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WP1: Research development

26th June 2018

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

Agenda

Tueday, June 26, 2018	
.00-10.20	-Review of Task1.2 contents -Discussion on the Task1. 2
0.20-10.40	**Coffee Break**
0.40-12. 00	-Report of progress from each partner -Summary of Task1.2
2:00 – 13:00	**Lunch** (Galae Restaurant Chiangmai)
3:00 – 15:00	-Review of Task1.3 contents and Questionnaires -Discussion on Task1.3 -Report of progress on Task1.3 by each partner
5:00 – 15:20	**Coffee Break**
5.20 – 16.30	-Summary of WP1 progress on Task 1.2 ,1.3
6.30 – 17.00	-Report of QC WP1.5
8:30 – 20:30	**Dinner** (@Ohkajhu organic)

Summary of WPL

- WP1: Gap Analysis (Leader: P2:CMU & P8:Uminho)
- WP2 Curriculum Development I: Curriculum Structure and Courses (P9 & P1)
- WP3 Curriculum Development II: Modernization of Teaching Methods and Tools for Innovative MSc Programmes (P1 & P8)
- WP4 Quality Control and Monitoring(P7 & P6)
- WP5 Dissemination and Exploitation of Project Results(P5 & P7)
- WP6 Project Management(P1)

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Description of WP1

- The comparative analysis of
  - **the actual situation concerning the MSc curricula in Industrial Engineering offered in Thai and EU partner countries universities,**
  - **the identification of the gaps between the real needs of the industry,**
  - the student needs and the actual offered curricula,
  - the recommendations for the new curriculum development,
  - the most important working elements for the first year of the project in WP1.
- Throughout the entire first year the purposes of the WP1 are:

- *1) to identify the strengths and weaknesses , the common points, the differences and the good practices concerning curricula, teaching methods and tools in Thai and EU universities*
- *2) to identify the gap between the needs of industry, for being ready for Thailand 4.0, especially in capacity building, and the competence of MSc graduates from current curricula offered by Thai and EU universities*
- *3) to recommend the specifications and focus areas of the new proposed MSIE curriculum.*

- ***The WP1 will be led by CMU (P2) in close collaboration with UMinho (P8) that will co-lead and be the WP1 coordinator for EU partners. All partners will also participate and be responsible for tasks related to their geographical regions.***

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WORKPLAN for Project year 1

Activities														Total duraton (number of weeks)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep
Ref.nr/Sub-ref nr	Title	WPL	CWPL	TL	AIT	CMU	MUTN	TU	KKU	PSU	UPB	UM	CUT		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Task 1.1	Develop a gap analysis working plan	CMU	UM	CMU	P	TL						P		3	3=,3X											
Task 1.2	Analyzing of MSIE curricula being offered, and of learning and teaching methods being applied	CMU	UM	UM	P	P		P			P	TL	P	8		2=,2X	2=,2X	2=,2X	2=,2X							
Task 1.3	Assessing needs of industry and students	CMU	UM	CMU		TL	P	P	P	P	P	P	P	10					2=,2X	2=,2X	2=,2X	2=,2X	2=,2X			
Task 1.4	Identifying gaps	CMU	UM	UM	P	P		P			P	TL	P	3									=,x	2=,2x		
Task 1.5	Identifying competitive factors for the curriculum	CMU	UM	CMU	P	TL		P			P	P	P	3										2=,2x	=,x	
Task 1.6	Developing recommendations for the specifications and areas of specialization for the curriculum	CMU	UM	CMU	P	TL				P	P	P	P	4											2=,2x	2=,2X
Task 3.3	Developing a web-portal for online learning	AIT	UM	AIT	TL	P					P	P		12						2=,2X	2=,2X	2=,2X	2=,2X	2=,2X	2=,2X	
Task 4.1	Developing a quality control and monitoring system	UPB	PSU	UPB	P	P		P			TL		P	7	2=,2X	2=,2X	2=,2X	=,X								
Task 4.2	Implementing the internal quality control and monitoring of the project	UPB	PSU	UPB		P	P				TL		P	5				=,X		=,X		=,X		=,X		=,X
Task 5.1	Development of a Dissemination, Exploitation and Sustainable plan,	KKU	UPB	UPB	P	P					TL	P		6	2=,X	2=,X	2=,X									
Task 5.2	Creating a project website and maintaining it throughout the project lifetime to support the dissemination strategy, and communication and collaboration among partners,	KKU	UPB	AIT	TL	P			P		P	P		14	2=,X	2=,X	=	=	=	=	=	=	=	=	=	=
Task 5.3	Production of dissemination materials	KKU	UPB	KKU	P	P			TL		P	P	P	6						2=,X	2=,X					2=,X
Task 5.6	Organizing dissemination events with relevant stakeholders	KKU	UPB	KKU	P	P			TL		P	P	P	2												2=,X
Task 6.1	Development of project management and communication rules and of the partnership agreement	AIT		AIT	TL	P	P	P	P	P	P	P	P	3	3=,3X											
Task 6.2	Organizing and management of the project communication and of regular consortium meetings	AIT		AIT	TL	P	P	P	P	P	P	P	P	6	2=,2X					2=,2X						2=,2X
Task 6.3	Financial and administrative management and monitoring of the project	AIT		AIT	TL	P	P	P	P	P	P	P	P	12	=	=	=	=	=	=	=	=	=	=	=	=

