ERASMUS+ CBHE PROJECT

Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry

WP4: Quality Control and Monitoring

Audit Report

(External Quality Control and Monitoring)

Project Acronym:	MSIE 4.0
Project full title:	Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry
Project No.:	586137-EPP-I-2017-I-TH-EPPKA2-CBHE-JP
Funding Scheme:	Erasmus + KA2 - Capacity Building in the field of Higher Education
Coordinator:	AIT
Work Package:	**WP4**
WP Leader:	Livia Lazar
Task Title:	Task 4.3: Inviting external evaluation of the project results
Task Leader:	Supapan Chaiprapat
Last version date:	09.12.2019.
Status:	Final
Dissemination Level:	In conformity with the detailed description of the project, section H1

ERASMUS+ CBHE PROJECT

Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry

REVISION SHEET

Version	Date	Author (Partner/Person)	The revision reason
1	22.10.2019.	Ružica Nikolić	First draft.
2	03.12.2019.	Ružica NIkolić	Accepted remarks from the PC, PEC and QCMB
3-Final	09.12.2019.	Ružica NIkolić	Preparing the report in the template form

DISTRIBUTION LIST

Project Partner	Acronym	Responsible (for dissemination)
PEC		
P1: Chiang Mai University	CMU	Wichai Chattinnawat
P2: Khon Kaen University	KKU	Kanchana Sethanan
P3: King Mongkut's University of Technology North Bangkok	KMUTNB	Athakorn Kengpol
P4: Czestochowa University of Technology, Poland	CUT	Tomasz Nitkiewicz
P5: Prince of Songkla University	PSU	Thanate Ratanawilai
P6: Thammasat University	TU	Apiwat Muttamara
P7: University of Minho, Portugal	UMinho	Rui M. Lima
P8: University Politehnica of Bucharest, Romania	UPB	Tom Savu
P9: Asian Institute of Technology	AIT	Pisut Koomsap
QCMB		
University POLITEHNICA of Bucharest	UPB	Livia Lazar
Prince of Songkla University	PSU	Supapan Chaiprapat
Asian Institute of Technology	AIT	Huynh Trung Luong
Chiang Mai University	CMU	Wasawat Nakkiew
King Mongkut's University of Technology North Bangkok	KMUTNB	Warapoj Meethom
Thammasat University	TU	Anintaya Khamkanya
Khon Kaen University	KKU	Sirorat Pattanapairoj
University of Minho	UMinho	Diana Mesquita
Częstochowa University of Technology	CUT	Robert Ulewicz

Work Package Leader		
University of Minho	UMinho	Rui M. Lima, WPL1
Chiang Mai University	CMU	Wichai Chattinnawat, Co-WPL1
Częstochowa University of Technology	CUT	Tomasz Nitkiewicz, WPL2
Asian Institute of Technology	AIT	Pisut Koomsap, Co-WPL2
Asian Institute of Technology	AIT	Huynh T. Luong, WPL3
University of Minho	UMinho	Rui M. Lima, Co-WPL3
University POLITEHNICA of Bucharest	UPB	Livia Lazar, WPL4
Prince of Songkla University	PSU	Supapan Chaiprapat, Co-WPL4
Khon Kaen University	KKU	Kanchana Sethanan, WP5
University POLITEHNICA of Bucharest	UPB	Andrei Dumitrescu, Co-WPL5

The dissemination responsible refers to the team member of each partner involved in the task's deliverable/ outcome that must disseminate the data within the partner internal team)

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1 Executive Summary

This Audit report contains data on the performed Audit process of the Project "Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry Project (MSIE4.0)", which is funded by the European Commission within the Erasmus+ program, KA2 – Cooperation for innovation and the exchange of good practices – Capacity Building in the field of Higher Education, Project number 586137-EPP-1-2017-1-TH-EPPKA2-CBHE-JP.

The audit process has covered the period of the project realization from 15.10.2017. to 30.09.2019. i.e. this is the Mid-term implementation audit.

The audit process was realized in two phases: the first phase assumed that auditor reviewed the available documentation on the project implementation, while the second phase consisted of the five day on-site interviews with the project team members at Asian Institute of Technology and visit to project realization sites in Bangkok, Thailand. It was realized according to mutually agreed Audit plan during the period from 21.10.2019 to 25.10.2019.

The auditor has met in person and via tele-conferencing with all the categories of the project team members, including the Project Coordinator – professor Pisut Koomsap from Asian Institute of technology, members of the Project Executive Committee (PEC), Members of the Quality Control and Monitoring Board (QCMB), other members of the Project Management team (PMT) – Work Package Leaders and Task Leaders, as well as the project administrative and technical staff.

The main objective of this audit was to review and evaluate the actual status of the project implementation. That assumed to establish the level of compliance of achieved results with the criteria determined for the project success, to verify the content of the project documents and all kinds of reports, as well as to identify opportunities for eventual improvements of both the project implementation and its management and to give recommendations on areas that could be further developed and improved, and to strengthen the self-assessment process.

The audit process included evaluation of the quality of the project management process, evaluation of Implementation of the planned activities and workload distribution across the work packages and activities actually undertaken, as well as estimate of compliance of the achieved project outputs and outcomes with the planned outputs and outcomes. Efficiency and quality of the project documentation were also evaluated and so was efficiency of the applied project management tools. Validity and sustainability of the project results: outcomes of the following tasks, were estimated, as well.

The objective of this audit was neither evaluation of the project implementation compliance with the legal regulations of the European Commission program Erasmus+, nor the financial matters (efficiency or correctness of spending the awarded resources).

Based on the reviewed documentation and the on-site visits and interviews with team members (in person - conversations and via answers to questionnaires) the auditor was able to draw conclusions on the status of the project realization, management, quality control, realized activities, executed outputs, outcomes and deliverables.

The problems that were noticed in the project realization by the project team members were presented to auditor sincerely and without hesitation.

The general conclusion by the auditor is that the project is on the right track, that the project team is doing their best to implement all the aspects of the project in time and with adequate level of quality and that eventual setbacks were (and would be in the future) remedied and eliminated in time, so that the project will be fully implemented as planned, both time-wise and results-wise.

2 Introduction

Project:

"Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry Project (MSIE4.0)"

Funded by the European Commission:

Project number 586137-EPP-1-2017-1-TH-EPPKA2-CBHE-JP

Erasmus+ programme, KA2 – Cooperation for innovation and the exchange of good practices – Capacity Building in the field of Higher Education

Audit period:

15.10.2017. – 30.09.2019. (Mid-term implementation audit)

Project is implemented by the following universities:

P1: Chiang Mai University (CMU)

P2: Khon Kaen University (KKU)

P3: King Mongkut's University of Technology North Bangkok (KMUTNB)

P4: Czestochowa University of Technology (CUT), Poland

P5: Prince of Songkla University (PSU)

P6: Thammasat University (TU)

P7: University of Minho (UMinho), Portugal

P8: University Politehnica of Bucharest (UPB), Romania

P9: Asian Institute of Technology (AIT)

Project coordinator: Dr. Pisut Koomsap, Associate professor (AIT)

Auditor:

Professor ***Ružica Nikolić***, PhD, SM, MSc, Dipl. Eng.

University of Žilina

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Slovakia

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Basic information on the project

01_MSIE 4.0 Project Proposal.pdf

Project objective(s):

Wider Objective:

The objective of this capacity building project is to enhance the capacity and ability of universities in Thailand for the delivery of a high quality competence-based curriculum for Master's degree in industrial engineering that supports sustainable smart industry, conforms to European Qualifications Framework (EQF), is applicable to European partner universities, and strengthens a partnership between participating European and Thai universities.

