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DIARKAZ

External Evaluation of the Project

WP 5.4

Created by external expert

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ABBREVIATIONS:

DIARKAZ	Dual Education for Industrial Automatization and Robotics in Kazakhstan
DHBW	Duale Hochschule Baden-Wuerttemberg, Location Heilbronn, Germany
EACEA	Education, Audio-visual and Culture Executive Agency EU
GA	Grant Agreement
FHJ	FH Joanneum, Graz, Austria
HE	Higher Education
HEI	Higher Education Institution
IAR	Industrial Automatization and Robotics
INEU	Innovative University of Eurasia
KEEU	Kostanay Engineering and Economics University
LLL	Life Long Learning
LFM	Logical Framework Matrix
NEO	National Erasmus Office
PA	Partnership Agreement
PST	Project Support Team
QCT	Quality Committee Team
SC	Steering Committee
WKATU	West Kazakhstan Agrarian and Technological University
WP	Work package
WPL	Work package Leader

1. Introductory Remarks, Objectives and other Evaluations

External quality assurance was originally planned to be conducted only at the end of the project, but after the recommendation from NEO Kazakhstan, the original Work plan had been modified and external assessment was decided to be done twice: in the autumn of 2022, and in summer 2023. In the first evaluation the external expert should assess the project deliverables and first generation of dual students already enrolled at IAR study programs at two Kazakh universities (KEEU and WKATU). The first results of assessment shall give the opportunity to make changes and improvements and to monitor the second generation of students at KEEU and WKATU and the first generation at INEU, by the end of summer semester in June 2023.

The Evaluation of the quality of the developed undergraduate program and the LLL seminars is based on information and documents from the consortium, as well as comments from the NEO and the EACEA. The report is the outcome of the project activity " WP 5.4 External Evaluation", sub-activity of WP 5 "Quality Control and Monitoring" and covers the duration of the project per the initial project plan until approximately September 30th 2022. The inputs of the evaluation are materials from the project web site and internal project documents, for me accessible via the respective googledrive. Furthermore, the evaluator gathered information in direct electronic communication with some representatives of the project or consortium members.

The goal of this external evaluation is summarizing and presenting independent, neutral expert view on the strengths and weaknesses of the project's activities to DIARKAZ partners, and to all other potentially interested parties. As such, this document can be used for a follow-up of the activities initiated by the project and the development of new projects, arising from the results of DIARKAZ.

The most important basis for the evaluation is the comparison of the deliverables and schedules defined in the proposal and the grant agreement. It is conceded to the participants that adjustments and improvements with increasing knowledge and project elaboration are useful and expedient. However, they must not change the goal described in the project proposal, but must serve its better fulfilment.

Here I present the general objectives of Dual Study Education programs and on whose consideration and fulfilment my evaluation is oriented. The study program has to serve four stakeholders:

1. Students, as they will be provided the chance to connect theoretical education and practical experience through interlinking and coordinating the two learning locations at universities and companies, leading to a better understanding and application of the theory, perception of the work arena, developing social skills and increased employability.
2. Companies, as they will be provided the chance to hands-on train selected, qualified, and committed students throughout their studies in own facilities, have them ready for the companies' specific job requirements immediately after graduation without further announcement and assessment efforts, influence curriculum development for improved matching of market needs and develop close ties to universities for collaboration and in other fields like technology transfer.

3. Universities, as they will be provided the chance to have highly experienced and qualified students and close ties with companies enriching classroom sessions, guaranteeing practice relevant and applied teaching, serving the profile, reputation, and attractiveness of the university, and enhancing collaboration with the industry also in other fields (e.g., industry projects, graduation projects/thesis on real industry challenges, etc.).

4. Kazakh society and State, as they will be provided the chance to improve the efficiency of investments of resources in the educational system to enhance the employability of the academic work force, the national and international competitiveness of graduates and companies, innovation, economic development, and prosperity.

1.1 The principal outcomes of the project

(As stated in the GA):

1. The development and implementation of the courses and undergraduate program in industry automatization and robotics (IAR) at three universities in Kazakhstan, as dual education programs. IAR is defined as a process of development of machine production, in which work functions previously performed by humans, including using mechanisms, are transferred to complex online instrumentation, automatic devices and robots.
2. The establishment of lifelong learning (LLL) courses for active professional employees in the field of IAR.

