the model and ensuring ongoing commitment from educational institutions and enterprises.

This report provides an evaluation of the project that highlights its accomplishments and identifying areas for improvement. It offers recommendations for addressing challenges and ensuring the continued success of dual education in robotics and automatization in the context of Kazakhstan.

3. Introduction

3.1. Project Overview

The DIARKAZ Erasmus+ project was launched with the aim of advancing the integration of dual education in robotics and automatization in higher education curricula in Kazakhstan. The project had eight main objectives, as outlined in the project proposal, and this evaluation report examines the extent to which these objectives have been achieved.

More specifically the project aimed to:

1) Promote the development and adjustment of curricula in accordance with the needs of industrial companies in the educational process of dual education technology.
2) Involve professionals from the industry in defining the specific training needs and elaborate the content for the periodical practical trainings within the dual technology of learning.
3) Transfer and implement the best practices from EU countries that have long-term experience in dual HE programmes by creating capacity for delivery of periodical practical trainings by academic and company staff.
4) Create tools and templates to facilitate the phased implementation of practical training in enterprises.
5) Demonstrate the benefits of dual education technology of HE for all involved stakeholders by piloting and evaluation of the adapted curricula, necessary tools and training materials.
6) Develop methodology for modification and realignment of existing undergraduate curricula in Science & Technology for implementation in practice-integrated dual paradigm (in the context of Kazakhstan).
7) Ensure continuous exploitation of results by proposing a dual education technology to other educational institutions and enterprises.

8) Disseminate project results and stimulate the creation of more dual HE programmes in Kazakhstan.

3.2. Objectives of the Evaluation

This evaluation seeks to:

- Assess the Achievement of Project Objectives: The primary aim is to evaluate the extent to which the project has successfully met its stated objectives.

- Examine the Impact of the Project on Stakeholder: A key aspect of the evaluation is the examination of how the project has influenced its various stakeholders.

- Analyzing Sustainability in Dual Education: A fundamental dimension of this evaluation is to analyze the sustainability of dual education technology within the higher education landscape of Kazakhstan.

- Identifying Challenges and Providing Recommendations: To ensure that the lessons learned from this project extend beyond its immediate scope, identifying challenges that have been encountered. Consequently, it will offer some recommendations for future initiatives in this domain.

4. Methodology

4.1. Data Collection

The evaluation utilized a qualitative data collection technique. Information sources included an interview with the project coordinators and a researcher and the analysis of project documentation available in the project webpage and in the Google Drive shared folder.

The interview with DIARKAZ project coordinators and researcher included Mirko Savic from University of Novi Sad, Zhanat Jabassova from Kostanay Engineering and Economics University and Maja Dragan from FH JOANNEUM. The conversation touched on various aspects of the project, including program implementation, challenges, benefits, training for mentors, and the possibility of future collaborations. The accreditation process, the developed dual study programs, and the unique selling points for engaging companies were discussed.

4.2. Evaluation Framework

The evaluation is guided by a framework aligned with the project's objectives. Each objective has been assessed based on a set of achieved versus planned results.

4.3. Limitations

It is important to note that the evaluation is subject to certain limitations, including the reduced number of interviews, the absence of on-site visits to gain a contextual understanding of the implementation and the time-bound nature of the evaluation, which may not capture long-term impacts.

Furthermore, a significant constraint lies in the inability to thoroughly assess the project's impact on stakeholders. This is a fundamental facet of the evaluation that typically involves examining how the project has influenced a diverse range of stakeholders, including students, educators, industry professionals, and educational institutions.

5. Project Objectives and Achievements

This section provides an overview of the project's objectives and the main achieved milestones.

5.1. Objective 1: Curriculum Development

Achievements:

The project successfully developed and adapted curricula to meet the needs of industrial companies in the field of robotics and automation.

