Project Acronym: MEDIS

Project Title: A Methodology for the Formation of Highly Qualified Engineers at Masters Level in the Design and Development of Advanced Industrial Informatics Systems

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Context

WP 8	Exploitation
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Dependencies	
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1. Table of Contents

1 Executive summary

This deliverable presents the report on the exploitation of the MEDIS Project results.

2 Exploitation plan

Exploitation includes a set of actions to provide the sustainability of the MEDIS project results. Exploitation plan consist of:

1.Involvement in new projects basing on the achieved project results..
2. Involvement in professional networks.
3. List of stakeholders interested in project results.
4. List of new programs and courses developed on the base on project courses.

3 Involvement in new projects

3.1 UPV

Erasmus+ Project (KA2) Blended Learning Initiative for master Students Specialization in Cyber-Physical Systems - BLISS	– University of Porto – National Technical University of Ukraine "Kyiv Polytechnic Institute"; – Kazakh National University – Atyrau Atate University – Georgian Technical University. – Batumi state University – University of Stuttgart – Polytechnic University of Valencia – University of Malardalen	Promote the use of Blended Learning as a suitable methodology to facilitate quick learning in advanced technological domains. • Promote transfer of knowledge on CPS from EU to non-EU universities (students and teachers) through prepared learning materials. • Enhance CPS-related career opportunities of non-EU students by means of combining study and work using the Blended Learning methodology. • Attract more students to learn CPS and by that also contribute to increase the number of students in technology, to raise the rate of the involved universities and thus improve their conditions to attract funding.	Methodological approach of the AIISM-PBL developed as the result of the MEDIS Project is adopted by the BLISS Project, This methodology will be used whily developing of new educational programme for training and retraining of highly qualified specialists in Cyber-Physical Systems.

Erasmus+ Project, IIS, EDUCATIONAL PROGRAM "INDUSTRIAL INFORMATION SYSTEMS" BACHELOR, 4-YEAR TRAINING – IIS	– University of Porto – Polytechnic University of Valencia – Kazakh National University – University of Stuttgart – University of Maelardalen	improve the quality of higher education and enhance its relevance for the labour market and society; improve the level of competences and skills in HEIs by developing new and innovative education programme - educational program "Industrial Information Systems" bachelor, 4-year training – IIS; implementation of educational program "Industrial Information Systems" bachelor, 4-year training in partners universities.	Using the developed courses and methodology of MEDIS project approach, exploitation of the equipment purchased within the MEDIS project, The same Medis project work team.

3.2 USTUUTT

Erasmus+ Project (KA2) Blended Learning Initiative for master Students Specialization in Cyber-Physical Systems - BLISS	– University of Porto – National Technical University of Ukraine “Kyiv Polytechnic Institute”; – Kazakh National University – Atyrau Atate University – Georgian Technical University. – Batumi state University – University of Stuttgart	Promote the use of Blended Learning as a suitable methodology to facilitate quick learning in advanced technological domains. • Promote transfer of knowledge on CPS from EU to non-EU universities (students and teachers) through prepared learning materials. • Enhance CPS-related career opportunities of non-EU students by	Methodological approach of the AIISM-PBL developed as the result of the MEDIS Project is adopted by the BLISS Project, This methodology will be used whily developing of new educational programme for training and retraining of highly qualified specialists in Cyber-Physical Systems.

	– Polytechnic University of Valencia – University of Malardalen	means of combining study and work using the Blended Learning methodology. • Attract more students to learn CPS and by that also contribute to increase the number of students in technology, to raise the rate of the involved universities and thus improve their conditions to attract funding.	

3.3 MDU

Erasmus+ Project, IIS, EDUCATIONAL PROGRAM "INDUSTRIAL INFORMATION SYSTEMS" BACHELOR, 4-YEAR TRAINING – IIS	– University of Porto – Polytechnic University of Valencia – Kazakh National University – University of Stuttgart – University of Maelardalen	improve the quality of higher education and enhance its relevance for the labour market and society; improve the level of competences and skills in HEIs by developing new and innovative education programme - educational program "Industrial Information Systems" bachelor, 4-year training – IIS; implementation of educational program "Industrial Information Systems" bachelor, 4-year training in partners universities.	Using the developed courses and methodology of MEDIS project approach, exploitation of the equipment purchased within the MEDIS project, The same Medis project work team.