1.2 EACEA Assessment

(07/22 based on technical report 09/21)

The EU has confirmed by a letter (2022-07-14), based on the technical report from September 10th 2021, the project implementation is in accordance with the Grant Agreement and the Erasmus+ Programme Guide. The project had been assessed and qualified by the EU as 'GOOD'. On summary it is stated; the report gave clear information on all activities or nearly all of the evidence needed, but they had also given a few comments and recommendations as an annex of their letter:

1. Updating of planning due to the delays caused by Covid-19 is lacking, so review of the timetable was required
2. For the activity sustainability a lack of "the measures with inserting concrete "institutional" measures (with dedicated financial/human resources)" was stated.
3. The published Quality Assurance plan measures should be reviewed
4. LLL activities should be implemented

1.3 NEO Assessment

(Based on visit on November 17, 2021 at INEU)

Along with the recognition of the positive developments Neo was concerned on several aspects

1. No indicators were provided on internal/external quality assurance of the project deliverables
2. No reports on monitoring of the project progress were made available.
3. Delays in implementing selected activities, including a guide in dual methodology; preparation of LLL courses and teaching materials were understandable due to Covid-19, but did not cause the work plan to be updated.
4. A sustainability strategy and plan in discussion with university leadership has not yet been developed. In particular, for the continuation of the BA and LLL programmes, an efficient collaboration with companies is required in the long term.
5. No activities towards wider promoting the project outputs in conjunction with D&E activities are foreseen.
6. The quality assurance process should be complemented with external assessment based on recommendations of professional experts.

1.4 Feedback Letter from DIARKAZ Project Group

In order to deal with and follow up on the above recommendations, the consortium had organized two meetings:

- Online meeting on March 24th 2022, dedicated on NEO monitoring report.
- Steering Committee meeting, organized in Heilbronn, on May 17th 2022.

Intended reactions and measures (summarized):

Here follow the statements of the consortium listed, but already extended by the actions realized in the meantime on. They will be evaluated in more detail later in the report.

1. FH Joanneum will deliver an internal quality report about all deliverables by September 2022.
2. Additional external quality evaluation (this report) in the autumn of 2022, and the already foreseen report at the end of the project. The budget is sufficient for two assessments. In the extension phase of the project, the consortium will make the corrections and improvements based on the external assessments.
3. Guide in dual methodology was finished in January 2022, in three languages.
4. Planning for LLL program was finished in 2021, and LLL courses were conducted in May 2022 by KEEU, another round followed in September 2022.
5. The revised Work plan was finished in summer 2022 and it was submitted to EACEA both with the request for the extension of the project for one year.

6. The LLL programs are focused on the target groups specified in the project proposal, especially on the professionals already working in the IAR area. Other target groups are and will be described and identified in the reports of the conducted LLL courses based on the feedback questionnaires from the participants and the companies. This analysis will indicate the needs of other stakeholders across Kazakhstan.
7. A new version of Dissemination plan was developed in the first half of 2022, where channels of dissemination are adjusted towards different and other target groups.
8. The collaboration with enterprises had continuously been improved in 2022. The templates of agreements for participation in dual study programs, appropriate in the Kazakhstan context, were prepared in July 2021 and agreements are already signed with companies.
9. The entire curriculum had been developed with emphasizing practical skills and with special attention towards versatile universal educational trajectories through dual education and stronger interlinking of HE and companies.
10. Study visits to Graz (FHJ) and Heilbronn (DHBW), after the travelling restriction were lifted for Kazakhstan partners, took place in 2022 were definitely beneficial in the development of study programs and LLL courses. The long successful experience of the FHJ and DHBW in dual programs with cooperating companies has once again pointed out that special attention has to be laid on soft and social skills, necessary for the graduates for meeting the needs of the labour market and for increasing their employability.

1.5 Internal Quality Report on Project Deliverables (5.3.2)

In this report from 13th, September, 2022, the authors from FHJ describe and evaluate the status of realization of planned activities and concrete available and missing deliverables in the DIARKAZ project. This internal quality report is based on quality plan and the related metrics and the detailed activity planning of the project. It states that 17 from approximately 70 activities are still open and have to be done. But not quite clear to me, it seems that some of the activities have been done, but the documents have not been placed on the google drive or either with a longer delay or not at all. As a consequence of this quality report, some documents for older events and activities may be placed after the appearance of the quality report.