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WORKPLAN for Project year 1

Activities														Total duraton (number of weeks)	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep			
Ref.nr/Sub-ref nr	Title	WPL	CWPL	TL	AIT	CMU	MUTN	TU	KKU	PSU	UPB	UM	CUT		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Task 1.1	Develop a gap analysis working plan	CMU	UM	CMU	P	TL						P		3	3=,3X											
Task 1.2	Analyzing of MSIE curricula being offered, and of learning and teaching methods being applied	CMU	UM	UM	P	P		P			P	TL	P	8		2=,2X	2=,2X	2=,2X	2=,2X							
Task 1.3	Assessing needs of industry and students	CMU	UM	CMU		TL	P	P	P	P	P	P	P	10					2=,2X	2=,2X	2=,2X	2=,2X	2=,2X			
Task 1.4	Identifying gaps	CMU	UM	UM	P	P		P			P	TL	P	3									=,x	2=,2x		
Task 1.5	Identifying competitive factors for the curriculum	CMU	UM	CMU	P	TL		P			P	P	P	3										2=,2x	=,x	
Task 1.6	Developing recommendations for the specifications and areas of specialization for the curriculum	CMU	UM	CMU	P	TL				P	P	P	P	4											2=,2x	2=,2X
Task 3.3	Developing a web-portal for online learning	AIT	UM	AIT	TL	P					P	P		12						2=,2X	2=,2X	2=,2X	2=,2X	2=,2X	2=,2X	
Task 4.1	Developing a quality control and monitoring system	UPB	PSU	UPB	P	P		P			TL		P	7	2=,2X	2=,2X	2=,2X	=,X								
Task 4.2	Implementing the internal quality control and monitoring of the project	UPB	PSU	UPB		P	P				TL		P	5				=,X		=,X		=,X		=,X		=,X
Task 5.1	Development of a Dissemination, Exploitation and Sustainable plan,	KKU	UPB	UPB	P	P					TL	P		6	2=,X	2=,X	2=,X									
Task 5.2	Creating a project website and maintaining it throughout the project lifetime to support the dissemination strategy, and communication and collaboration among partners,	KKU	UPB	AIT	TL	P			P		P	P		14	2=,X	2=,X	=	=	=	=	=	=	=	=	=	=
Task 5.3	Production of dissemination materials	KKU	UPB	KKU	P	P			TL		P	P	P	6						2=,X	2=,X					2=,X
Task 5.6	Organizing dissemination events with relevant stakeholders	KKU	UPB	KKU	P	P			TL		P	P	P	2												2=,X
Task 6.1	Development of project management and communication rules and of the partnership agreement	AIT		AIT	TL	P	P	P	P	P	P	P	P	3	3=,3X											
Task 6.2	Organizing and management of the project communication and of regular consortium meetings	AIT		AIT	TL	P	P	P	P	P	P	P	P	6	2=,2X					2=,2X						2=,2X
Task 6.3	Financial and administrative management and monitoring of the project	AIT		AIT	TL	P	P	P	P	P	P	P	P	12	=	=	=	=	=	=	=	=	=	=	=	=

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Tasks

☑ CMU : TL

Task 1.1 Developing a gap analysis working plan

- Task 1.1.1 Forming a working group for WP1
- Task 1.1.2 Creating a list of curricula to be reviewed
- Task 1.1.3 Setting up criteria for evaluation
- Task 1.1.4 Creating a list of companies and organizations for survey
- Task 1.1.5 Preparing an execution plan

☑ UMinho : TL

Task 1.2 Analysing of MSIE curricula being offered, and of learning and teaching methods being applied

- Task 1.2.1 Reviewing MSIE curricula being offered currently in Thailand
- Task 1.2.2 Reviewing teaching and learning methods being applied currently in Thailand
- Task 1.2.3 Reviewing MSIE curricula being offered currently in partners' countries
- Task 1.2.4. Reviewing teaching and learning methods being applied in partners' countries
- Task 1.2.5 Analysing curricula, and teaching and learning methods

☑ CMU : TL

Task 1.3 Assessing needs of industry and students

- Task 1.3.1 Preparing a survey form for identifying the needs of industry for MSIE graduates to support their success in Thailand 4.0 and Industry 4.0
- Task 1.3.2 Preparing a survey form for the needs of prospective students for preparing them for Thailand 4.0 and Industry 4.0
- Task 1.3.3 Conducting survey for companies and organizations in the list
- Task 1.3.4 Conducting survey from students
- Task 1.3.5 Identifying the needs of industry and students

☑ UMinho : TL

Task 1.4 Identifying gaps

- Task 1.4.1 Comparing the needs of industries in Thailand and European partners' countries
- Task 1.4.2 Identifying gaps between the needs of industry and the competence of MSIE graduates

☑ CMU : TL

Task 1.5 Identifying competitive factors for the curriculum

Task 1.6 Developing recommendations for the specifications and areas of specialization for the curriculum