Erasmus+ Project (KA2) Blended Learning Initiative for master Students Specialization in Cyber-Physical Systems - BLISS	– University of Porto – National Technical University of Ukraine “Kyiv Polytechnic Institute”; – Kazakh National	Promote the use of Blended Learning as a suitable methodology to facilitate quick learning in advanced technological domains. • Promote transfer of	Methodological approach of the AIISM-PBL developed as the result of the MEDIS Project is adopted by the BLISS Project, This

	University – Atyrau Atate University – Georgian Technical University. – Batumi state University – University of Stuttgart – Polytechnic University of Valencia – University of Malardalen	knowledge on CPS from EU to non-EU universities (students and teachers) through prepared learning materials. • Enhance CPS-related career opportunities of non-EU students by means of combining study and work using the Blended Learning methodology. • Attract more students to learn CPS and by that also contribute to increase the number of students in technology, to raise the rate of the involved universities and thus improve their conditions to attract funding.	methodology will be used whily developing of new educational programme for training and retraining of highly qualified specialists in Cyber-Physical Systems.

3.4 UP

The University of Porto has used the Advanced Industrial Networks and fieldbuses Module" developed within the current project as the basis for a summer school program on Industrial Automation and Communication. The students also follow a problem based learning approach, and are given the opportunity to practice with the industrial equipment - Schneider, Siemens, Omron, Codesys, Isagraf, Beremiz PLCs and remote I/Os, and Profibus, Devicenet, CANopen, and Modbus (TCP, RTU and ASCII) industrial networks. The first instance of the course was held in 2016, and was attended by students from Al-Farabi Kazakh National University. The UP has also been invited to teach a variation of the Advanced Industrial Networks and Fieldbuses Module that also includes an overview of programming of Programmable Logic Controllers (PLCs) according to the IEC 61131-3 standard. This short course was as offered at Al-Farabi Kazakh National University over a single week.

Erasmus+ Project (KA2) Blended Learning Initiative for master Students Specialization in Cyber-Physical Systems - BLISS	– University of Porto – National Technical University of Ukraine "Kyiv Polytechnic Institute"; – Kazakh National University	Promote the use of Blended Learning as a suitable methodology to facilitate quick learning in advanced technological domains. • Promote transfer of knowledge on CPS	Methodological approach of the AIISM-PBL developed as the result of the MEDIS Project is adopted by the BLISS Project, This methodology will be

	– Atyrau Atate University – Georgian Technical University. – Batumi state University – University of Stuttgart – Polytechnic University of Valencia – University of Malardalen	from EU to non-EU universities (students and teachers) through prepared learning materials. • Enhance CPS-related career opportunities of non-EU students by means of combining study and work using the Blended Learning methodology. • Attract more students to learn CPS and by that also contribute to increase the number of students in technology, to raise the rate of the involved universities and thus improve their conditions to attract funding.	used whily developing of new educational programme for training and retraining of highly qualified specialists in Cyber-Physical Systems.

Erasmus+ Project, IIS, EDUCATIONAL PROGRAM "INDUSTRIAL INFORMATION SYSTEMS" BACHELOR, 4-YEAR TRAINING – IIS	– University of Porto – Polytechnic University of Valencia – Kazakh National University – University of Stuttgart – University of Maelardalen	improve the quality of higher education and enhance its relevance for the labour market and society; improve the level of competences and skills in HEIs by developing new and innovative education programme - educational program "Industrial Information Systems" bachelor, 4-year training – IIS; implementation of educational program "Industrial Information Systems" bachelor, 4-year training in partners universities.	Using the developed courses and methodology of MEDIS project approach, exploitation of the equipment purchased within the MEDIS project, The same Medis project work team.