This is especially the case for the LLL activities: It is mentioned, the lack of LLL activities, but today documents (in the meantime?) show that there were LLL courses for industry engineers and technicians at WKATU (3.3.3) and from 15/06 till 29/06 with 10 participants and also from 13/06 till 24/062022 a course for teachers at INEU LLL (report 3.3.4). So, these activities have been successfully implemented.

The report is a clear report and lists in a realistic way the project results and deliverables obtained so far, and those to be implemented in the extension phase. But unfortunately, do not indicate the fulfillment of the GA key figures in quantities as defined in the metrics report. The reason could be that the data from the three universities were not available so far. See also WP5 page 15 of this report.

2. General Overview on Project Implementation

The main goal of the project is described in the proposal and the grant agreement (GA) as:

The project will fill the existing gap in the IAR area between university education and necessary professional skills required in enterprises. Through cooperation with companies and other stakeholders sustainable joint dual study program shall be developed in Kazakhstan with an international orientation and cooperation partners and institutions from program countries. It is aimed that Kazakhstan becomes a major leader in the IAR technology in the region of Central Asia.

Development, implementation, testing and validation of bachelor programs and LLL programs in the field of industrial automation and robotics (IAR) with the introduction of dual training at three universities in Kazakhstan: Kostanay Engineering and Economics University (KEEU) named after M. Dulatov, Innovative University of Eurasia (INEU), Pavlodar and West Kazakhstan Agrarian and Technological University (WKATU) named after Zhangir Khan.

Specific objectives and outcomes of the project are indicated in the GA as follows:

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 programs in Kazakhstan.

Further, it is expected that the project will contribute, in general, to the quality and relevance of HEI's Activities in Kazakhstan and will provide an essential contribution to fulfilment of the Development Strategy "Kazakhstan - 2050", which defines the key benchmarks of the modern education system, training and retraining of personnel based on an analysis of the lack of highly qualified specialists in the economy.

The project has the intention to lead to a win-win scenario for all partners, i.e., all will benefit from of the project outputs:

1. Students by connecting theoretical education and practical experience through interlinking and coordinating the two learning locations of university and company, leading to a lower dropout and an increased employability.
2. Teachers by networking with their colleagues from other European universities in the field of dual education, IAR and modern teaching methodology.
3. Participating universities from Kazakhstan by increased relevance of engineering curricula through close ties with companies enriching classroom sessions and practice relevance. Through international networking with the partners in EU, the IAR know how and the expertise in dual education will be rapidly assembled. Hence, reputation, attractiveness and ranking of the university will increase
4. Companies by expertise from international partners and highly competent professionals in the field of IAR. The cooperation with universities allows them to participate in the curriculum development and to provide students already in the company phase with the company-specific know-how while they are still studying. This enables them to secure graduates as highly qualified professionals and to have them ready for the company specific job requirements without further training. It simplifies and improves the selection of already well-known applicants and the HR planning.
5. Employees already working in companies benefit by up-to-date technical training and updating and improving their competences in the field of IAR through on the job LLL programs.
6. HE system in Kazakhstan by improving the efficiency of investment of resources in the educational system to enhance the employability of academic work force, the national and international competitiveness of graduates and companies, innovation, economic development and prosperity. Dual study programs act as a model for other universities
7. After the project is finished, the project website will continue to exist for at least five years after the end of the project in order to share the information about DIARKAZ project to all stakeholders.

The activities of the project were split in the technical description into 6 work packages where each package was described in detail in timing and content. The evaluation will deal with the work packages in the next chapter 3.

3. Key Activities and Results Achieved

As there are no actual (11/2022) achieved key quantity data on students, companies, working hours and ECTS for practice phases available in the published documents, the evaluator had briefly launched a survey with some key questions on the implementation of the programme. Thanks to the very good and fast support of the project coordinator, Prof Savic, it was possible to obtain up-to-date figures and to evaluate the project status in addition to the information provided in the quality report from FHJ. The questionnaire form is attached in this report as the Annex.

3.1 WP1: Development of dual study program in IAR

Major Milestones:

Analysis of best practice, curriculum: learning outcomes, module descriptions, syllabus, ECTS structure, Contractual documents HEI, company, student

WP 1		Comment	Status
1.1 HE models	DHBW, FHJ, Serbia	External partner models presented, and discussed - completely done	done
1.2 Meeting with employers	KEnEU, WKATU, INEU	Three meetings implemented, high interest - completely done	done
1.3 Joint Robotic System Education Program	KEnEU, WKATU, INEU	Agreement University – Company Curriculum prepared and agreed Should be reviewed after two years	done
1.4 Agreements, Contracts	KEnEU,	Agreement University – Company Student labor contract, feedback form exists	done

Comment.