Specific project Objectives:

- ***SO1*** *Modernization of the education of industrial engineering discipline in Thailand by the development of a curriculum for Master's degree in industrial engineering to support sustainable smart industry,*
- ***SO2*** *Development of courses, learning and teaching tools, delivery processes and platform for student-centered learning of the curriculum,*
- ***SO3*** *Implementation of modern ICT tools and methodologies for effective student-centered learning of the curriculum,*
- ***SO4*** *Introductions of quality assurance and of the EQF approach for the delivery of the curriculum meeting international accepted education,*
- ***SO5*** *Establishment and continuation of partnerships among partner universities.*

Project outputs and outcomes:

01_MSIE 4.0 Project Proposal.pdf

WP1 – Gap Analysis

- *Gap Analysis working plan*
- *Comprehensive analysis of MSIE curricula in Thailand and in EU partner countries*
- *Assessment of learning and teaching tools & methods in Thailand and in EU partner countries*
- *Analysis of needs of industry and students*
- *Gaps between the needs and graduates' competences*
- *Competitive factors for the curriculum*
- *Recommendations for specifications and areas of specialization for the curriculum*

– Workload 16 %, Budget 6.7 %

WP2 – Curriculum Development I: Curriculum Structure and Courses

- *A modernized curriculum for Master's degree in IE*
- *Syllabuses for all courses in the curriculum*
- *Pilot teaching in modernized MSc at partner universities*
- *Assessment of pilot test of the key courses & improved courses*
- *Accreditation of the curriculum*

– Workload 16 %, Budget 6.5 %

WP3 – Curriculum Development II: Modernization of Teaching Methods and Tools for Innovative MSc Programmes

- *Teaching materials for instructors*
- *Learning materials for students*
- *A platform for online learning*
- *Trained instructors & staffs on new teaching tools & methods*
- *Online learning materials*
- *Installed hardware & software*
- *Laboratory equipped with online remote access from partner locations*

– Workload 28 %, Budget 51.2 %

WP4 – Quality Control and Monitoring

- *Quality control & monitoring system*
- *Internal quality control & monitoring*
- *External quality control & monitoring*
- *External financial audit*

– Workload 13 %, Budget 14.3 %

WP5 – Dissemination and Exploitation of Project Results

- *A Dissemination, Exploitation and Sustainable plan (DESP),*
- *A project website,*
- *Dissemination materials,*
- *Publications in professional journals, newspapers, magazines, brochures and social media,*
- *Short-term courses in the field of Industrial Engineering for professionals,*
- *Dissemination events,*
- *A dissemination-sustainability conference*
- *Sustainable network between project partners & IE enterprises*

– Workload 13 %, Budget 5.2 %

WP6 – Project Management

- *Project management & communication plan (PMCP)*
- *Kick-off & regular consortium meetings*
- *Documents on daily project administration and coordination*
- *Project reports*

– Workload 15 %, Budget 16.1 %

Project budget:

01_MSIE 4.0 Project Proposal.pdf

Staff costs: 392,328 eur
Travel costs: 135,590 eur
Costs of stay: 131,040 eur
Equipment costs: 292,670
Subcontracting costs: 30,000 eur
Total budget: 981,628 eur.

B: Budget awarded by the European Commission:

Staff costs: 392,328 eur
Travel costs: 135,590 eur
Costs of stay: 131,040 eur
Equipment costs: 292,670
Subcontracting costs: 30,000 eur
Total budget: 981,628 eur.

Implementation dates:

15.10.2017. – 14.10.2020.

Audit objectives:

The main objective of this audit was to review and evaluate the actual status of the project implementation. That includes to establish the level of compliance of achieved results with the criteria determined for the project success, to verify the content of the project documents and QCM reports, as well as to identify opportunities for eventual improvements of both the project implementation and its management and to give recommendations on areas that could be further developed and improved, and to strengthen the self-assessment process.

To achieve the set objective, the following partial objectives were set: evaluation of the quality of the project management process, evaluation of Implementation of the planned activities and workload distribution across the work packages and activities actually undertaken, estimate of compliance of the achieved project outputs and outcomes with the planned outputs and outcomes, review of efficiency and quality of project documentation and evaluation of efficiency of the applied project management tools and assessment of the validity and sustainability of the project results: outcomes of the following tasks.

The objective of this audit was neither evaluation of the project implementation compliance with the legal regulations of the European Commission program Erasmus+, nor the financial matters (efficiency or correctness of spending the awarded resources).

Representatives of the audited project

The project is represented by the Project Coordinator, Professor Pisut Koomsap of AIT, The Project Management Team (PMT), consisting of The Project Executive Committee (PEC), which consists of representatives of all the partner universities (Table 1) and the Administrative members (AM) (Table 2) that consists of the Work-Packages Leaders and Co-leaders. The quality control of the project realization is conducted by the Quality Control and Monitoring Board (QCMB), which also has representatives of all the partner universities (Table 3).

Table 1. Project Executive Committee members

02_PMC Plan.pdf

No.	Partner	Name	E-mail
1	AIT	Pisut Koomsap	pisut@ait.asia
2	CMU	Wichai Chattinnawat	chattinw@gmail.com
3	KMUTNB	Athakorn Kengpol	athakorn.kengpol@gmail.com
4	TU	Apiwat Muttamara	mapiwat@engr.tu.ac.th
5	KKU	Kanchana Sethanan	ksethanan@gmail.com
6	PSU	Thanate Ratanawilai	thanate.r@psu.ac.th
7	UPB	Tom Savu	tomsavu@gmail.com
8	UMinho	Rui M. Lima	rml@dps.uminho.pt
9	CUT	Tomasz Nitkiewicz	tomasz.nitkiewicz@wz.pcz.pl

Table 2. Administrative members

02_PMC Plan.pdf

WP	Role	Name	Partner	E-mail
6	PC[1]	Pisut Koomsap	AIT	pisut@ait.asia
1	WP-L[2]	Rui M. Lima	UMinho	rml@dps.uminho.pt
	Co-WP-L[3]	Wichai Chattinnawat	CMU	chattinw@gmail.com
2	WP-L	Tomasz Nitkiewicz	CUT	tomasz.nitkiewicz@wz.pcz.pl
	Co-WP-L	Pisut Koomsap	AIT	pisut@ait.asia
3	WP-L	Huynh T. Luong	AIT	luong@ait.asia
	Co-WP-L	Rui M. Lima	UMinho	rml@dps.uminho.pt
4	WP-L	Livia Lazar	UPB	livia_veronica_lazar@yahoo.com
	Co-WP-L	Supapan Chaiprapat	PSU	supapan.s@psu.ac.th
5	WP-L	Kanchana Sethanan	KKU	ksethanan@gmail.com
	Co-WP-L	Andrei Dumitrescu	UPB	dumitrescu.andrei@yahoo.co.uk

[1] PC – Project Coordinator; [2] WP-L – Work Package Leader; [3] Co-WP-L – Co-Work Package Leader

Table 3. Quality Control and Monitoring Board members

03_QCM Plan.pdf

No.	Partner	Name	Role	E-mail
1	UPB	Livia Veronica Lazar	Chair	livia_veronica_lazar@yahoo.com
2	PSU	Supapan Chaiprapat	Co-Chair	supapan.s@psu.ac.th
3	AIT	Huynh Trung Luong	Member	luong@ait.asia
4	CMU	Wasawat Nakkiew	Member	wasawat@eng.cmu.ac.th
5	KMUTNB	Warapoj Meethom	Member	Warapoj.m@kmutnb.ac.th
6	TU	Anintaya Khamkanya	Member	kanintay@engr.tu.ac.th
7	KKU	Sirorat Pattanapairoj	Member	siropa@kku.ac.th
8	UMinho	Diana Mesquita	Member	diana@dps.uminho.pt
9	CUT	Robert Ulewicz	Member	robert.ulewicz@wz.pcz.pl

List of the checked documentation:

1. Project proposal 01_MSIE 4.0 Project Proposal.pdf
2. Midterm Technical Report 14.04.2019. 04_Midterm Technical Report.pdf
3. Annex V – Technical Implementation report of 14.04.2019.