Deliverables/results/outcomes

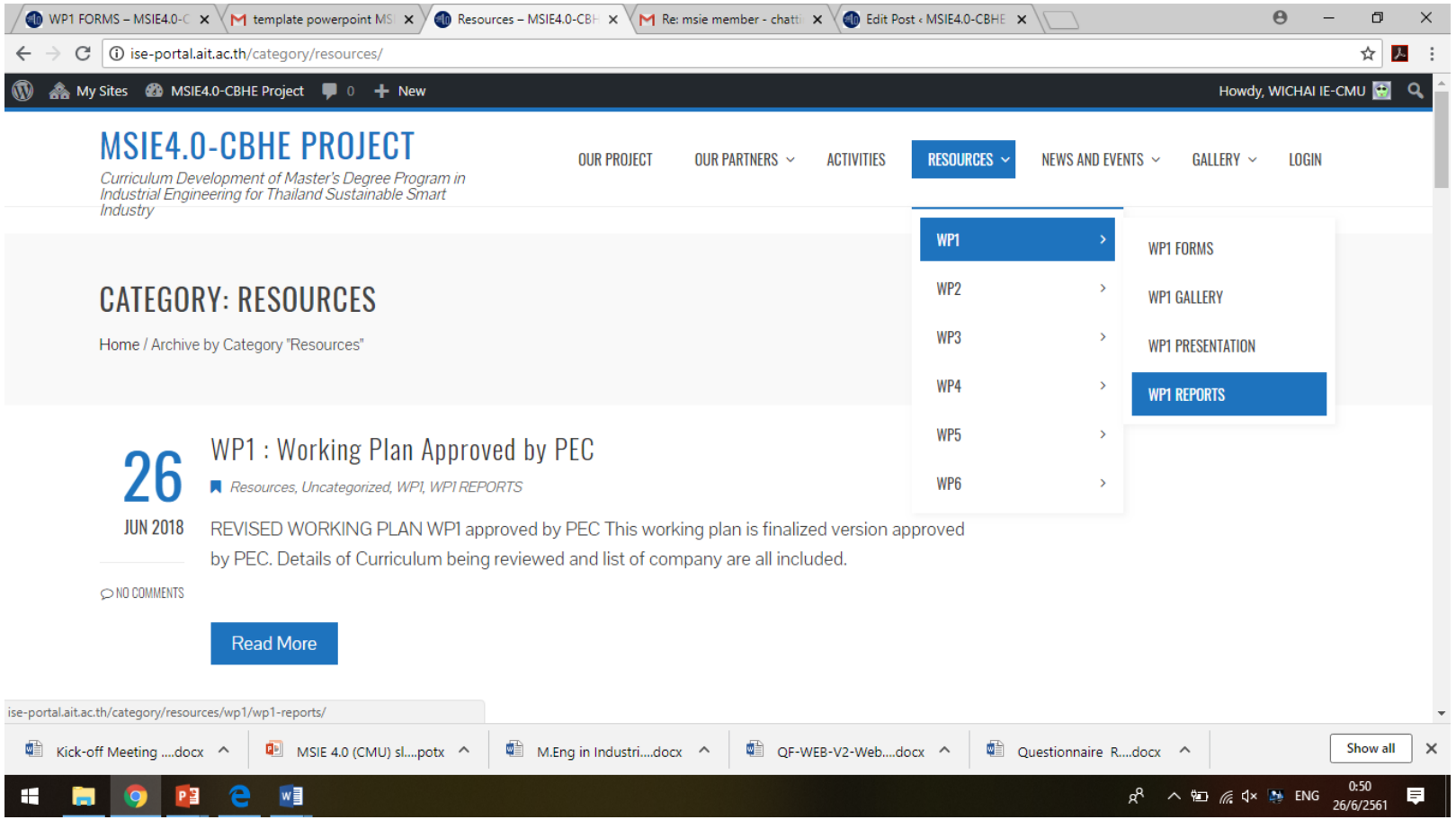
☑ CMU : TL

Task 1.1 Developing a gap analysis working plan

- Task 1.1.1 Forming a working group for WP1
- Task 1.1.2 Creating a list of curricula to be reviewed
- Task 1.1.3 Setting up criteria for evaluation
- Task 1.1.4 Creating a list of companies and organizations for survey
- Task 1.1.5 Preparing an execution plan

Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**1.1.**	
	Title	Gap Analysis working plan	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	A working plan containing: a) A list with WP1 working group members and responsibilities among the project partners , a list with companies , organizations , student associations and other stakeholders who will be the involved in the survey. b) Specific MSc curricula in MIE to be reviewed in Thailand and in EU partners' countries c) Criteria for evaluation d) templates and documents for the analyses e) Procedures and rules for the analyze process and for the control and quality assurance of the results f) Planning of the Gap Analysis activities.	
	Due date	M1	
	Languages	English	
Target groups	☒ Teaching staff ☐ Students ☐ Trainees ☐ Administrative staff ☐ Technical staff ☐ Librarians ☐ Other		
	If you selected 'Other', please identify these target groups. (Max. 250 characters)		
Dissemination level	☐ Department / Faculty ☒ Institution	☒ Local ☐ Regional	☒ National ☒ International