WP1.3 and WP 1.4 is acceptable for the starting period. With sometime of experience after implementation these documents may be revised and improved. The module descriptions should reflect and refer more to the interlinking of academic and practical phases. In theory, there are many – too many – subjects offered, of which some are not any more really relevant for IAR engineers. For example: electronic hardware (microprocessors), in depth knowledge of mobile applications, algorithms etc. are subjects where electronic engineers or sw specialist are nowadays required for projects.

Syllabus:

It is recommended to focus more and deeper in the future on PLC and Scada systems; the very essential fields of functional system safety and cyber security are not included.

Products, plants and processes are becoming increasingly intelligent - thanks to the embedded computer systems on which they are based. These systems combine coordinated hardware and software in a very small space and should be very reliable. This is where the necessary knowledge for the development and project planning of

automated and security-oriented systems should specifically taught. Fail safe systems and international standardization and regulations become more and more important and should be taught in fields of automation and robots. The safety of automated – in the future artificial intelligent - systems and devices and their validation and certification is essential. The operation of such systems is associated great risks and danger to man and environment. Hence, a sound design and an approval according to the laws and regulations of these technologies are very essential for companies and the society.

Agreements:

Different dual models can exist at HEIs, but they should have certain minimum requirements in common, such as: contract between university, company and students, they should know and sign an employment contract. The content of student’s practice activity should be described with learning outcomes.

3.2 WP2: Preparations for implementation of new bachelor and LLL programs

Major Milestones:

Equipment purchase, training of staff, study visits partners, reports study visit to steering committee, Guide dual methodology, courses and teaching material and LLL program prepared and published

WP 2		Comment	Status
1. Report equipment	INEU KEnEU, WKATU	Equipment redesigned, approved, ordered and all delivered completely done	done
2. Seminar teaching methodology	INEU,	Report exists, one day workshop with all project partners involved done	done
3. Guidelines dual methodology	All partners	Implemented and online in Jan 2022. In English, Kazakh, Russian done	done
4. Study visits	Serbia 12/21 Austria 05/22 Germany (05/22)	20 to 25 participants from all partners, Delayed, travel restrictions due to Covid 19, Company visits: Dematic, AT&S, Gösser, Audi, Festo, completely done	done
5. Courses and teaching material	INEU, KEnEU, WKATU	Online available only in Kazakh, not finished so far. Additional are planned at program country institutions, in the beginning of 2023. Two external reviewers shall comment	In progress
6. LLL Courses robotic systems	INEU, KEnEU, WKATU	Approved Planning for 02/03 2022 INEU 36 hrs; & KEnEU 36 hrs/professionals KEnEU 72 hrs/teachers WKATU 72 hrs	done
7. Improvement of English language skills for teachers	INEU, KEnEU, WKATU	By courses by language specialist at the universities	done

3.3 WP3: Implementation of the program

Major Milestones:

accreditation of dual IAR achieved and program implemented and started,

LLL courses conducted and finished at all three sites, quality feedback and review

WP 3		Comment	Status
1. Accreditation of study program	INEU KEnEU, WKATU	Accreditation achieved KEnEU, WKATU but not all published on HEI websites, INEU in progress, Registration done	done INEU in progress
2. Study program implemented	INEU, KEnEU, WKATU	Year: 2022 Stud: planned15 Comp:? Year: 20 /21/22 Stud: 6/6/9 Comp: 6 Year: 20/21/22 Stud: 9/8/? Comp: 7 Target number 60/year not yet achieved	Done but in progress
3. New LLL program implemented	All partners	Implemented 2022. 10 to 20 participants companies, teachers – but should be reviewed and reoffered - targets not achieved	Done In progress
4. Report on feedback and final analysis	INEU, KEnEU, WKATU All partners	Should be done in extension phase	To do

Comment:

The joint dual study program at bachelor level of three Kazakhstani universities is a common program, but each university must register the program and go through accreditation individually. Registration of the dual study program IAR in national register has been achieved and this allows according to the rules in Kazakhstan universities to enroll students in the first year. Hence, the first generation of students on dual study IAR program could start at KEEU and WKATU in January 2022, at INEU in autumn2022. Representatives of the accreditation agency visited KEEU WKATU, INEU in 2022.