3.6 KazNU

Name of the project	Partners	Objectives of the project	Exploitation of the MEDIS results (brief description)
Erasmus+ Project, IIS, EDUCATIONAL PROGRAM "INDUSTRIAL INFORMATION SYSTEMS" BACHELOR, 4-YEAR TRAINING – IIS	– University of Porto – Polytechnic University of Valencia – Kazakh National University – University of Stuttgart – University of Maelardalen	improve the quality of higher education and enhance its relevance for the labour market and society; improve the level of competences and skills in HEIs by developing new and innovative education programme - educational program "Industrial Information Systems" bachelor, 4-year training – IIS; implementation of educational program "Industrial Information Systems" bachelor, 4-year training in partners universities.	Using the developed courses and methodology of MEDIS project approach, exploitation of the equipment purchased within the MEDIS project, The same Medis project work team.
Erasmus+ Project, ModEast: Skill-based modernization of curricula in Eastern countries in the area of computer engineering	Aristotle University of Thessaloniki; University of Groningen; University of Bonn; ZettaComputics GbR ; Web2Learn; Kazakh National University	Aim of the project is to modernize existing MSc Software Engineering curricula of Eastern countries, based on their national priorities/needs and global trends in software engineering research and practice. Based on this goal various objectives have been set, categorized into three classes: technical, social, and cooperation objectives	Using the developed courses and methodology of MEDIS project approach, exploitation of the equipment purchased within the MEDIS project, The same Medis project work team
Erasmus+ Project	– University of Porto	Promote the use of	Methodological

(KA2) Blended Learning Initiative for master Students Specialization in Cyber-Physical Systems - BLISS	– National Technical University of Ukraine “Kyiv Polytechnic Institute”; – Kazakh National University – Atyrau Atate University – Georgian Technical University. – Batumi state University – University of Stuttgart – Polytechnic University of Valencia – University of Malardalen	Blended Learning as a suitable methodology to facilitate quick learning in advanced technological domains. • Promote transfer of knowledge on CPS from EU to non-EU universities (students and teachers) through prepared learning materials. • Enhance CPS-related career opportunities of non-EU students by means of combining study and work using the Blended Learning methodology. • Attract more students to learn CPS and by that also contribute to increase the number of students in technology, to raise the rate of the involved universities and thus improve their conditions to attract funding.	approach of the AIISM-PBL developed as the result of the MEDIS Project is adopted by the BLISS Project, This methodology will be used whily developing of new educational programme for training and retraining of highly qualified specialists in Cyber-Physical Systems.

3.7 PSU

Name of the project	Partners	Objectives of the project	Exploitation of the MEDIS results (brief description)
The project of training engineers Pavlodar region within the framework of the national program for industrial/innovation development of the republic of Kazakhstan, 2015-2019 pages/national-program-industrialinnovation-development-republic-kazakhstan-2015-2019	- Universitat Politecnica de Valencia - LLP «KSP Steel» - PF LLP "Casting" - JSC "Kazakhstan Aluminum" - "Kazakhstan Electrolysis Plant" - LLP	Training of engineers of Pavlodar region in the field of industrial informatics, management controllers and simulators.	design and development of author educational Master’s programmes for training engineers on specialties 6M070900 “Metallurgy”, 6M072100 “Chemical Technology of Organic Substances”

	"Prommashkomplekt" - LLP "Technological lines" - LLP "Pavlodar Petrochemical Plant" - LLP "Neftechim LTD» - LLP "UPNK-PV"		to develop skills in the field of industrial informatics, management controllers and simulators basing on developed MEDIS courses and in the equipped Labs

3.8 NTUU-KPI

Name of the project	Partners	Objectives of the project	Exploitation of the MEDIS results (brief description)
Erasmus+ Project (KA2) ParIS – Partnership in Information Security	– National Technical University of Ukraine "Kyiv Polytechnic Institute"; – University of Luxembourg; – University of Lisbon; – Warsaw University of Technology.	The main objective of the ParIS Project is the establishment of strategic partnership in the field of information security. Especial attention of the project is paid to links with potential employers, in particular companies, industries, and governmental organizations.	Methodological approach of the AIISM-PBL developed as the result of the MEDIS Project is adopted by the ParIS Project, what facilitates the development of new educational programme for training and retraining of highly qualified specialists in information security.