05_Annex V - Technical Implementation Report.pdf

4. Quality Control and management plan
5. Project Management and Communication Plan
6. Reports on individual Work Packages, Tasks and Outputs
7. Meetings' minutes (PEC, QCM Board and Training sessions)
8. Document templates
9. Courses' syllabi
10. Courses' teaching materials
11. Video clips
12. List of promotional meetings/seminars
13. List of published papers related to the project realization
14. Templates for various reports
15. Questionnaire answers of the Project coordinator
16. Questionnaires answers of the PEC members
17. Questionnaires answers of the QCMB members
18. Questionnaires answers of the team members

06_Project Documents List.pdf

Audit process overview

Audit process was performed in two phases.

The first phase assumed that auditor reviewed the available documentation on the project implementation.

That included daily contacts with Mrs. Supapan Chaiprapat, person in charge of supplying all the necessary information that auditor requested and/or could not find in available documentation.

Auditor is expressing gratitude for all the help that she provided.

The second phase was the five day on-site interviews with the project team members at Asian Institute of Technology and visit to project realization sites in Bangkok, Thailand.

That phase was realized according to mutually agreed plan during the period from 21.10.2019 to 25.10.2019.

Audit plan:

07_AuditPlan_11.10.2019.xps

The following project representatives and team members were participating in the audit (Tables 4 and 5).

*Table 4. Project team members Present in person during the audit**

No.	Name	Partner	Role(s)
1	Pisut Koomsap	AIT	Project Coordinator
2	Athakorn Kengpol	KMUTNB	PEC member
3	Supapan Chaiprapat	PSU	Co-chair of the QCM Board, Task Leader 4.3
4	Huynh Trung Luong	AIT	WP3 Leader, Task Leader 2.3
5	Duangthida Hassadintorn Na Ayutthaya	AIT	Administrative staff
6	Clifford M. Gasillos	AIT	Technical staff
7	Hoang Hung Manh	AIT	Technical staff

Marked as P in Audit plan

*Table 5. Project team members Present via teleconferencing***

No.	Name	Partner	Role(s)
1	Apiwat Mutamara	TU	PEC member
2	Thanate Ratanawilai	PSU	PEC member
3	Kanchana Sethanan	KKU	PEC member, WP5 Leader
4	Rui M. Lima	UMinho	PEC member, WP1 Leader, WP3 Co-Leader, Task leader 1.2, 1.4, 1.5 and 1.6
5	Tom Savu	UPB	PEC member, Task Leader 4.2
6	Wichai Chattinnawat	CMU	PEC member, WP1 Co-Leader, Task Leader 1.1 and 1.3
7	Livia veronica Lazar	UPB	QCM Board Chair, WP4 Leader

8	Anintaya Khamkanya	TU	QCM Board member
9	Wasawat Nakkiew	CMU	QCM Board member
10	Sirorat Pattanapairoj	KKU	QCM Board member
11	Warapoj Meethom	KMUTNB	QCM Board member
12	Tomasz Nitkiewicz	CUT	WP2 C-Leader, Task Leader 2.1 and 2.2
13	Andrei Dumitrescu	UPB	Task Leader 5.1

***Marked as C in Audit plan**

Here should be noted that no representative from Europe was present in person. They participated in audit by teleconferencing. This did not produce any problems in communications. However, this proves the smart funds spending from the project management team, since the travel and accommodation costs for 5 persons to attend the audit in Bangkok would exceed 1000 euros each. In other words, more than 5000 euros was saved in this way.

3 Audit findings

3.1. Findings based on the reviewed project documentation

Project was executed according to the Adjusted Work Plan, which is the substitute for the Original Work Plan from the project proposal.

08_Adjusted Work Plan_30.09.2019.pdf

09_Proposed Workplan.pdf

3.1.1 Project progress management

Based on review of the available documentation, presented by the project team, as well as on answers to respective questionnaires (by the Project Coordinator, members of the Project Executive Committee (PEC), members of the Quality Control and Monitoring Board (QCMB) and the Team members) it was established that there were adequate procedures for all the aspects of the project realization. 03_QCM Plan.pdf Those include the project management, quality control and monitoring, budget management, risk management, tasks and results (outputs and deliverables) management, introducing changes and producing and keeping the project documentation. The project management structure is presented in Table 6. 02_PMC Plan.pdf

The Project Coordinator, as well as members of the PEC and QCM Board were appointed by their respective institutions (universities). Each member of these bodies was aware of his/hers tasks, competencies, as well as their extents.

Roles and responsibilities of all the project managing bodies, Work Package leaders and team members were strictly defined in the Project Management and Communication Plan.

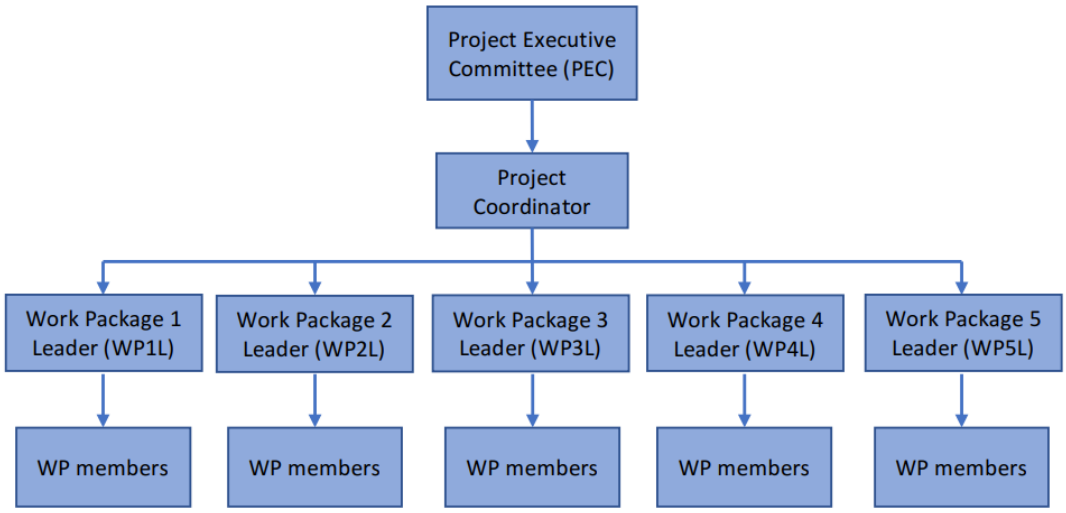
Project Operations Management Flow was defined in such a way that the project is managed at three levels: operation (WP1, WP2, WP3, and WP5), monitoring and control (WP4) and management (WP6). 02_PMC Plan.pdf

The Work Package Leaders (WPLs) manage and are accountable for their WPs. All the operational tasks are initiated by the WPLs who allocate the tasks to the task members nominated by the Partner Leaders (PLs). The WPLs are responsible for updating the Project Coordinator on the status of ongoing tasks on a monthly basis. For each completed task, the responsible WPL submits the deliverable to his/her representative in the QCMB for initial evaluation. The deliverable is then sent to the QCMB for approval. The deliverable is then submitted to the PEC via the PC for final approval. In the case that the deliverable gets rejected at any stage, the WPL is informed immediately. According to the monthly reports from the WPLs, the PC submits a progress report to PEC and informs the QCMB. For the WP4 tasks, the chair of the QCMB initiates all the tasks. With endorsement of the QCMB, the Chair submits deliverables to the PEC via the PC for the final approval. For the WP6 tasks, the PC submits the progress reports to the PEC directly for approval and informs the QCMB.

Communication within the project managing bodies, between them and with other team members was going on without major problems.

Channels for communications were face-to-face meetings, teleconferences, E-mail, written messages and the project website.