The new programs have started.at all three universities, but the number of students could not reach the standard of 60 students (20 per location) per year. This is due to Covid 19 pandemic in 2020 and 2021, which made it difficult to reach students and companies.

The one-year extension phase of the project activities will be very valuable for finishing the implementation in quality and quantity. These arguments are also valid for the LLL courses.

Due to delay of activities, the feedback analysis related to external assessments, study programs, LLL courses will be done in June 2023 after the second generation of students at KEEU and WKATU and first generation at INEU have finished their semesters.

3.4 WP4: Dissemination and exploitation of the results

Major Milestones:

Project website with documents in English, Kazakh, Russian, one day seminars in each of the 3 centers for informing on LLL program, awareness of dual IAR program

WP 4		Comment	Status
1. Dissemination and exploitation plan	INEU KEnEU, WKATU	Planning (2020) exists but needs more actual activities and implementation	Done To do
2. Design of project visual identity	INEU,	Is completed but should be continued, reviewed	Done To do
3. Design and setup of project web site	All partners	Is completed but should be continued, reviewed	Done To do
4. Raised awareness for DIARKAZ	all partners	By dissemination activities, websites, meetings	done
5. Final Conference	all partners	Shifted into extension phase	To do

Comment:

There exists an extensive and very detailed dissemination and exploitation plan with Version V5 from 20/04/2020 prepared by KEnEU. Again, this version v5 is found in work package 4 but not in the actual deliverables or on the googledrive.

A further update, based on feedback from the previous measures, and actual new planning and implementation of future activities has unfortunately not be done so far. This gives the impression that most efforts were made in 2020, which was certainly an unfavorable time due to the pandemic. No activity related to dissemination in 2022 is mentioned in the documents.

I received the remark from the project coordinator, Prof. Savic, that the update of the dissemination plan is scheduled for the next steering committee meeting middle of December, as well as the discussion of the sustainability activities.

3.5 WP5: Quality control and monitoring

Major Milestones:

Plan for quality control, metrics for DIARKAZ, reports on internal and external evaluation.

WP 5		Comment	Status
1. Plan for project quality control	FHJ All partners	Has been developed in time	done
2. metrics for DIARKAZ	FHJ All partners	Exist, but should be applied for reporting Not target group specific May be too many indices (39)	Done Review!
3. Internal project control and monitoring	All partners	Should be continued and become a continuous regular process. Qualitative indices not applied	Done 09/2022
4. External evaluation	Prof. Droege SC	This report is the external evaluation, administrative bureaucratic, obstacles in contracting process Will be ready by end 2022	delayed In progress
5. Development of sustainability plan	KEEU All partners	New activity from May 2022 was planned (See extension request) See also chapter 5 of this report	Delayed In progress

Comment:

The “Quality Control and Monitoring Manual” is a deliverable within WP 5 entitled “Quality Plan” of the DIARKAZ project and the task leader the WPL (FHJ) is responsible for this WP. The leader of this WP has drafted, produced and monitored the manual, where the minimum quality requirements and mechanisms for collecting, monitoring and analyzing the management of the project are described.

The metrics and indices for evaluation have been created, but the table is too extensive. Many of the 39 questions are not appropriate for the students and also not for the companies to achieve results about the quality. I recommend a 360-degree evaluation, i.e. students evaluate the HEI and companies; companies evaluate students and HEI, and the HEI evaluates students (is done in assessments) and companies.

The internal quality report does not apply the quantitative metrics and indices and therefore, this report needs to be supplemented. Unfortunately, despite multiple written requests from the author, the FHJ did not respond and could not be reached for clarification or further information.

It also provides templates for the events (participation, feedback), meetings (agenda and minutes), reports, study visit reports, power point presentations and some more deliverables for the common design and documentation of the project.

The documents and the manual have been prepared in a timely manner and are well accessible to all partners. In the documents published on the websites, they have been used almost. The documents describe very clearly and well-structured the responsibilities of the partners and the structure of the quality assurance system.

However, the timely posting of the documents on the googledrive sometimes seems delayed and not completely. KEnEU planned to develop a new version of project sustainability plan based on the recommendations of Ursula Göz by 15.07.2022. The delay may be due to boundary conditions or can be related to the organization but also to Covid-19 Pandemic.

The work-integrated dual Study program should be evaluated at least once a year after completion of the practical phases from the perspectives of the students, companies, and universities. It should consider both learning locations. It should publish a quality report.