WP1: Task 1.1



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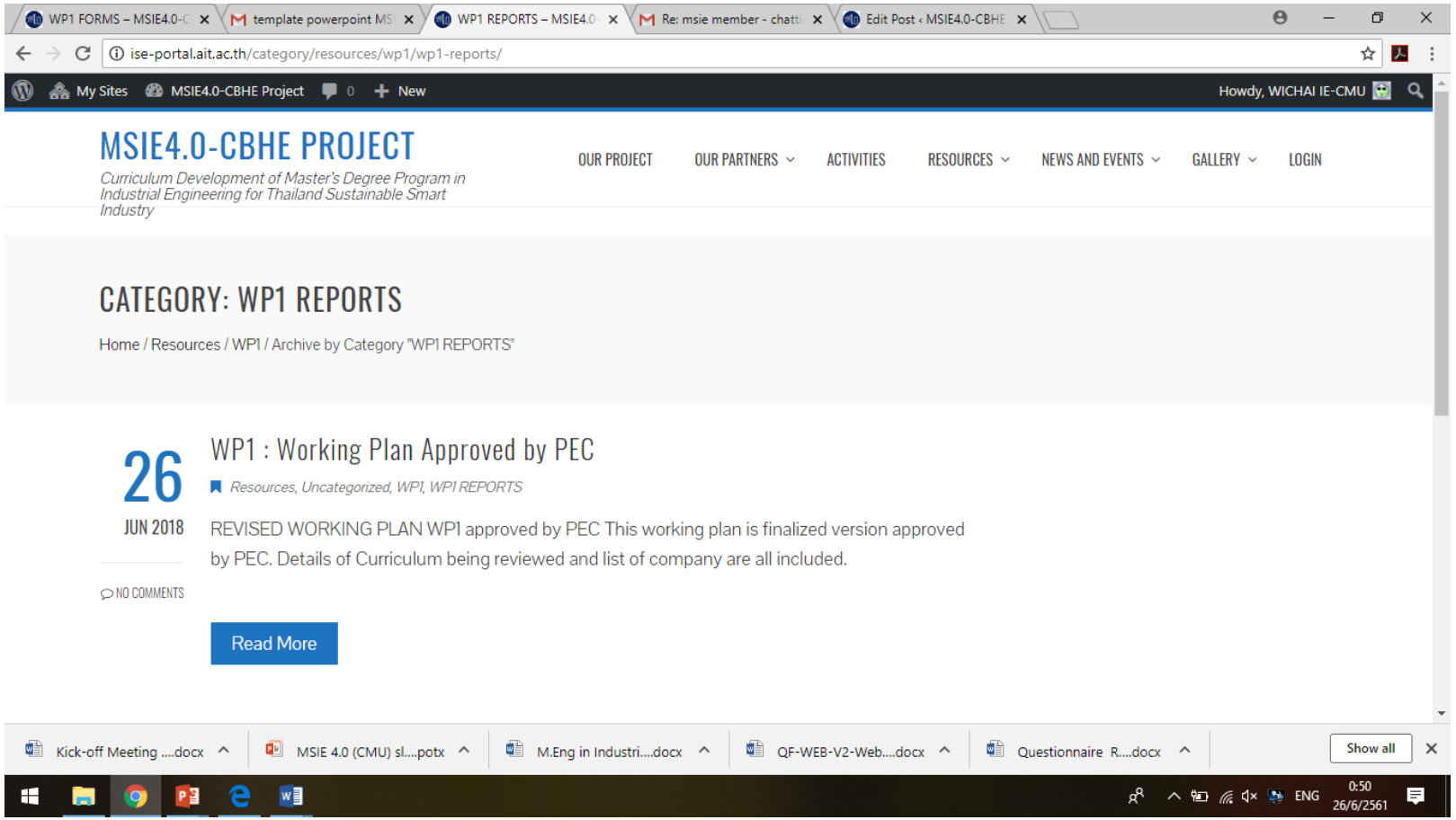
WP1: Task 1.1



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WP1: Working Plan

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Curriculum Development of Master's Degree Program in Industrial Engineering for Thailand Sustainable Smart Industry -MSIE4.0

REVISED WORKING PLAN WP1

WP1

WP1 is aimed to provide comparative analysis of the actual situation concerning the MSc curricula in Industrial Engineering offered in Thai and EU partner countries universities, the identification of the gaps between the real needs of the industry, the student needs and the actual offered curricula. The recommendations for the new curriculum development, are the most important deliverable working elements for the first year of the project in WP1.

Throughout the entire first year the WP1 will

1) identify the strengths and weaknesses , the common points, the differences and the good practices concerning curricula, teaching methods and tools in Thai and EU universities
2) identify the gap between the needs of industry, for being ready for Thailand 4.0, especially in capacity building, and the competence of MSc graduates from current curricula offered by Thai and EU universities
3) recommend the specifications and focus areas of the new proposed MSIE curriculum.

The WP1 will be led by CMU close collaboration with UMinho that will co-lead and be the WP1 coordinator for EU partners. All partners will also participate and be responsible for tasks related to their geographical regions.

This analysis working plan is now revised after the kick-off meeting and is being presented to the project executive committee-PEC for approval.