Table 6. The project management structure



Here should be emphasized that both the Project Coordinator and those two bodies' members stated that there were some problems in communications, in general, at the very beginning of the project realization. It is their opinion, with which the auditor completely concurs, that those initial problems primarily appeared from the two reasons. The first is the differences that appear in the timeline of the school year's duration and above all, beginnings, between the European and Thailand universities, as well as between the Thailand universities themselves, which can be as long as two months. Illustration is presented in Table 7.

Table 7. Partners' Academic Schedule

School year	2017		2018		2019		2020	
Semester	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**
Partner								
AIT	05.08.2017	07.01.2018	05.08.2018	07.01.2019	05.08.2019	07.01.2020	05.08.2020	07.01.2021
UMinho	11.09.2017	05.02.2018	10.09.2018	04.02.2019	09.09.2019	03.02.2020	TBA	TBA
CUT	01.10.2017	19.02.2018	01.10.2018	18.02.2019	01.10.2019	24.02.2020	01.10.2020	22.02.2021
UPB	25.09.2017	19.02.2018	24.09.2018	18.02.2019	23.09.2019	17.02.2020	21.09.2020	15.02.2021
CMU	15.08.2017	03.01.2018	06.08.2018	02.01.2019	05.08.2019	16.12.2019	22.06.2020	09.11.2020
KKU	31.07.2017	08.01.2018	06.08.2018	07.01.2019	22.07.2019	02.12.2019	TBA	TBA
TU	15.08.2017	08.01.2018	14.08.2018	14.01.2019	13.08.2019	13.01.2020	TBA	TBA
PSU	15.08.2017	08.01.2018	14.08.2018	07.01.2019	05.08.2019	23.12.2019	13.07.2020	30.11.2020
KMUTNB	08.08.2017	09.01.2018	07.08.2018	08.01.2019	06.08.2019	11.12.2019	17.06.2020	11.11.2020

The other reason lies in some cultural differences, as well as in time difference of 5(6) hours between Europe and Thailand. However, it is the general conclusion of all the participants in the auditing process that those initial differences have been overcome and that communication at all the levels is now normal and without

any problems. Several team members emphasized that after obtaining the teleconferencing equipment no communication problem remained.

In the other type of communication, which concerns with assigning tasks to team members and their executing them, there were no major problems, as well. The only problems could (and did) arise from the fact that this is the first time that this type of project is being realized at Thailand high education institutions. Some team members, as well as some of the project management bodies' members did not quite grasp the EU programs (Erasmus+) procedures and regulations, since those are very different from the ways of the projects in which they participated earlier, were realized. Problems of this type were gradually overcame, as well.

The project management was executed by the Project Executive Committee (PEC), which consists of representatives of all the participating universities and is led (chaired) by the Project Coordinator, Professor Pisut Koomsap from Asian Institute of Technology (AIT) in Bangkok.

01_MSIE 4.0 Project Proposal.pdf

05_Annex V - Technical Implementation Report.pdf

The Project Executive Committee was meeting regularly, according to the Workplan presented in the project proposal. However, besides those scheduled meetings, the members of the PEC were communicating with each other if there was a need for that, mainly by teleconferencing and/or e-mail. 02_PMC Plan.pdf

The project management was executed according to adopted procedures in accordance with the adopted Project Management and Communication Plan.

Here should be noticed that project realization was postponed due to the fact that a couple of the partner members did not have PIC code and needed time to obtain their PIC Codes.

3.1.2 Project progress quality control and monitoring

Project progress was monitored by the Quality Control and Monitoring Board according to the QCM plan. 03_QCM Plan.pdf

The QCM Board consists of representatives of all the partner universities and is chaired by Professor Livia Veronica Lazar of University Politechnica of Bucharest (UPB) and is co-chaired by Supapan Chaiprapat of Prince of Songkla University (PSU).

The QCM Board has held regular meetings according to the project proposal and the QCM plan and was preparing the Minutes and Reports on those meetings accordingly.

All the QCM documents were at auditor's disposal. Based on those documents, as well as answers from the QCM Board members, it could be concluded that the project progress, its management and quality of those actions, were monitored constantly according to established plan and procedures, Table 5, page 11 of the QCM Plan. 03_QCM Plan.pdf

The project outputs quality was also constantly monitored, according to the established procedures and outputs were released only after passing the rigorous checking and only after complying with the adopted quality criteria. In the case that those criteria were not met, the output in question (report, meeting minutes, etc.) was returned to the responsible team member (or body) for corrections.

3.1.3 Project results and outputs and project risk management

The project tasks and outputs creating and executing were monitored throughout the complete process. The linked Table gives an overview of the realized tasks and their outputs.

10_QCM Internal Report_31.08.2019.pdf

The project risks were defined in the Project Proposal, for each Work Package, activity and outcome. The risk management procedure was defined as well. The risks of all the aspects of the project realization were monitored by The Risk Management Committee (RMC), which is composed of all the WP Leaders or Co-WP Leaders and chaired by the Project Coordinator (PC).

All events, conditions and conflict that had a potential to delay the delivery of deliverables or to lower the quality of those deliverables were considered as the project risks.

All the RMC members were asked to consult with their Work Package team members to perform the risk assessment on an annual basis. The risk eliminating procedure consisted of the risk identification, risk assessment (according to the risk assessment form) and response planning. Table 8 presents the Risk Assessment Form, Table 13, page 48 of the PMM plan. 02_PMC Plan.pdf

Levels of the individual risk impacts on the project realization were defined in three categories as high, medium and low and the priority of mitigating them was set accordingly. The risks were classified according to the Risk Assessment Matrix, Table 9. Priority in resolving the critical situations was given to the critical and significant risks, Table 14, page 49 of the PMC Plan. 02_PMC Plan.pdf

Table 8. The risk assessment form

Risk No.	Descriptions	WP	Risk Assessment			Mitigation Measures	Risk Owner
			Likelihood	Impact	Level		

Table 9. The risk assessment matrix

Likelihood	Impact		
	Low	Medium	High
Unlikely	Mild	Mild	Moderate
Likely	Mild	Moderate	Significant
Most Likely	Moderate	Significant	Critical

Thus, the risk managing procedure was defined in details, what enabled that all the potential risks could be dealt with and eliminated in time, so that they would not cause any of the possible negative impacts on the project realization (delaying and/or reducing the project outcomes (benefits), reducing the quality of project outputs, extending the project activities' timeframes or increasing any type of costs in project realization).

3.1.4 Project Dissemination and Exploitation of results

Dissemination and Exploitation of the project results was done according to the Dissemination, Exploitation and Sustainability Plan (DES). 11_DES Plan.pdf

The usual dissemination activities for this type of project were conducted. The project web-site was created, with the Face-Book page and YouTube channel. Numerous video clips were posted both on project introduction and realization of project activities, like clips on WP1 and others. Brochures and the project posters were also prepared.

The dissemination activities included presentation in order to introduce the project to wide audience, in both educational and industrial community. That included promotional seminars at Thailand universities (both the project partner and non-partner ones), presentation of the project topic, program, future results and outcomes at various international conferences, seminars and symposia in South Korea, Romania, Poland, Spain and Croatia. 12_Dissemination events.pdf*

Further activity was publishing papers related to the project topic at various scientific and educational meetings, both in Thailand and other countries (Poland, South Korea, Spain, Romania, Tunis, Japan). 13_Publications reports.pdf *

**Note: these lists are as of 14.04.2019 (listed in Project technical Implementation Report).*

Additional events and papers were produced until 30.09.2019.

3.1.5 Project changes and project documentation management

During the project realization some changes were inevitable, due to various reasons. Changes were possible to be proposed by the Project Coordinator, PEC and QCMB members or the regular team members. Changes proposed by the project (managing) bodies were first discussed at their meetings and then adopted either by consensus or by majority; the former practically being a rule. Changes proposed by the team members were submitted either to the Team leader (of the particular Partner) or to the Work Package Leader and then either accepted/rejected or forwarded to the proper managing body (PC, PEC, QCMB), depending on the nature of the proposed change, for the further decision.