The steering committee and the senior managements of participating universities shall discuss the results of the evaluations, draw conclusions and follow up on their implementation. HEI shall inform companies and students about the basic results of the evaluations.

3.6 WP6: Project Management

Major Milestones: reports on meetings, 2 annual reports to Steering Committee

WP 6		Milestones, Comment	status
1. Organization of coordination meetings	Coordinator All partners	The consortium had seven Steering Committee meetings (target 6) 4 virtual, 3 face-to-face	done in progress
2. Coordination of overall project activities	coordinator	difficulties due to Covid-19 and situation in Kazakhstan. Partly only online possible	done in progress
3. Local project management	All partners	Delayed and only 4 meetings implemented and all online	Delayed continued
4. Reporting	Serbia (12/21) Austria (05/22) Germany (05/22)	20 to 25 participants from all partners, Delayed due travel restrictions due to Covid 19, Company visits in Austria, Germany	done in progress

Comment:

The SC meeting activity is a regularly activity (biannual) and so far, the consortium had met in seven Steering Committee meetings. The last meeting was organized in Heilbronn, Germany, at DHBW. In September 2022. Two more are planned in 2023.

All minutes of SC meetings can be found at the project website

The coordination of overall project activities is also a measure that has to accompany the project continuously during its lifetime. The difficulties due to Covid-19 and temporarily unstable conditions in Kazakhstan have had a disadvantageous effect. Only three meetings were possible face-to-face. But all partners are committed and are engaged in certain activities of each WP. In the extension phase, more favorable working conditions are assumed.

Local project management was slowed down due to delays in administration and because of COVID-19 pandemic and other circumstances. The LC meetings are a regularly activities will be organized meetings in 2022 and 2023. This activity is the key for improving dissemination of project results and reaching the intended key indices.

4. Sustainability of the Project Results

Conditions and measures for sustainability of the project results have been discussed, created and listed by all participants of DIARKAZ project. If the generated project outcome – better qualification of graduates – according to the needs of the national labor market and the enterprises can be achieved, then a solid base for achieving longtime sustainability is laid. All outcomes have already been mentioned in the discussion of the work packages above.

The sustainability is a particularly crucial goal and can often only be achieved in a longer period of time and with adjustments to the study model. We know from other dual study projects that this goal is usually often first achieved when the first graduates are working successfully in the companies - usually after about 5 years. The convincing arguments for the companies are these highly motivated and committed new employees. Only then do the companies realize that this cooperation is a win-win situation for them: training students together with the university and supervising according to their business needs and technologies. Therefore, it is important that politics, the HEI and the companies have patience and do not end such projects because the target numbers have not been reached at the beginning. A typical example is the German DHBW, which in the first years was often only able to achieve 50% or less of the target numbers for their courses and by reorienting itself to the needs of companies was able to grow slowly but very steadily to what is now the leading role in Europe with around 35,000 students and over 7,500 companies participating. It is also interesting to note that there the legal and statutory structuring only took place once the model had been successfully established. This shows that such models can often be established within the existing legal framework.

As already mentioned, sustainability is the crucial issue of the project that determines the success. Therefore, both ECEA and NEO have rightly (see 1.2 and 1.3) emphasized it. It is the goal that must be in the foreground in the extension. Hence, here some informal suggestions

follow for the internal discussion of the project group; they come from my personal experience of being involved setting up dual study programs and achieving their accreditation in other countries such as Germany (DHBW, FH), France, UK, Switzerland, Jordan, Canada, USA, etc.):

- Guidebook on standards and procedures for implementation and accreditation of dual study programs must be kept up to date and supplemented by best practice examples and experiences in dual study in Kazakhstan.
- Organize conferences and especially open days for potential students, devoted to the presentation of the study model, if possible, combined with participation in open lectures and booths where companies present themselves.
- It is important that the senior management and the faculties of HEIs strongly support the set-up of these study programmes and are always informed about the latest status.
- Energy must be put into public advertising, informing employment agencies and teacher and students of high schools. In editorial articles and interviews of newspapers and media institutions, reference should be made to the model.

5. Further Recommendations and Considerations

Dual study programs should be open and introduced to other faculties and programs starting at the cooperating HEIs. In many countries successfully offering HE dual study programs most students are enrolled in business administration (with tourism, banking, logistics etc. or health sector), business information systems or industrial engineering. In fact, in these disciplines, that do not require special infrastructure and complex production machinery and laboratories, it seems to be much easier to find potential students and interested companies for this model.