3.9 ONPU

Name of the project	Partners	Objectives of the project	Exploitation of the MEDIS results (brief description)
Erasmus+ Project (KA2) Blended Learning Initiative for master Students Specialization in Cyber-Physical Systems - BLISS	– University of Porto – – National Technical University of Ukraine "Kyiv Polytechnic Institute"; – Kazakh National University – Atyrau Atate University – Georgian	Promote the use of Blended Learning as a suitable methodology to facilitate quick learning in advanced technological domains. • Promote transfer of knowledge on CPS from EU to non-EU universities (students and teachers) through prepared learning	Methodological approach of the AIISM-PBL developed as the result of the MEDIS Project is adopted by the BLISS Project, This methodology will be used whily developing of new educational programme for training and retraining of

	Technical University. – Batumi state University – University of Stuttgart – Polytechnic University of Valencia – University of Maelardalen	materials. • Enhance CPS-related career opportunities of non-EU students by means of combining study and work using the Blended Learning methodology. • Attract more students to learn CPS and by that also contribute to increase the number of students in technology, to raise the rate of the involved universities and thus improve their conditions to attract funding.	highly qualified specialists in Cyber-Physical Systems.

3.10 SPbPU

Name of the project	Partners	Objectives of the project	Exploitation of the MEDIS results (brief description)
573545-EPP-1-2016-1-DE-EPPKA2-CBHE-JP ERASMUS+/APPLE "Applied curricula in space exploration and intelligent robotic systems"	Technische Universitat Berlin – the coordinator; Tallinn University of Technology, Praga Technical University, RU – 7 (including SPbPU) BY -5 universities, KZ – 7 universities		Exploitation of the equipment purchased within the MEDIS project, teaching the MEDIS courses for students/

3.11 PetrSU

As a result of implementation the pilot course and materials proposed by the MEDIS project PetrSU started a new project in the sphere of automation of industrial processes.

Project title: "The cloud service for the automation of planning of corrugated packaging production"

Brief description: The service works as WEB application and can work as stand-alone application or can be integrated with another information systems with SOA (Service Oriented Architecture) technology support.

Using of service calculation results can give to production enterprise a significant economic effect due decreased trim losses by 1-2%. Material costs contain 70-80% of ready good price. The service using can reduce a product cost on 3-5%.

The cloud service allows the company to use more effective approach to the information

system selection.

4 Involvement in professional networks

The PC universities are involved in the following company networs:

4.6 KazNU

Medis project work team organized the Workshop **"**Formation of highly qualified engineers within IIDSP-2**" (**Industrial and Innovative Development STATE PROGRAM -2**)** to discuss results of project. It was hosted by the al-Farabi Kazakh National University and had taken place on June 1-5, 2016. Eltex (industrial company)

and PIT Alatau (park of innovation technology) invited them to show companies works. It shows a big interest of industrial company to Medis project results.

15 students which learned all 5 Medis courses are working on Labwork at Eltex company now.

The results of workshop were published. https://www.dropbox.com/home/Tempus-MEDIS-shared-data/work-packages/WP8-Exploitation/Workshop-KazNu?preview=book+Medis+Almaty+WorkShop.pdf

After the discussion of the MEDIS projects results the industrial companies sent letters of support to Information system department of KazNU and the letters with detail analysis of educational program where Medis project courses were implemented.
The Letter of Supports is attached.

4.7 PSU

4.8 NTUU-KPI

The MEDIS Project has been presented to the members of the professional Association "IT Ukraine", which unites more than 40 leading IT-companies of Ukraine:

The results of MEDIS Project have been discussed. The positive response from stakeholders is received. Several companies have already addressed their Letters of Support to the Faculty of Applied Mathematics of the NTUU "KPI". In particular, Video Internet Technologies (VIT) Company (), which is a leading producer of intelligent systems, video surveillance and security systems, their hardware and software, is expressed its interest to employing graduates of the Faculty of Applied Mathematics of the NTUU "KPI", who have been taught according to the MEDIS Project methodology. Another example is the IT-company Miratech (), which is named in FORTUNE magazine as one of the best 100 outsourcing service providers.

4.9 ONPU

MEDIS project was introduced to the representatives of IT Cluster of Odessa, which represents 17 companies and 22 partner-organizations not only in IT sphere, but in such spheres like education, development, business and marketing of Odessa Region.
Non-Governmental Public organization «IT cluster Odessa», combining IT-companies and educational institutions of Odessa for the development of information technologies in our city, expresses its sincere gratitude for the demonstration of new approaches and achievements in the field of development and implementation of methods of problem-oriented and competence-based approach in teaching process, implemented on the basis of the Institute of Computer Systems of Odessa National Polytechnic University. After the discussion of the MEDIS projects results the company granted its letter of support and intend to our project and summarized that the efforts to improve the quality of educational programs in of training courses in the field of technical systems with the support of Ukrainian and foreign companies contribute to the production of

contemporary knowledge of students and improve the quality of engineering education. The Letter of Supports is attached.