For example, there was a switch of roles role between WP1 leader and co-leader at the beginning of the second year, by the decision of the Project Coordinator. The leader was unable to deliver results as planned and the progress was slow. Another example is that the team from University of Minho (UMinho) was extended for one person who is an expert in the field of Industry 4.0.

The project documentation contains all the details on the project realization thus far. It includes various documents regarding all the aspect of the project realization.

The project management developed coding of all the documents. There are three types of documents: plan, form and document. 02_PMC Plan.pdf

The coding is done according to six work packages:

G – Documents from WP1: Gap Analysis

C – Documents from WP2 & 3: Curriculum Development

Q – Documents from WP4: Quality Control and Monitoring

D – Documents from WP5: Dissemination and Exploitation of Project Results

M – Documents from WP6: Project Management

For the project plan, the code is XXXP-VY. "XXX" is three initial capital letters of the plan followed by "P" (e.g., QCMP is for Quality Control and Monitoring Plan, and PMCP is for Project Management and Communication

Plan). VY is a version number of the document. *For example*, QCMP-V1 is a Quality Control and Monitoring Plan version 1.

For the project form: the code is AF-XXX-VY. "A" is a WP code, "F" means form and "XXX" is three initial capital letters of a form (e.g., QF-QFT is for Quality Form Template, and MF- WMR is for Work Package Monthly Report). VY is a version of the document. *For example*, QF-QFT-V1 is a quality form template version 1.

For the project document: the code is AD-XXX-VY. "A" is a WP code, "D" means a document and "XXX" is three initial capital letters of a document. VY is a version of the document. *For example*, MD-PMR-V1 is the first PEC meeting minutes report.

The project documentation is very voluminous. Auditor, with help of the Project Coordinator, tried to actually count all the documents and realized that this is really a very difficult task. However, ALL the pieces of project documentation are well kept in several ways and places. The Project Coordinator keeps all the project documents and soft copies of all the partner documents both in his personal server and computer and on the project website. Hardcopies are kept in his office. Members of the PEC and QCMB also keep all the records of their activities, reports, meeting minutes, etc. Some individual team members also keep their own records and documentation.

All the project official documents are available for inspection to any team member, without any restrictions, as well as to authorities of the partner universities.

3.1.6 Project Financial Management

The project budget handling was not within the scope of this auditing process. All the details on the project financial management procedures, including the general provisions, financial reporting, exchange rates, staff costs, travel costs and costs of stay, equipment costs, reimbursement procedure and budget transfer procedure, are described in details in the Project Management and Communication Plan, Section 5. 02_PMC Plan.pdf

3.2. Findings based on answers to questionnaires sent to all categories of the project team members

In order to prepare the audit interview, the questionnaires were prepared for all the categories of project participants: the PC and the PEC members, the QCMB members and for the team members. 14_Summary of PC and PEC quest.pdf ; 15_Summary of QCMB quest.pdf ;

16_Summary of TM quest.pdf

Answers were obtained from the PC and all of the PEC and QCMB members and from 16 team members. Questionnaires were anonymous, except for the PC!

The questionnaire for the PC and the PEC members contained questions regarding all the phases of the project, from the origin stage, through the design and planning stage to the implementation stage and the project mid-term evaluation stage. The questionnaire for the QCMB members and the team members covered only the last two stages.

Here are some remarks from questionnaires that attracted the auditor's attention and should be the part of this Audit Report. *Auditor's remarks and conclusions are marked by italic letters in red*.

3.2.1. Answers from the PC and PEC members

Project mid-term evaluation stage	
37	Were all the outputs, planned to be realized thus far, implemented, in what amount and quality? If not, why?

PC:

At the time of mid-term evaluation, deliverables were completed according to the plan. The progress after the submission of the mid-term report, however, has been slowed. Task 2.1 and Task 2.2 should have been completed a couple months after the submission.

Other PEC members:

"In addition some overlapping of WP2 with WP1 was noticed due to delay in WP1 realization due to its complexity, which was higher than anticipated".

"In practice, it appeared the outcome 2.1 could not be achieved without outcome 2.2 and therefore some further delays appeared".

A: This could point to not quite a proper selection of outcomes. Please, elaborate on that!!!

Some PEC members think that the quality of delivering the results can be seen from the quality reports.

Some delays were also recorded in acquiring equipment.

38	Which parameters of the defined project objectives (to be achieved thus far) were met / were not met? If not, why?

PC:

"Five focuses under the objective have been implementing. First focus on modernization of a curriculum has been unofficially completed. We are waiting for WP2 leader to submit a report.

Second and third focuses on courses and technology are being developed.

Fourth focus on quality and EQF have been implemented.

Fifth one on partnership has been implemented since day one".

Other PEC member:

As for now, most of the parameters are met. It is still an ongoing activity and all the parameters should be possible to be achieved during implementation.

40	Did the project management (Coordinator/PEC) propose recommendations for improving the organization of work?

PC:

Yes. WP leaders were normally invited to attend PEC meeting to update the progress and PEC members asked, discussed and suggested, if there was any concern.

41	Which measures to improve the project organization were proposed/ implemented?

PC:

PEC offered suggestion on issues.

PC communicated with members at large on progress of tasks and deliverables.

Other PEC members:

"The follow up of the PC through WP leaders and members help improve both organization and implementation.

Normally, we discuss by E-mail and online – meeting".

There were 3 versions of the Project Management and Communication Plan *(PMCP).* *Examples:* *Monthly WP reports; Team reports; Reviewing and approval of outcomes by several teams; Creation of systematic Zoom meetings for content and for management.* *Enabling the use of internet platform for documentation flow, enabling multi-side access to output documents, creating the mixed Partners teams.*	
42	How were the project outputs (realized thus far) promoted?
PC: *The project outcomes were presented in various capacities, including introducing the project and presenting outcomes at both national and international conferences, published promotional materials, organizing workshop and public seminars, talk to industry and communicating with target audience via website, Face-Book and YouTube.* ***A: The actions are described in the Dissemination reports.*** ***Other PEC members:*** *Project meetings usually include open seminars for general public, big social media campaign is being introduced, several papers on the project were presented on the conferences, dedicated seminars are organized for different stakeholders in Thailand and associate partners participate in promotional events and activities.*	
43	Were the project outputs (realized thus far) duly promoted to stakeholders? At which stakeholders was the promotion aimed?
PC: *Project aims at different stakeholders groups including universities, students and academics, companies, educational institutions and researchers, public authorities and all of these groups are addressed with different dissemination activities.*	
44	Do you consider that the project is a success *thus far*, i.e. are the project objectives met within the planned deadline(s) using the planned funds? Are all the predicted indicators and outputs (thus far) met?
PC: *Somewhat. I wish it could be better but what we have completed is acceptable.* ***Other PEC members:*** *Somewhat success. The project is still in progress.* *I consider the project is quite success, even though some works are a little delay but we can cover them to meet the deadline and the quality of the deliverables.* *Not completely.* *Yes, the project is a success so far. At this point we can say that are meeting the objectives in the planned deadlines with the planned funds.* *Project is a success for the moment due to its high visibility, raised interested among its key stakeholders and sound outcome flow. It seems that the major output, namely MSc in IE curriculum is innovative and attractive enough to meet the predicted expectations of the project.* ***A: Generally, the PC and the PEC members consider a project realization as a successful one.***	
46	*Is there anything you would like to add?*

PC:

Familiarity of members to the procedures and requirements needs to be improved.

Mid-term report and Annex C are available on the project website.

We are not yet at our best. I have not yet been able to bring up the best of every single member.

Other PEC members:

Somewhat success. The project is still in progress. However the communication of the current WP seems to be slow and not clear.

I admire EU partners. They gave many ideas through discussions that make our success.

The way in which the work was structured and divided between different teams it may look a little bit too complicated.

This is being a challenging and motivating project so far.