1. The structure of the dual study program should become more transparent and clearer. The study model can be kept simple, flexible and transparent, if the practicable phases are interlinked to theory related to content and organization, and understood as another form of delivery (social) knowledge. Then only a few regulations and documentation are required:
 - A memorandum of understanding (MoU), agreement or contract has to be signed by HEI and companies regulating specifics of dual studies and the obligations of the parties. The students should know their obligations in the company. The MoU should regulate type of workplace and student's supervision in the practical phases, this includes the status of a student (work contract, assessment, payment?)
 - Qualification, eligibility criteria, approval and monitoring procedures for a participating company have to be stated. For example, something like this:
Companies must meet technical and personnel requirements (sufficient staffing capacity and equipment), enabling them to provide the students with work placements in line with the study program and the scheduled content of the practical phase.
 - Module descriptions for practical phases and an existing or new accreditation is required
 - Compliance with any further insurance or legal regulations according Kazakh laws.

2. A joint committee (max 12 to 15 persons) with representatives of HEIs, companies and accreditation agencies - and for the first years may be national/international experts - should be established to define the Kazakh minimum requirements for a dual study program, some points are mentioned in point 1. In particular the minimum amount of practical training (e.g., 1500 hours, divided into several phases) should be defined.
3. Each HEI should flexibly set up its own study model, observing the minimum requirements. Hence, different dual study models can be implemented: HEI can offer it related to a separate degree program or as an optional track within an existing degree program.
4. Establishing a quality assurance system, that regards the needs from the perspectives of all stakeholder. As said in WP5 (this report), this includes annual reports and their discussion.
5. As far as possible, graduation projects should be conducted and implemented in collaboration with and in the working environment of the companies on real challenges taken from the fields with relevance for the companies. The projects become the intellectual property of the companies and provide an incentive to participate in the study model, because they also give access to the know-how of the universities.

6. Conclusions

The conclusions follow directly from the facts presented above. The DIARKAZ project has delivered good results, until the writing of this report. Most of the planned and important activities were successfully started and many have been already finished and are performed in accordance with implementation plan (GA). It was a logical decision by ECEA to follow the request for an extension of the project by one year so that the project objectives can still be achieved despite the difficult political and epidemic obstacles in Kazakhstan.

With the request for extension the activity workplan has been updated. The 6 work packages and their sub activities were very ambitious, especially related to the key quality measurement indicators like number of students and participating companies. The field of robotics and industrial automation is a very important, but also very specific and limited sector from the point of view of the companies being active in it.

The internal quality report (5.3.3) is not enough informative, the quantitative key figures are missing, the indices are not formulated appropriately for the stakeholders HEI, companies and students and are too extensive and overlapping. A revision is recommended.

The quantitative target figures could not be achieved in the time available. The main reason for the delay of some activities and their realization is due to the COVID-19 world pandemic. In 2020 and 2021, no face-to-face meetings and no visits of EU partners were possible. However, the project management managed well to switch the cooperation to virtual electronic communication and to implement many work packages.

The visits of the Austrian and German companies and universities could then be perceived through the visits in 2022. Hence, by end 2022 the most part of the lacking results, mentioned in the NEO and ECEA reports from state 2021, could already be achieved. More precisely, the external expert assumes, the delays and now still missing results can and will be compensated in the extension phase 2023 of the project.

The extended duration of the project should be used for some additional modifications, which were not initially planned. I see the biggest deficit is the low number of enrolled students and cooperating companies and consequently a high danger for sustainability. The specialisation in IAR-robotics may also be a hindrance. Even in the industrialised nations, these are numerically very specialised courses with only few enrolled students. My suggestion (see 3.1 my comment WP1: Development of dual study program in IAR) is therefore to pay also attention to general automation and the areas of functional safety and fail-safe systems. These automation topics play an increasingly important role today and are essential in a very wide range of technology, for example from automated driving to material flow and medical technology.

Since, as mentioned, the internal report did not provide key figures, the author had to conduct a questionnaire and it was answered from the three participating Kazakh universities – the form is attached – and yielded the following results. It is noticeable that there are differences in the number of hours a student works in companies. Furthermore, it must be noted that not all activities of the total practical working time can be counted for the ECTS calculation, because typically in a company there are also side activities and tasks not related to the study objective.