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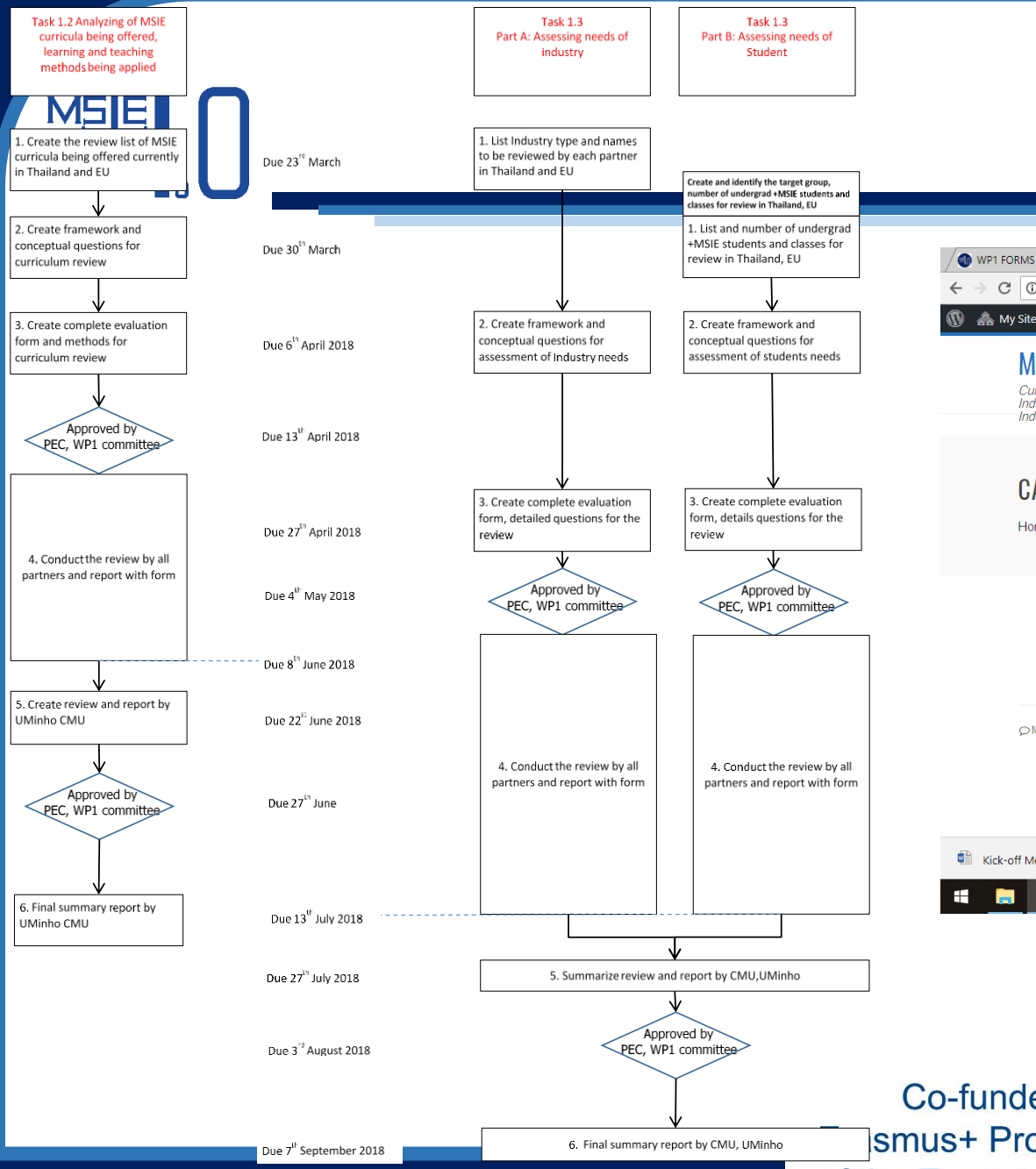
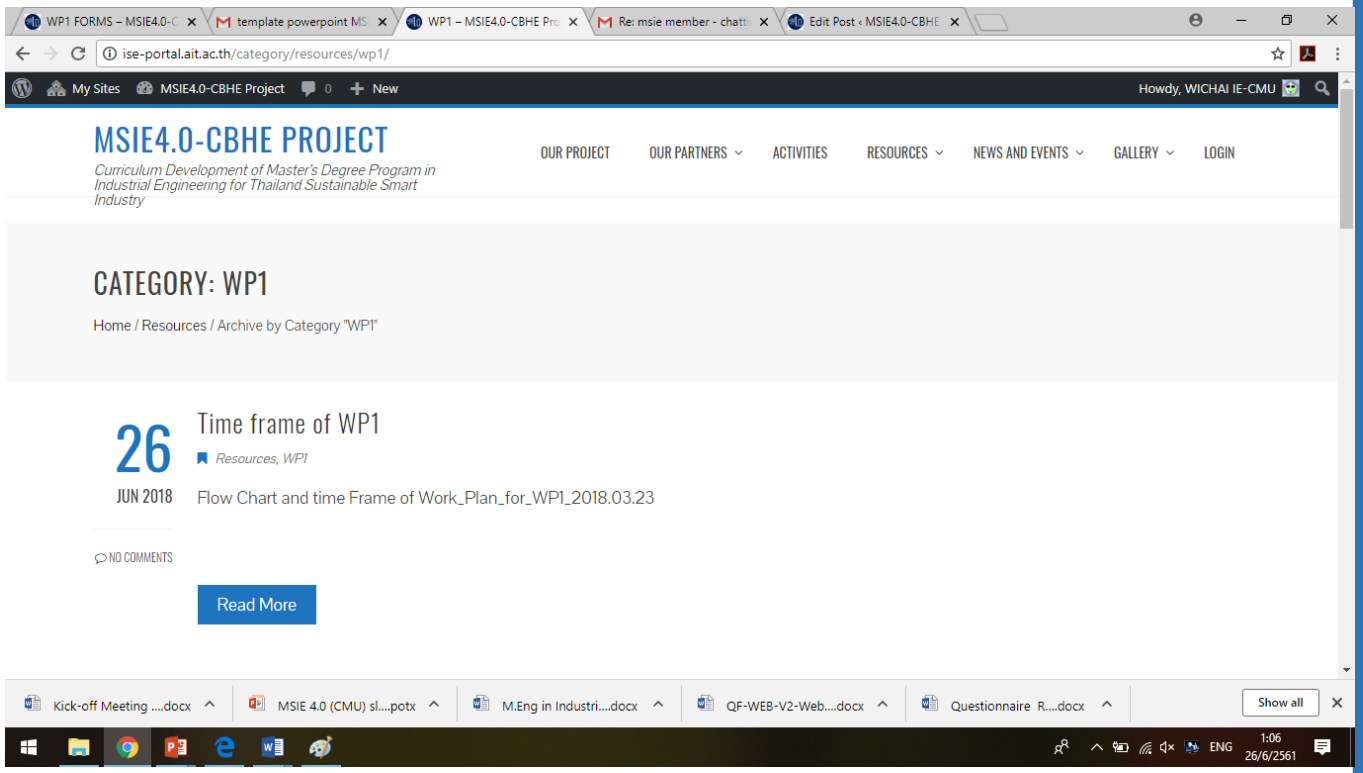
WP1: Task 1.1