Achieved Milestones:

- A new undergraduate study program, focusing on industry automation and robotics through a dual program, has been defined and launched at three Kazakh universities, involving a combination of academic and industry-based learning. The program was launched at the three universities with a reduced number of students: 6 in KEEU, 8 in WKATU and 15 planned in INEU.
- The programs were launched with specialized international initial *ex-ante* accreditation for 5 years (institutional accreditation at Faculty level) but it is awaiting program accreditation which is expected to be finalized in November 2023.
- A Lifelong Learning (LLL) program has been conducted, offering courses at participating Kazakh universities for professionals already working in the field of IAR,

with invitations extended to regional professionals from organizations such as the Association of Automation and Robotics (KAAR) of Kazakhstan and other partner companies. The LLL program has also served to train the mentors of companies.

Recommendations:

- Continue to update and refine curricula to keep pace with industry changes.

5.2. Objective 2: Industry Involvement

Achievements:

Industry professionals actively participated in defining specific training needs.

Achieved Milestones:

- A comprehensive survey was conducted in Kazakhstan to understand the status of Industrial Automation and Robotics (IAR) and the specific needs of stakeholders in this field.
- Collaboration with industry experts and program partners to define the key learning outcomes and competencies required for experts in IAR, with a focus on the context of Kazakhstan. The learning outcomes and competences were defined jointly with industry experts in three meetings at Kostanay, Zhangir Khan WKATU Uralsk and Innovative University of Eurasia.
- Companies have been incorporated as full partners in the project, and connections have been established with certain industry and robotics associations in Kazakhstan.

Recommendations:

- Maintain industry partnerships for ongoing input into curricula development.

5.3. Objective 3: Best Practice Transfer

Achievements:

The project effectively transferred some best practices from EU countries with dual HE programs.

Achieved Milestones:

- The Steering Committee analyzed best practices, resulting in three reports. The Germany report introduces the European Framework for Dual Higher Education and the DHBW model. The Austria report focuses on dual education programs, while the

Serbian report explores the development of dual education in Serbia, including the Law on Dual Education and a higher education case study.

- The study visits to Germany, Austria (twice) and Serbia for teachers and company tutors to transfer knowledge and know-how related to dual education and IAR were postponed due to the COVID-19 pandemic but ultimately completed.
- A workshop in Kazakhstan on teaching methodology involved educators from program countries and local universities, including those participating in a new undergraduate program, as well as tutors from companies.

Recommendations:

- Regularly review and adapt these practices to the Kazakhstani context.

5.4. Objective 4: Tools and Templates

Achievements:

The project created tools and templates to facilitate the phased implementation of practical training in enterprises.

Achieved Milestones:

- The project created a Dual Education Agreement template available in the project webpage which defines the roles, responsibilities, and terms related to curriculum delivery, including assessment methods, time, expenses, confidentiality, and property rights. The templates have used with some companies like SAP LLP, KST BETON LLP, Kostanayzhobakurylys LLP and Branch Maslo-Del LLP.
- A Guide for dual methodology, including instructions for company tutors, will be developed and utilized in teaching and Lifelong Learning (LLL) programs at participating Kazakh universities, serving as a valuable resource for academic staff and industrial supervisors in dual education.
- The Career Guidance Plan, created by KEEU, outlines a comprehensive action plan for a vocational guidance campaign with specific responsibilities assigned to university units and associated deadlines.

Recommendations:

- Ensure proper training for educators and industry professionals on tool usage.

5.5. Objective 5: Demonstration of Benefits

Achievements:

Pilot programs demonstrated the benefits of dual education in robotics and automatization for stakeholders.

Achieved Milestones:

- The project marks the initial stage, which has involved a few meetings and interactions with various stakeholders.
- Three rounds of the LLL program have already been conducted in one of the universities, and two rounds have been organized in the other two universities. Additionally, courses have been arranged for educators from other colleges and universities, as well as for employees of various companies.

Recommendations:

- Disseminate findings to a wider audience to promote the benefits further.

5.6. Objective 6: Curriculum Modification

Achievements:

Methodology for modifying undergraduate curricula for practice-integrated dual paradigm was somehow developed.

Achieved Milestones:

- Following visits to program countries and a seminar on teaching methods conducted on June 18, 2021, teachers will progressively be able to create lectures and teaching materials aligned with the new course syllabi.