Item	INEU	KEEU	WKATU
Start of IAR	2022	2020	2020
ECTS -Bachelor	240	240	240
separate program	yes	yes	yes
As add-on for "normal" tracks			yes
IAR accredited	In progress	yes	yes
Credits for practical phases	30	118	30
Working hours in company	1350	70 weeks – 2950??	1740
MoU, agreement	no	yes	yes
Renumeration for student	no	Yes	yes
Quality evaluation by students/companies	No/no	Yes/yes	Yes/yes
Number enrolled students 2020/2021/2022	0/0/?	6/6/9	9/8/?
Number companies 20/21/22	0/0/?	1/1/4	0/2/5

This rough survey and evaluation show that the three locations - while still accepting different study organisations - urgently need to coordinate their activities.

Unfortunately, the number of students - as already noted - is currently far from the target figures.

According to the project description in GA, the target numbers are 20 students and 20 companies per site and per year. Both have not yet been achieved and it will be very difficult to reach these figures in 2023. The number of companies is not as crucial as the number of students, since large companies can also hire several students. For sustainability, however, it is also important to have enough companies that hire students every year, even if the first ones have not yet graduated.

Hence the project target group needs some rectifications (together with initially planned activities) for improving the outcomes and helping to increase the number of participating students and companies. This will lead to a better sustainability for the future.

Having in mind that the legislative formalization of dual education in HEI is still under process in Kazakhstan, it is realistic to assume that the project's achievements and success can initiate similar changes at other HEI. Improvement of employability for graduates and meeting the human resources needs of the companies as well as offering LLL courses for active employers make this project important and essential for the society in Kazakhstan.

There is no doubt that in the remaining time of the project, additional outcomes will be achieved, which will help to fulfil the goal of the project as stated in GA. Even, if the target key numbers cannot be achieved in 2023, I rate the project as successful and recommend its continuation then with own funds. The set-up of dual study programmes usually takes 5 years and more.

The evaluator would like to thank all consortium partners, and especially coordinator, for their open and constructive cooperation, which were essential for carrying out of the external monitoring report. All my questions - which may be perceived to be annoying - were dealt with promptly, effectively and in a friendly manner.

DIARKAZ Status Form for existing/planned Dual Education (DE)

Prof. Karl-Heinz Droege, external evaluator of the project karl39a@t-online.de

Dear partner of the EU DIARKAZ project

I have been appointed as the external evaluator (WP5.4) for this project and I need your help.

With the following questionnaire I want to get some information on the project at your university. The results shall help to improve the study model for you and future students.

Please take your time and fill a form for each program separately and send it to karl39a@t-online.de

Please answer fast, I hope to receive your answer within one week.. Thanks for your cooperation!

University /Faculty/Department	KEEU <input type="radio"/>	INEU <input type="radio"/>	WKATU <input type="radio"/>
Title of dual study program			
Program director/contact/mail			
How many years (till graduation)		Degrees (D iploma, B achelor/ M aster)	
Accredited	Yes <input type="radio"/>	Total credit hours of program	credits:
Separate DE program? or Is it add-on for selected students from normal courses?	Yes <input type="radio"/> Yes <input type="radio"/>	If credits are granted for practice - only for practice - total credit hours	credits:
Final year projects in company Is it compulsory?	Yes <input type="radio"/> No <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/>	Credits for final year project/thesis	credits:
Number participating students	2020:	2021:	2022
Number participating companies	2020:	2021:	2022
Practical Phases	How many working hours for a student (totally)		hours:
How many practical phases	No: <input type="radio"/>	How long each phase?:	In weeks:
module descriptions for practice?	Yes <input type="radio"/> No <input type="radio"/>	Assessment of practice & reports?	Yes <input type="radio"/> No <input type="radio"/>
Exist Student-company contract?	Yes <input type="radio"/> No <input type="radio"/>	Student remuneration for practice	Yes <input type="radio"/> No <input type="radio"/>
Exist criteria for selection, eligibility of companies	Yes <input type="radio"/> No <input type="radio"/>	Comment:	
Supervision of students by university tutors at company?	Yes <input type="radio"/> No <input type="radio"/>	Exist joint board/ meetings with participating companies	Yes <input type="radio"/> No <input type="radio"/>
Quality evaluation by students?	Yes <input type="radio"/> No <input type="radio"/>	Quality evaluation by companies	Yes <input type="radio"/> No <input type="radio"/>
Free Comment			