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Final list of IE curriculum reviewed

20 Programs from 16 Universities selected in Thailand listed by each partner

Chiang Mai University (CMU)	1.Chiang Mai University (CMU)	1.Master of Engineering Program in Industrial Engineering
	2.Naresuan University	1.Master of Engineering Program in Management Engineering
	3.Mae Fah Luang University	1.Master of Business Administration Programme in Logistics and Supply Chain Management (International Programme)
	4.Kasetsart University	1.Master degree in industrial engineering 2. Master degree in engineering management
Khon Kaen University (KKU)	1.Khon Kaen University (KKU)	1.Master of Engineering Program in Industrial Engineering
	2.Suranaree University of Technology	1.Master of Engineering (Industrial Systems and Environmental Engineering)
	3.Ubon Ratchathani University	1.Master of Engineering Program in Industrial Engineering
	4.Chulalongkorn university (CU)	1.Master of Industrial Engineering
Prince of Songkla University (PSU)	1.Prince of Songkla University (PSU)	1.Master of Engineering Program in Industrial Engineering
	2.King Mongkut's Institute of Technology Ladkrabang	1.Master of Industrial Engineering
	3.Burapha University	1.Master of Industrial Engineering
	4.Nakhon Si Thammarat Rajabhat University	1.Master of Industrial Engineering
King Mongkut's University of Technology North	1.King Mongkut's University of Technology North Bangkok	1.Master of Industrial Engineering
	2.King Mongkut's Institute of Technology Thonburi	1.Master of Engineering Program in Metal Forming Technology 2.Master of Engineering Program in Manufacturing System Engineering 3.Master of Engineering Program in Precision Engineering
Thammasat University (TU)	1. Thammasat University (TU)	1.Master of Industrial Engineering
	1.Sirindhorn International Institute of Technology (SIIT), Thammasat University	1.Master of Engineering Program in Engineering Technology 2.Master of Engineering Program in Information and Communication Technology for Embedded Systems (ICTES) 3.Master of Engineering Program in Logistics and Supply Chain Systems Engineering (LSCSE)

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IO Programs being reviewed in Europe listed by each partner

UPB	1. Universitatea POLITEHNICA din Bucuresti/POLITEHNICA University of Bucharest (UPB)	1.Master of Engineering Programs in Industrial Engineering
		Design industrial şi produse innovative/Industrial design and product innovation(DIPI)
		Inginerie avansată asistată de calculator/Advanced Computer Aided Engineering(IAAC)
		Ingineria nanostructurilor şi proceselor neconvenţionale/Engineering of nanostructures and nonconventional processes(INPN)
		Ingineria proiectării şi fabricării produselor/Engineering of Design and Product Manufacturing(IPFP)
		Conception intégrée des systèmes technologiques/ Concepţia integrată a sistemelor tehnologice/Integrated design of technological systems(CIST)
		Concepţie si management în productică/Design and Management of Automated Production Systems(CMP)
		Echipamente pentru terapii de recuperare/Rehabilitation Therapies Equipments(ETR)
		Maşini şi sisteme de producţie/*Machines and production systems(MSP)*
		Tehnologii şi sisteme poligrafice/*Poligraphic systems and technologies(TSP)*
		Logistică industrial/Industrial logistics(LI)
		Managementul întreprinderilor industriale virtuale/Management of virtual industrial enterprises(MIV)
		Ingineria calităţii/Quality Engineering(IC)
		Ingineria şi managementul proceselor de sudare şi control/*Engineering and management of welding and control processes(IMPSC)*
		Ingineria securităţii şi sănătăţii în muncă/Occupational safety and health engineering(ISSM)
		Evaluarea calităţii materialelor şi produselor/*Quality assessment of materials and products(ECMP)*