4.10 SPBSPU

University Network «Synergy»
Petersburg State Polytechnic University
National Research University "MEI"
- Baltic State Technical University "Voenmech"
- Omsk State Technical University
- Karaganda State Technical University (Kazakhstan)
- Sevastopol National Technical University
Concern "Festo"
Associated partners:
- Belarusian-Russian University (Belarus)
- University of Le Quy Don (Vietnam)
- Kaliningrad State Technical University
- Yaroslav-the-Wise Novgorod State University

The objectives of the network: cooperation of the universities in the field of science and education for the development of innovative systems engineering design methods and management techniques in the fields:

- Industrial automation and;
- Control and robotic systems;
- Motion control of autonomous vehicles;
- Energy facility management.

Exploitation of the MEDIS results:
Development of the author educational programmes for training and retraining of highly skilled experts in the field of advanced technology design and operation of control systems and technologies basing on developed MEDIS courses and in the equipped Labs

4.11 PetrSU

Project results were highly evaluated by the local staff as a result 3 members of the MEDIS project were involved in activities of Innovation technology park of PetrSU

Brief description of the network

Innovation technology park is formed as a result of realization of the Innovative infrastructure development program for the promoting of high-tech products, created on the basis of scientific and educational, intellectual and technological potential of PetrSU by means of uniform policy forming and coordination of the activity of all the participants, common scientific works.

Now technopark is a key part of innovative infrastructure, it contains departments and small innovative enterprises founded by PetrSU, which carry out innovation and industrial activity in scientific and innovative areas.

Supporting link:

Also members of the MEDIS project were included in the professional network of the Automation Systems Center (until 06 April 2015 - PetrSU-Metso Automation Systems Center) was founded in September, 2002 with the assistance of Metso Automation Inc (Finland) on the basis of Northern European Open University PetrSU and the

department of applied mathematic and cybernetics of PetrSU. The main goal of the Center creation is rising of the efficiency of department work in accordance with customer enterprise and organization agreements.

5 List of stakeholders interested in project results

The PC universities have got support from the following stakeholders:

5.6 KazNU

Universities and University research centers:

Information System Department of KazNU has agreement with 154 Universities and Research centers. The list can be found here

It was signed agreement with Medis project partners UP, UPV and SPBSPU during this MEDIS project.

Industrial companies:

It was written letter to 910 industrial companies during the Medis project. List of industrial stakeholders (Name, address, phone number, email) can be found here

46 students which were involved in MEDIS project have chosen 11 industrial companies for their labor practices. Travelling, accommodation expenses were paid by KazNU.

5.7 PSU

Universities:

1. Tomsk State University (Russia) – double degree master program “Physics”, образовательная траектория «Информационные процессы и системы»
2. Universitat Politecnica de Valencia

University research centers:

1. Центр информатизации образования

Kazakhstan companies:

Metallurgical enterprises

1. LLP «KSP Steel»
2. PF LLP "Casting"
3. JSC "Kazakhstan Aluminum"
4. "Kazakhstan Electrolysis Plant"
5. LLP "Prommashkomplekt"
6. LLP "Technological lines"

Petrochemical Company

7. LLP "Pavlodar Petrochemical Plant"
8. LLP "Neftechim LTD»
9. LLP "UPNK-PV"

5.8 NTUU-KPI

Universities:

- ENSTA ParisTech (France) – Double Degree Program in Engineering Mathematics
- Lappeenranta University of Technology (Finland) – Double Degree Program in Technomathematics

- Carinthia University of Applied Science (Austria) – academic exchange programs in Industrial Mathematics and Electronics

IT-Companies:

- Video Internet Technologies (VIT)
- Miratech
- EPAM Systems
- DataArt
- GlobalLogic
- Luxoft
- Softserve