3.2.2 Answers from the QCMB members

Project implementation stage	
7	Did the project team meetings take place in accordance with the adopted rules and plan?
A: In all the Thai universities project team meetings were held regularly, once or twice a month and even more frequently if it was necessary to resolve some situation.	
9	How does the QCMB evaluate and approve changes in the project plan and realization?
The main channels are meetings or via email through surveys, the conclusions, including observations and recommendations been recorded under the minute meeting or centralized and transmitted to implicated parties via email by QCMB Chair. *The QCMB Chair will inform about the change via email or in the meeting.* *We discuss until reaching consensus answer after that implement it.* *The Task leader informs about changes in the plan to QCMB. The QC Task leader would circulate an email to all QCMB members for approval and then make conclusions and submits the issues to PEC. The PEC will take action on approval of any changes to the plan.* *WPL will circulate the issues to be discussed around the QCMB.* *Finalization of the discussion is made based on the majority.* *QCMB assesses individual stages/tasks at meetings or assesses in the form of a survey that is sent to the Chair. The survey includes an assessment of the individual elements of a task/project, as well as any comments and reservations.* ***A: All the QCMB members strictly follow the procedures accepted in the QCM plan!***	
16	How was the project budget monitored?
The project budget was monitored through the financial statements sent by each partner. *PEC leader handles this task.* *Monitored and reported by financial statements, project time sheet and monthly time sheet every month. By the project coordinator, PEC, and* *Team manager.*	

PC will monitor the budget overall. For PSU, the university has an administration body to look over how the allocated budget is spent. ***A: Note here: The PSU administration body cannot be above the project manager and team. Spending of funds should be justified (explained) ONLY to PEC and PC and not to a particular university's financial administration.***	
19	Were all the tasks, planned to be realized thus far, implemented at a standard level of quality? If not, why?
All tasks were carried out at a standard level, following QCMB's comments and recommendations. *The tasks planned to be realized thus far, were implemented at the standard level required by the project and the evaluation criteria identified, when necessary taking in account the comments and recommendations of QCMB.* *Most of the tasks were implemented as planned.* *All the tasks that have been implemented are of standard quality. However, it is very challenging now as we are moving through WP2 when the pilot tests to be conducted in each partner university. Some local rules and regulations may apply, that probably prevent the planned activities to successfully take place in time.* ***A: This is very important to note!***	
23	Do you consider, from the quality aspect, that the project is a success *thus far*, i.e. are the project objectives met at a standard level of quality?
Thus far, the finished outcomes of the project met the assumed quality level, there is still a need to recover from delays. *Yes, but it could be better. The level of expected outcomes should be clearly identified before the given task have commenced.* *Based on the evaluation of task outcomes, the quality of outputs is very good. This project seems to accomplish the proposed goals.* *From my point of view, the project is considered successful at some level. Project results have been released from each WP with great effort and dedication, though some delays may be experienced.* *The project's goals have been achieved; the quality is at a satisfactory level.* ***A: All the QCMB members agree that the quality level of the project realization is more than satisfactory. Their remarks prove that they are all eager to make it even better, i.e. at the "excellent" level.***	
25	Is the project documentation at the standard level of quality?
QCMP is developed using the Erasmus+ project standard. *Yes. We also allow changes to be made whenever the documentation is not clear or insufficient.* ***A: This is an important remark! Mainly all the answers were simply: "Yes, it is".***	

3.2.3 Answers from the Team members

Project implementation stage	
6	Do you regularly communicate the actual status of project activities and individual outputs to the project manager? How? Do you prepare reports?

A: They all communicate, generally with the partner's team leader, either in person or by e-mail and on-line apps.

Some also prepare the written reports.

We have monthly time sheet to update the monthly work, and the project time sheet to show the works that have been done. These sheets have to be sent to the project manager every month. According to my current work (i.e. developing a course), we have to update the status of our course development e.g. course learning outcome or course outline through a Google sheet.

Yes, immediately after the completion of a dissemination activity, I inform the WP leader about it using the predefined report. It takes a little longer when the dissemination activity is the presentation of a scientific paper at a conference, because I have to wait for the publication and indexation.

9	Were you able to propose any changes? Were they accepted/rejected?

Some opinions:

I have proposed the changes of resource acquisition concept by involving all members. However the PC and AIT may not see any necessity for changes and have pursued all the resource design development and specification.

A: This was a somewhat "criticizing" opinion and it was discussed with the PC.

Yes, I proposed some changes in the planned schedule and in the procedures applied for analyzing survey questionnaires. Those changes were approved.

A: Some did propose certain changes (some were accepted, some were not) and some did not propose any changes.

12	Are the tasks assigned to you adequate with respect to your qualifications?

A: Almost all the answers were simple "Yes" or "Yes, I am".

One a little longer:

Yes, right from the very start of the project.

And one quite concrete:

As my responsibility is the course that is quite new, I have to take a bit of time to develop the course. However, I think we can complete this course to achieve the purpose of the curriculum.

14	What is your general opinion on the project realization so far?

A: There were several simple answers like "it looks OK to me" and alike.

Many team members feel that the project is "on the right track and will bring benefits to Thailand universities".

This is a good project because all the partners are helping each other.

This is a good project since it can improve the engineering education for Thailand to become close to I4.0.

This project has a very good reputation and feedback in Thailand.

A: But there were some concerned opinions, as well:

The project is lagging behind the schedule and the clear risk management measures should be implemented.

Some tasks are difficult to complete. The teaching and learning methods are new to me. The proposed course might not be ready to teach within the project period.

A: Then again, many team members are quite enthusiastic about the realization of this project:

I think that this project can provide benefits, particularly for master's degree in industrial engineering for Thailand. *I consider that the project is on the right track and it will be concluded successfully.*	
16	*Is there anything you would like to add?*
Quality of curriculum being developed is the essence of the project, which is also related to the university mechanism. The resources used for the whole curricula play important roles for the sustainability of the project. If there is any sustainable measure taken with respect to resource allocation, this will definitely help giving another improvement of the project. *This curriculum development project could be further applied in other fields.*	

The general conclusion is that the PC and the PEC, QCMB and team members are quite sure that the project is "on the right track" and would be beneficial for the participating Thailand universities.

Furthermore, there were number of proposals for extending the scope of the project application to other Thailand universities, maybe even to universities in the region.

This testifies that the sustainability of the project results is pretty ensured.

3.3. Findings based on the audit interviews and site visits

3.3.1 The Project Coordinator (PC)

The first part of interview consisted of going through some of his answers to the questionnaire.

Project implementation stage		
Original answer		***What has changed*** *and/or* ***Auditor's remarks***
20	Was the project team communicating without any major problems?	
No. Communication has remained a major problem for the project. Members have not communicated enough. PC has encouraged WP leaders to call meetings to move project forward. Members have been encouraged to communicate as well.		There are no problems in communications any more.
23	Did the composition of the project team change with respect to the previous stages? If yes, who was replaced and why?	
There was a switch of roles role between WP1 leader and co-leader at the beginning of the second year. The leader was unable to deliver to results as planned and the progress was slow. In addition, there was a replacement of WP2 co-leader as the old one has taken a long sabbatical leave during after the project started.		***This is an example of good project managing.***
27	How does the risk management take place?	
	There is an Action plan written in PMCP and PEC members were reviewing it. WP leaders report on potential risks once a month.	***This is an example of good project managing.***

29	When, how and to whom do you communicate the risk development or arising new risks?	
	WP leaders communicate possible risks to PC and other PEC members.	***This is an example of good project managing.***
Project mid-term evaluation stage		
37	Were all the outputs, planned to be realized thus far, implemented, in what amount and quality? If not, why?	
At the time of mid-term evaluation, deliverables were completed according to the plan. The progress after the submission of the mid-term report, however, has been slowed. Task 2.1 and Task 2.2 should have been completed a couple months after the submission.		Tasks 2.1 and 2.2 are not quite finished. Actually, activities are done but the WP and Tasks leaders did not send the final reports, just the official notes. This is expected to be finished within two weeks.
40	Did the project management (Coordinator/PEC) propose recommendations for improving the organization of work?	
Yes. WP leaders were normally invited to attend PEC meeting to update the progress and PEC members asked, discussed and suggested, if there was any concern.		***This is very good practice. In this way all the managing personnel of the project are acting as a single team, without unnecessary delays in relaying responsibilities.***
41	Which measures to improve the project organization were proposed/ implemented?	
PEC offered suggestion on issues. PC communicated with members at large on progress of tasks and deliverables.		***The same remarks as for answer to previous question.***
46	*Is there anything you would like to add?*	
We are not yet at our best. I have not yet been able to bring up the best of every single member.		***This describes the best the PCs devotion to the project realization.***

The second part consisted of going through some points in the project realization for which the auditor considered that they need further clarifications or answers.