	2. Universidad Politécnica de Madrid	1.Master programe from ESCUELA TÉCNICA SUPERIOR DE INGENIEROS INDUSTRIALES(CFAC)
	3.Universitatea Tehnica Gheorghe Asachi, Iasi/Technical University Gheorghe Asachi, Iasi (U Gha Iasi)	1.Concepţia şi Fabricaţia Asistată de Calculator/Computer Assisted Design and Manufacturing(IMFM) 2.Inginerie şi Management în Fabricaţia Mecanică/Engineering and Management in Mechanical Manufacturing
	4.ESCUELA TÉCNICA SUPERIOR DE INGENIEROS INDUSTRIALES - Universidad Politécnica de Madrid (UPM)	1.ESCUELA TÉCNICA SUPERIOR DE INGENIEROS INDUSTRIALES - Universidad Politécnica de Madrid
U Minho	1.University of Minho	1.UMinho1 - Integrated Master in Industrial Engineering and Management (MIEGI) 2.UMinho2 - Master in Engineering Systems (MES) 3.UMinho3 - Master in Industrial Engineering (MEI) – Industrial Management option
	2.University of Porto	1.U.Porto -Integrated Master in Industrial Engineering and Management (MIEGI)
	3.University of Aveiro	1.UA – Master in Industrial Engineering and Management (MEGI)
CUT	1.University: Częstochowa University of Technology, PL	1.Master Program in Management and Production Engineering
	2.University: AGH, Kraków, PL	1.MSc Program: Management and Production Engineering
	3.University: Grenoble INP, FR	1.Master in Sustainable Industrial Engineering

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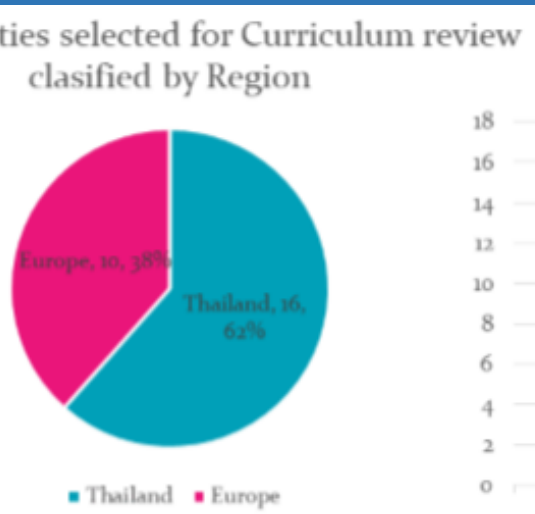