5.9 ONPU

- "Sigma Software" LLC
- Luxoft Holding, Inc.
- «IT cluster Odessa»
- «Videosolutions Group» Company

5.10 SPbPU

Universities:

3. City University London (UK) – double degree program "Intelligent systems"BRIDGE Project
4. Leibniz University of Hannover (Germany) double degree program in the field of Mechatronics
5. Lappeenranta University of Technology (Finland) double degree program in the field of Technomathematics

University research centers:

2. Research institute "Mathematical modelling and intelligent control systems"
3. Academic Competence Centre SAP

Russian companies:

- Holding company "Leninets",
- Electropribor, Center of certification "Alf"
- Branches of Russian Academy

Foreign companies:

- Festo,
- National Instruments,
- Schneider Electric,
- Siemens AG

5.11 PetrSU

Foreign companies:

- METSO AUTOMATION INC
- OUTOTEC

Scans of endorsement letters were provided.

Russian companies:

PetrSU Head of the Innovation Department

6 List of new programs and courses developed on the base on project courses

6.6 KazNU

On the base of Medis project result KazNU developed educational programs 5B070300, 5M070300 - INDUSTRIAL INFORMATION SYSTEMS for 2017-2020. The aim of the educational program is Formation for the students a complex knowledge and skills needed to design, support and development of industrial information systems for management of industrial production. KazNU invited in December 2016 the next Medis partners to develop new educational programs.