On WP2 - Tasks 2.1 and 2.2 are moved to earlier terms in the Adjusted Work Plan (AWP), what is now considered as very good.

On WP 3 - the problem as auditor saw it, was that Task 3.3 should have started earlier than proposed in the Adjusted Work Plan (AWP). 08_Adjusted Work Plan_30.09.2019.pdf

It was planned for the task 3.1 (developing course material) to start first, before conducting the pilot testing (task 2.3). They are overlapped because it was not planned to develop all the courses simultaneously. Unfortunately, there were some delays. So, the course materials were being developed week by week for the course offered during the semester in fall of 2019.

The problem with preparing the teaching materials for instructors and learning materials for students was that their execution was planned after the beginning of pilot courses. That was now (mainly) corrected. Those tasks are predicted to be executed in time for the pilot courses.

Task 5.4 and deliverable 5.4 were moved to month 9, which is also very good.

Tasks 5.5 – preparation of machines is in progress and it is planned for it to start on time – in January 2020.

The question on dissemination the project results with stakeholders – the PC replied that it was executed with other Thailand universities, however it was not yet executed with industry, completely. One positive experience was a visit to Western Digital Company, where the module of Industry 4.0 courses was introduced.

Budget for WP1 was cut because they did not deliver result in time.

It is the auditor's opinion that the Project Coordinator is running this project very well, with extreme responsibility and paying attention to all the details, as well as the project as a whole.

It should be emphasized that all the team members were expressing admiration and gratitude to the Project Coordinator for the ways in which he is managing this project.

3.3.2 The Project Executive Committee members, WP leaders and Tasks leaders

Interviews with managerial staff of the project were done within three days. The following remarks and conclusions follow from those interviews.

WP1 – Gap Analysis

– There are two months delay in the project realization (in general), explained by difference in starts of the semesters and school years between the participating universities. This delay is gradually being overcome.

The WP leader started teaching the course at his own department at University of Minho "Project management in communications" in September 2019 and it was to be finished in two months. (The audit interview was held in the fourth week of October 2019). The topic of the course was chosen to be as close as possible to the topic of the project itself.

WP2 – Curriculum Development I: Curriculum Structure and Courses

– The WP2 leader was asked why this WP is not finished yet. The explanation is that the cause lies in differences in the Thailand universities credit systems. There exists the official note on this task and report is to be prepared soon.

WP3 – Curriculum Development II: Modernization of Teaching Methods and Tools for Innovative MSc Programmes

The WP leader considers that developing the Laboratory is the most important task. Instructions for teachers (predicted in M5, M12 and M16) are done.

There is no report on Task 3.5. It has to be done AFTER the task 3.2 is finished.

WP4 – Quality Control and Monitoring

The WP4 leader explained in details (more than in the actual report) all the QCM procedures. There were 28 videos available at the project web-site, YouTube Channel and on the project's Face-Book page and task 4.2 is moved to M5 in the AWP and executed.

The task 4.2 leader was asked why the Internal Quality Control (IQC) has started only in M12? The answer was that it took a lot of time to prepare the proper IQC plan and then to continue with execution of task 4.2. There were 5 ICMB reports prepared until now (October 2019):
ICMB Report #1 - December 2018 (it covers more a year of the project realization)

ICMB Report #2 - February 2019

ICMB Report #3 - April 2019

ICMB Report #4 - June 2019

ICMB Report #5 - August 2019

and it will be continued to publish them every two months as planned.

WP5 – Dissemination and Exploitation of Project Results

What concerns the WP 5, the WP leader explained that this WP is practically executed throughout the whole project duration, which is very good. The Dissemination and Exploitation strategy was well defined in the project proposal (page 79).

The task 5.1 is done.

The Assumption #2 in the LFM seemed a bit unrealistic.

The question by auditor also concerned the Task 5.8 "Sustainable network", which was not predicted in the AWP or the LFM. It is explained that it was added later and this means the network of all the Thailand partner universities as an initial core and other universities that already expressed interest in the project realization, as well as some associated partners. This would support the project results sustainability.

WP6 – Project Management

On WP6 the question of the auditor was why the spent budget seems not to be "proportional" to elapsed time of the project realization (this is about the half of the project executed). The explanation is that the predicted equipment was not purchased at the time when the Technical Implementation Report was written (14.04.2019). In the meantime the majority of equipment was purchased. So, the apparent "disproportionality" does not exist anymore.

It should be mentioned that the project is already having the "spin-offs". The Romanian partner, University Politechnica of Bucharest (UPB), is already planning to introduce the similar Master's program as the program predicted as the outcome of this project.

It is also opinion of some EU team members that this project, due to its topic would be hard to apply even at EU universities and that the Thailand project team is doing, as it is put: "an excellent pioneering job".

It should also be noted that due to mutual collaboration on this project the Romanian and Polish partner universities have prepared the proposal for another project in the area similar to Industry 4.0.

There is an agreement to be signed on official collaboration between the Asian Institute of Technology (AIT) - the Project Coordinating University and University Politechnica of Bucharest (UPB), which was agreed upon during the visit of the President of AIT, Dr. Eden Woon to UPB.

3.3.3 The Project Quality Control and Monitoring Board members

This interview also included some clarifications of answers in the questionnaires. The Co-chair of the QCMB explained that some of the WP leaders were not "sufficiently involved" in the project realization and that they needed to be "pushed" by the Project Coordinator.

The QCMB Chair explained that "no deliverable would "go on the project web-site" if not approved by the QCMB: Evaluations of all the results are done "very carefully", based on *objective* observations. The WP leaders are responsible for those observations to be followed and make corrections if so suggested.

For example, the WP1 report submitted in July of 2018 was approved by the QCMB in January of 2019.

The Risk assessment is done by the Risk Assessment Committee (RMC).There are different procedures for different tasks – but they all fall under the general rules: obey the due dates for reports and forms and do them at the highest quality level! 03_QCM Plan.pdf

When the course materials will be developed all the WP teams will evaluate them and make remarks and send to QCMB for final approval.

One course leader has shown nice initiative for he developed the questionnaire for evaluation of his own course.

The QCMB does not monitor the budget – financial transactions – that is done by the PEC.

The conclusion by the auditor is that the QCMB is doing a very good job since controlling the quality of the project realization and results is the most responsible task.

3.3.4 The project team members

The team members present at this interview were the administrative and technical staff from Asian Institute of Technology (AIT). Here are some observations they made.

At the beginning the team members did not know all the procedures for this type of project. They were confused how to prepare all the documents (meetings' minutes, reports, time sheets) about their work.

Administrative staff had to work for extra time correcting and examining the time sheets submitted from all the partners to ensure that they conform to the EU financial rules.

Then, for the second meeting, held at Portuguese partner, University of Minho (UMinho) (from 09. to 11.10.2018) the extensive instructions were prepared by the project managing team. Now they do not have that type of problems anymore and understand all the procedures and requirements.

The technical staff, in charge of assembling/mounting and maintenance of electronic equipment, were satisfied to learn about the new equipment, ordered and purchased for the project's Laboratory and communications. It was quite challenging to combine the existing and the newly purchased equipment.