Recommendations:

- Monitor the implementation of this methodology and provide additional training to some teachers when necessary.

5.7. Objective 7: Continuous Exploitation

Achievements:

The project proposed dual education in robotics and automatization to other educational institutions and enterprises.

Achieved Milestones:

- One spin-off Horizon project on dual higher education in agriculture has already been undertaken, and further projects are being contemplated for the post-completion phase of the DIARKAZ project.

- Good numbers of participants and listeners have been observed in the LLL courses, and requests have been made by companies for the organization of additional courses in the upcoming year.
- DIARKAZ Plus project: this follow-up projects should develop the legislative basis for the introduction of micro-credentials in Kazakhstan.

Recommendations:

- Develop a clear strategy for the ongoing promotion and implementation of dual education in robotics and automatization.

5.8. Objective 8: Dissemination

Achievements:

Project results were successfully disseminated.

Achieved Milestones:

- The project website (http://diarkaz.kineuprojects.kz) serves as a platform for disseminating project objectives and results, offering free downloads of developed tools, reports, and research papers through an output library.
- The Final Conference will provide a comprehensive overview of the entire process of establishing dual programs in Industrial Automation and Robotics in Kazakh universities, with a focus on project achievements, program implementation, success rates, stakeholder satisfaction, and areas for improvement.

Recommendations:

- Expand dissemination efforts to reach a wider audience in Kazakhstan.
- Make the course material of the developed programs available in the web.

6. Impact and Sustainability

6.1. Impact from Stakeholders' Perspectives

The DIARKAZ project has received some positive feedback from a range of stakeholders involved in some of the initiatives, in particular educators who have been involved in field visits to partner countries and have received training on innovative teaching methodologies, and stakeholders from industry who have participated in the LLL

programs. These perspectives highlight some of the most visible impacts of this project and its potential for long-term sustainability:

- Increased Alignment between Academic Programs and Industry Needs: Among the key outcomes of the project is the adjustment of academic programs to better suit the changing industry landscape. The modification of curricula to align with these needs aims to reduce the gap between education and workforce demands and potentially enhance graduate employability.
- Enhanced Collaboration between Educational Institutions and Companies: The project's accomplishments can be partly attributed to the engagement of industry professionals and companies. The cooperative efforts between educational institutions and the business sector have allowed to shape the curricula but has also facilitated the sharing of industry expertise.
- Extended Cross-Border Networking Opportunities: The project's impact on education in Kazakhstan has extended to fostering networking possibilities with other dual higher education institutions across borders. This has led to knowledge sharing and the exchange of best practices, promoting collaboration beyond the project's immediate scope.

6.2. Long-term Sustainability

While the DIARKAZ project has laid a strong foundation, its long-term sustainability might rest on:

- Continued Commitment from Educational Institutions and Companies: For the project's success to be sustained, educational institutions and companies must remain committed to the dual education model. Their continued collaboration and support are vital for the longevity of the initiative.
- Government Support for Policy Changes: Government backing, and policy changes are crucial for the institutionalization of dual education practices. Policymakers should recognize the benefits of this model and provide the necessary support and incentives for its widespread adoption.
- Scaling the Model to Reach a Broader Audience: To ensure the broadest possible impact, the dual education model developed through the DIARKAZ project should be scaled up to reach a broader audience. Expanding beyond the current scope will enable more institutions and students to benefit from this innovative approach.
- Regular Monitoring and Adaptation of Curricula and Practices: The curriculum and practices established through the project should be subject to periodic review and adaptation to remain relevant to evolving industry needs.
- Enrollment of Students: The sustainability of the project also depends on the enrollment of students in these dual education programs. It is essential to attract and retain students in the educational institutions offering these courses, particularly given the challenges posed by the country's size and economic conditions.