UPV- Houcine Hassan, Carlos Dominguez

UP- Mario de Sousa

SPbPU- Slava Potehin

NTUU-KPI-Igor Tereikovsky

MDU – Radu Dobrin

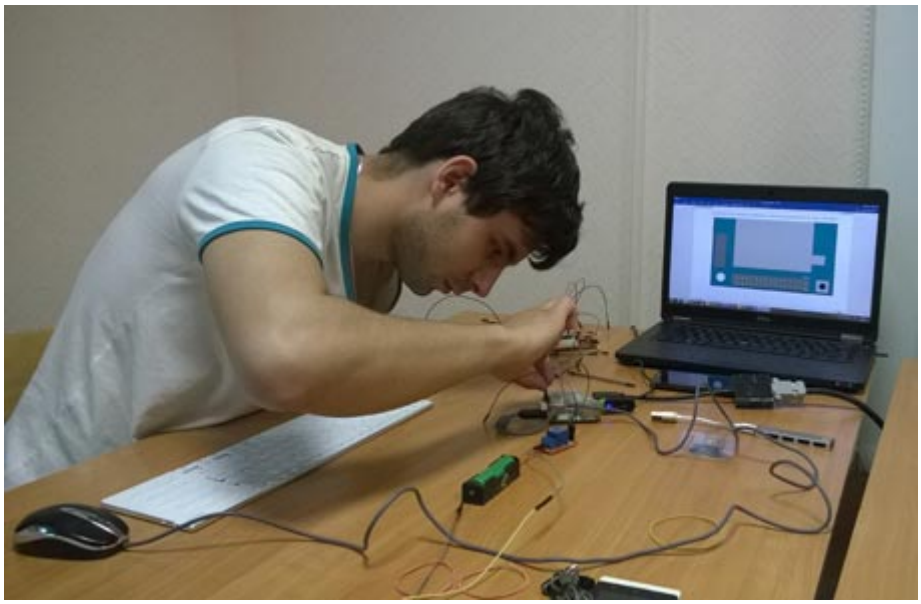
USTUUT – Mahdi Motahhedi

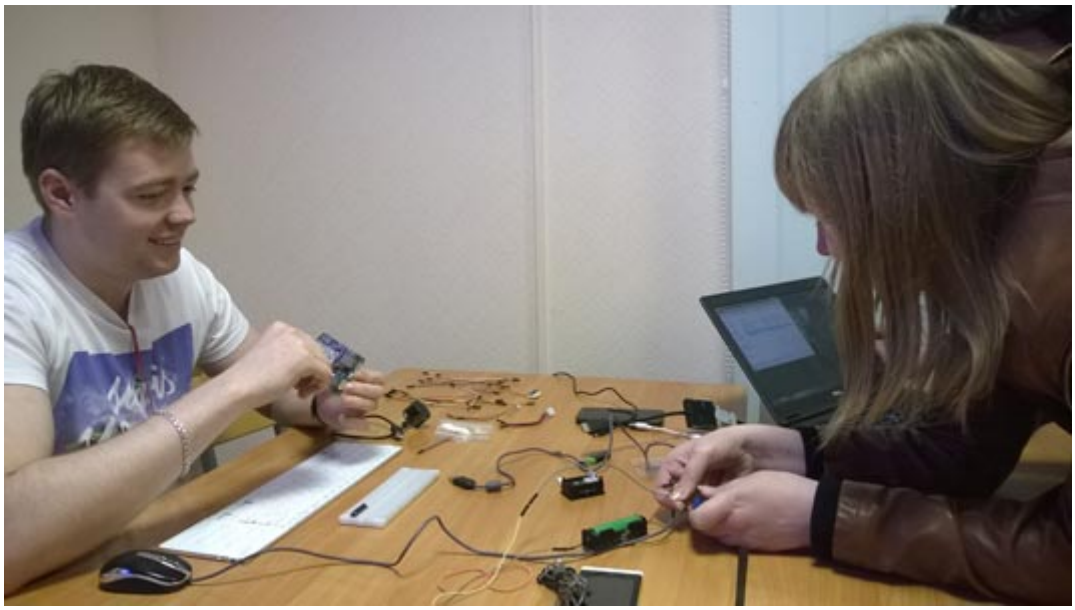
6.7 PSU

Course on «Industrial informatics» for training engineers Pavlodar region within the framework of the national program for industrial/innovation development of the republic of Kazakhstan, 2015-2019.

6.8 NTUU-KPI

The AIISM-PBL methodology developed in the MEDIS Project has been used for the development of new lecture materials and laboratory tasks in the subjects “Digital Signal and Image Processing”, “Graphical and Geometric Modeling”, “Computer Architecture”, “Programming”:





6.9 ONPU

During the implementation phase of the MEDIS project new educational materials were prepared by teachers, who are using this methodology while teaching Master student on specialty “Information Control Systems and Technologies”. All 5 trainng cources are integrated to the Curricula as the alternative Modules by student’s choice. These courses are being taught during 2015, 2016 and first Semester of 2017 by using AIISM-PBL developed during MEDIS project.

6.10 SPbPU

Online course on "Modern Industrial Electronics” within the Open Education platform. The main objective of the course is to develop ideas about the composition and appointment of modern industrial electronics.

6.11 PetrSU

Courses developed on the basis of Faculty of Applied Mathematics PetrSU:
"Web application architecture and frameworks"
"Automation of technological processes in mechanical engineering"

7 Supporting documents

7.6 KazNU

Letter of Support from PIT Alatau

Letter of Support from AlmatyEnergy

Letter of Support from IC EFES KAZAKHSTAN

Letter of Support from KazAtomProm

Decree about development new specialty KazNU.

Educational programs where Medis courses were implemented –
http://kaznu.kz/en/18592/page/

7.7 PSU

National program for industrial/innovation development of the republic of Kazakhstan, 2015-2019

Curriculum of specialties 6M070900 "Metallurgy", 6M072100 "Chemical Technology of Organic Substances"

EXPERT OPINION on the developed modular education programs of Vocational Master's program on specialty 6M070900 "Metallurgy", on specialty 6M072100 "Chemical Technology of Organic Substances"

7.8 NTUU-KPI

Letter of Support from Video Internet Technologies (VIT) Company
Letter of Support from Miratech Company

7.9 ONPU

Letter of Support from Luxoft Holding, Inc.
Letter of Support from «Videosolutions Group» Company
Letter of Support from «IT cluster Odessa»
Letter of Support from "Sigma Software" LLC

7.10 SPbPU

Letter of Endorsement Festo Company
Letter of Endorsement St. Petersburg Institute of Informatics and Automatisation of Russian Academy of Science (SPIIRAN)

7.11 PetrSU

Letter of Endorsement from Metso Expect Results Company (Finland)
Letter of Endorsement from Outotec Company (Finland)

8 Conclusion

In this WP8, the established network of stakeholders has been presented. The involvement in new projects of the partners has been shown. The participation of the PC in professional networks has been detailed. The list of stakeholders interested in Medis are detailed and the letters of support of the companies are presented.