They thought that it would have been more efficient to buy the less expensive equipment that they can service and manage for a long time.

They had to make "a master plan" on maintaining the equipment within the limited budget.

Administrative workers stated that they do not have time to work more on the project as they would like to.

Ordering equipment cannot be done efficiently since the tender procedure is mandatory for amounts over 25000 Euros. That takes too much time. The limit should be raised.

The project intranet is very good.

3.3.5 Visits to laboratories and lectures and interviews with students

Visits to lectures included conversation with students attending courses developed within the project realization.

At Asian Institute of Technology the students were attending lectures in communications within the Course No. 16 - Communications and People Skills Development for Engineering Leaders (delivered by Professor Pisut Koomsap, the Project Coordinator). 17_Pilot Course 16 Syllabus.pdf

During the interview there were 8 students present. It is interesting to emphasize that two of them were foreigners (from Myanmar). All students were very satisfied with the course, considering it as a good preparation for their future carriers. The course made them more confident to speak in public, especially not to be afraid to speak in English language. The two foreign students emphasized that after attending the course they feel more accepted within the Thailand students community.

The following was visit to the Future Learning Laboratory that is being constructed at AIT. The setup of the laboratory is being "in construction" with some equipment already installed. The results of the 3D printing were impressive and even included making the toys for future promoting visits of public with small children, who could "make their own toys". Also impressive was presentation of the prototype of the small robot that will be developed for stacking pallets in rack warehouses during the manufacturing process.

At King Mongkut's University of Technology North Bangkok (KMUTNB) the visit included the laboratory for machining and robots and interview with students who are taking the two pilot testing courses (Course No. 6 Digital Factory, Course No. 16 Communications and People Skills Development for Engineering Leaders).

Nine students were present at auditor's interview, two were the exchange students, one from Indonesia and one form Jordan. Those were students attending the Course No. 6 Digital factory (delivered by Professor Athakorn Kengpol). 18_Pilot Course 06 Syllabus.PDF

Each student was assigned a different type of factory to develop. They were very proudly presenting to the auditor "their own factories", explaining in details what is produced there, describing what are possibilities for development and improvement of production lines and quality of products. The motto of the course is Visiting, Experience, Learning and Observing. Students were visiting various "real" factories so that they would be able to transfer the experience they gained there to developing their own digital factories – how to transform to a digital factory. The special benefit for students of this course were lectures from eminent experts from Europe, like Professor Alexander Dressler from University of Stuttgart, Germany.

The visit to KMUTNB ended with a reception of the auditor by the Dean of Faculty of Engineering, Assoc. Prof. Udomkiat Nontakaew, Ph.D. He was explaining the participation of his faculty in the Project realization and expressed satisfaction for being a part of this "venture" as he put it.

It is the auditor's opinion that both courses were well presented to students, which could be concluded from their expressed satisfaction with the gained knowledge and skills.

What concerns the project Laboratory that was visited, it is quite obvious that its development and status is very good at present and that the project realization should help in its completion and enabling the operation at satisfaction of both students and trainers/teachers.

4 Audit conclusions and recommendations

Based on reviewed documentation and interviews with project team members, as well as based on visits to project realization sites and interviews with students of the pilot courses, the auditor came up with the following conclusions.

Audit objective (related to on-site visit and interviews with project management and the team members) was met in accordance with the audit plan.

Tasks 2.1 and 2.2 are behind the schedule. The Work Package Leader had promised to submit the outcomes within 2 weeks.

The further delays in the project realization should not be allowed.

The Workload distribution between packages and activities is well balanced (WP1 – 16 %, WP2 – 16 %, WP3 – 28 %, WP4 – 11 %, WP5 – 13 % and WP6 – 15 %).

The same goes for the work load distribution between the staff categories (Teachers/trainers – 58 %, Technical – staff 26 %, Administrative staff – 8 % and Management staff – 8 %).

The budget is also evenly distributed between partners, without extremely larger amount kept for the Coordinating University, which is the usual "mistake" the coordinators do.

The budget distribution to Work Packages is also commendable, since the largest amounts are allocated to the most important Work Packages and equipment purchasing.

The original Workplan from the project proposal is adjusted and is now better suited to execution of the project realization. Some further small adjustments are inevitable for such a voluminous and, as some of the EU partners had put it, complex project. Task 5.8 is new and should be added to the WP.

The project management was executed according to adopted procedures in accordance with the adopted Project Management and Communication Plan.

It is the auditor's opinion that the Project Coordinator is running this project very well, with extreme responsibility and paying attention to all the details, as well as the project as a whole.

It should be emphasized that all the team members were expressing admiration and gratitude to the Project Coordinator for the ways he is managing this project.

The general conclusion is that the Project Coordinator, members of the Project Executive Committee, and members of the project's Quality Control and Monitoring Board, as well as other team members (administrative and technical staff) are quite sure that the project is "on the right track" and would be beneficial for the participating Thailand universities.

Furthermore, there were number of proposals for extending the scope of the project application to other Thailand universities, maybe even to universities in the region.

This testifies that the sustainability of the project results is pretty ensured.

It should be mentioned that the project is already having the "spin-offs". The Romanian partner, University Politechnica of Bucharest (UPB), is already planning to introduce the similar Master's program as the program predicted as the outcome of this project.

It should also be noted that due to mutual collaboration on this project the Romanian and Polish partner universities have prepared the proposal for another project in the area similar to Industry 4.0.

There is an agreement to be signed on official collaboration between the Asian Institute of Technology (AIT) – the Project Coordinating University and University Politechnica of Bucharest (UPB), which was agreed upon during the training visit of the Thailand project team members to UPB.

It is also opinion of some the EU team members that this project, due to its topic would be hard to apply even at EU universities and that the Thailand project team is doing, as it is put: "an excellent pioneering job".

The conclusion by the auditor is that the QCMB is doing a very good job since controlling the quality of the project realization and results is the most responsible task. There are precise procedures developed for realization of the quality control of each task, activity, outcome and deliverable. Some of these procedures are common for several Work Packages and some are specific since that depends on the nature of the Work Package (or even activity) in question.

Dissemination and Exploitation of the project results is done according to the DES plan (DESP). The success of these activities is illustrated by the number of promotional activities (seminars and workshops) as well as number of articles, related to the project topic (Industry 4.0) presented at scientific conferences. Even when presenting their articles, the team members are also giving the project promotional material to conferences' participants.

It is the auditor's opinion that both pilot courses (that she was able to overview) were well presented to students, which could be concluded from the satisfaction that they expressed about the knowledge and skills that they gained.

What concerns the project Laboratory that was visited, it is quite obvious that its development and status is very good at present and that the project realization should help in its completion and enabling the operation at satisfaction of both students and trainers/teachers.

Auditor is free to propose some actions that should help in more efficient project realization and in securing the project's sustainability.

The online teaching and learning platform developed must be accessible from abroad to promote the global participation. The WP Leader must work together with the technical staff to ensure that the server security does not prohibit access of the overseas partners.

Since this project is the first of this kind in this field (Industry 4.0) it is suggested to the Project Coordinator and the Project Executive Committee to investigate the possibility for accrediting the Master's program, developed within the project, with European Network for Quality Assurance (ENQA) from Helsinki, Finland. That would expand the visibility of this program to all the countries that have any of the programs accredited by this institution.

Establishment of partners networking is one of the project outcomes that promotes the project sustainability. A memorandum or contract with partners, especially associated partners, is suggested.

Establishing the Double degrees (within this Master's program) with European universities is also suggested to Thailand universities participating in the Project, as well as extending the collaboration to other Thailand universities, not participating in this project realization.

It should be emphasized that this initiative did not come from the auditor only, but as presented in the conclusions above, from the project team members as well.

Auditor

Professor Ruzica Nikolic, PhD

In Žilina,

December 09. 2019.