7. Challenges and Recommendations

7.1. Challenges

The initiative undertaken within the framework of the DIARKAZ project faces the following challenges:

- Sustainability and Student Enrollment: A critical challenge lies in ensuring the sustainability of dual programs, with a pressing need to increase student enrollment to justify the resources allocated.
- Accreditation Process: Accreditation process in Kazakhstan is acknowledged to be very long and complex, and it may be aggravated by the limited understanding of the dual education model within the quality and accreditation agency.
- Scaling the Model: Expanding the achievements of the project to involve a broader range of educational institutions and companies represents a challenge demanding planning and appropriate allocation of resources.
- Educational innovation culture: The introduction of the dual education methodology might face resistance within Kazakhstan's higher education culture, marked by the prevalence of more traditional educational approaches.
- Capacity Building and Mentoring: Training and developing mentors for dual students is essential, requiring the establishment of specific mentor training programs for educators and company mentors.
- Language skills: It is especially crucial to enhance the English language skills of educators and mentors from companies, enabling them to actively engage in innovation projects.
- Geographical expanse: The challenge lies in sustaining the project's impact due to the large geographical expanse of Kazakhstan.

7.2. Recommendations:

To tackle the challenges and lay the basis for the project's long-term success, the following recommendations are presented:

- Scale Gradually: It is advisable to expand the project's reach incrementally, ensuring that each phase maintains quality and sustainability. A gradual approach allows for the careful attention to the evolving needs of the initiative.
- Continuous Improvement: Establish mechanisms for the continuous review and adaptation of curricula and practices. A dynamic approach is indispensable for the relevance and responsiveness of dual education in a changing industry landscape.

- <u>Focus in Other Areas</u>: Beyond the scope of robotics, exploring alternative areas of education such as agriculture can diversify the impact and opportunities presented by the project, potentially broadening its reach.
- <u>Monitoring Employability</u>: A focus on monitoring the employability of graduates is important, as it can provide insights into the effectiveness of dual programs and guide future improvements.
- <u>Mentor Training Program</u>: To address the capacity-building challenge, the creation of a comprehensive mentor training program should be a priority. Adequately trained mentors play a pivotal role in the success of dual students.

8. Conclusions

The Erasmus+ project "Promoting Dual education in robotics and automatization in Higher Education" has made substantial progress toward its objectives and it has established the foundations for the implementation of dual higher education in Kazakhstan.

The project successfully achieved its objectives in several key areas. These achievements include the new curricula development to address industry needs, active industry involvement in defining training needs, the effective transfer of best practices from EU countries, the creation of tools and templates for practical training and the dissemination of outcomes via the project's website. While the project has effectively achieved these objectives, the demonstration of the benefits of dual education in robotics and automatization and fostering methodology development for curriculum modification may require ongoing efforts.

The project successfully introduced an educational program involving robotic systems in three Kazakhstani universities. This program is a collaborative effort among the three universities who have incorporated shared courses into their curriculum. This initiative is referred to as a joint educational program, which is quite uncommon in Kazakhstan, where collaboration typically involves only two universities. The fact that three universities are working together in this manner is an important development in the landscape of higher education in Kazakhstan.

At this point in the project, the number of enrolled students is considered a key indicator concerning the impact on stakeholders. Among the indicators, the number of participants in lifelong learning courses stands out and this achievement is regarded as one of the project's best results.

The future remains uncertain, as there is a pressing need to increase the number of students. The challenge is complex when it comes to student enrollment, as Kazakhstan is a vast and sparsely populated country. These universities are quite distant from each other, requiring air travel for transportation, which presents significant challenges in

organizing student and teacher exchanges. Additionally, retaining students within the country is challenging, given that Kazakhstan is economically disadvantaged, leading to many individuals leaving the country upon gaining qualifications. The sustainability of the project is consequently a significant concern due to the scarcity of students.

The project additionally emphasized the involvement of universities located outside of the capital city, aligning with the European policy for regional development, which advocates for the participation of universities in provincial regions alongside their counterparts in capital cities.

In conclusion, the DIARKAZ project has made important progress in bridging the gap between academia and industry in Kazakhstan. Its impact and stakeholder support, coupled with a focus on long-term sustainability, will determine the potential for this dual education model to shape the future of education in the region. By maintaining the commitment of stakeholders and scaling the model, Kazakhstan will continue to benefit from this innovative educational approach, ultimately fostering a more responsive and competitive workforce for the country's evolving industrial landscape.