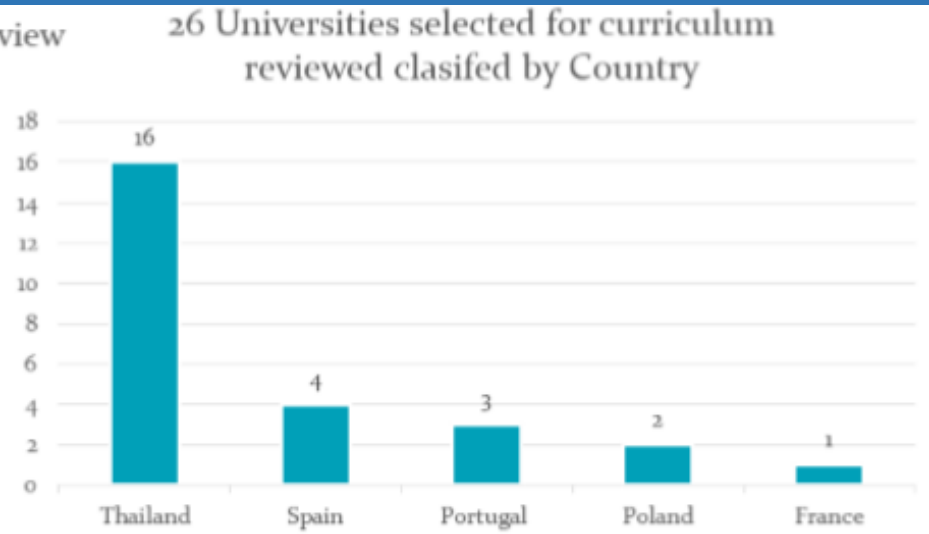

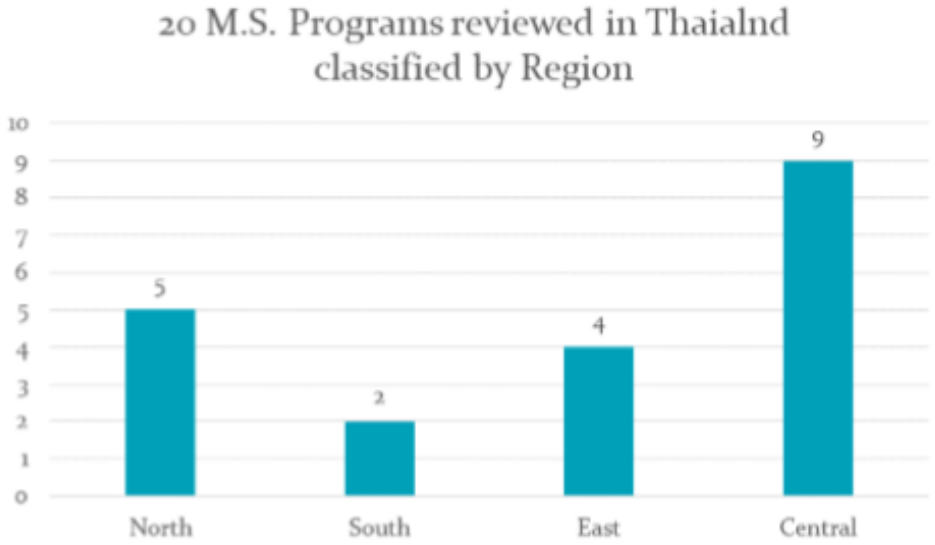

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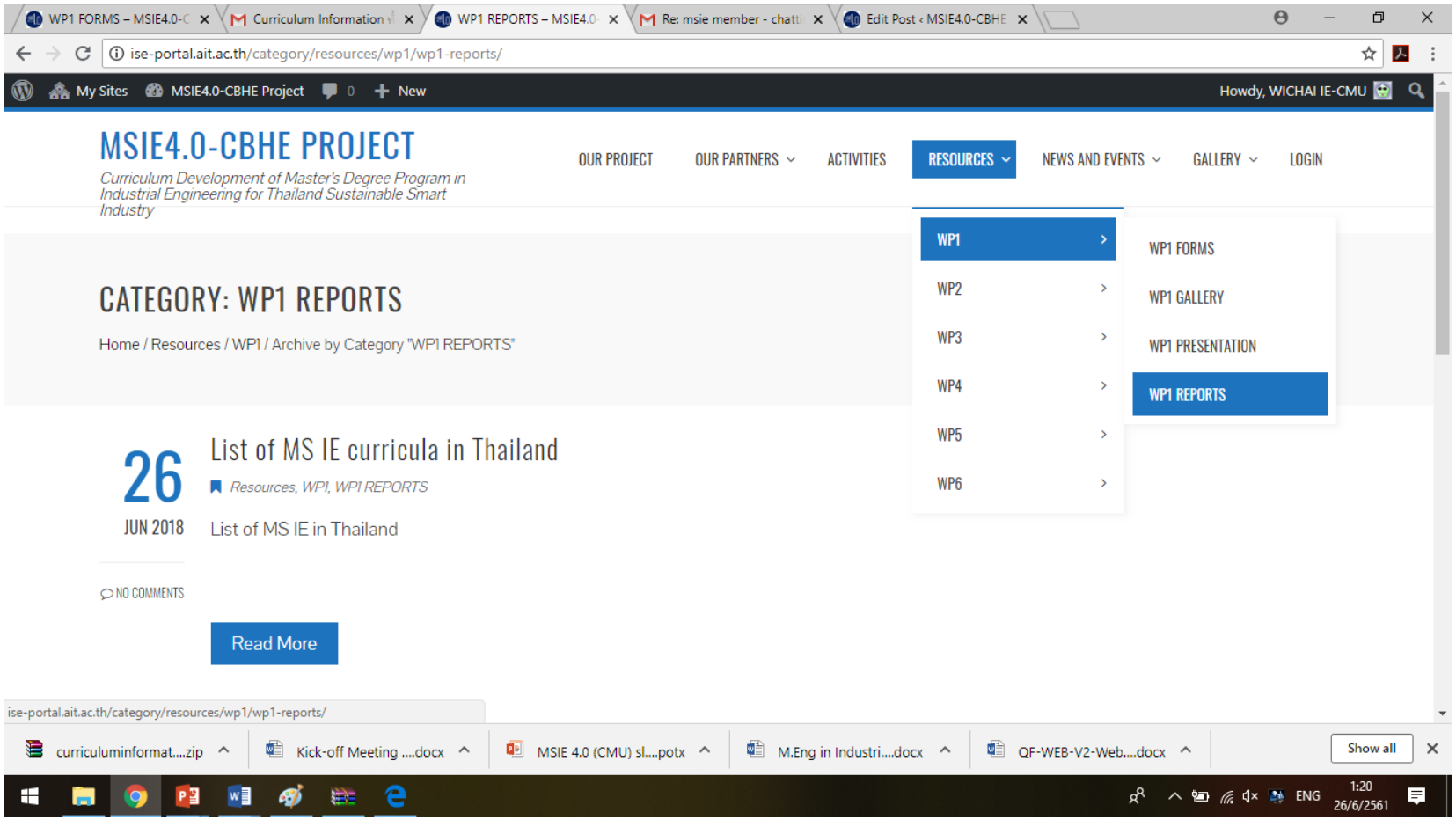
List of MS IE Curricula in Thailand



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Deliverables/results/outcomes

☑ UMinho : TL

Task 1.2 Analysing of MSIE curricula being offered, and of learning and teaching methods being applied

- Task 1.2.1 Reviewing MSIE curricula being offered currently in Thailand
- Task 1.2.2 Reviewing teaching and learning methods being applied currently in Thailand
- Task 1.2.3 Reviewing MSIE curricula being offered currently in partners' countries
- Task 1.2.4. Reviewing teaching and learning methods being applied in partners' countries
- Task 1.2.5 Analysing curricula, and teaching and learning methods

Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**1.2.**	
	Title	Comprehensive analysis of MSIE curricula being offered in Thailand and in EU partner countries	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	A comprehensive analysis of MSIE curricula being offered currently in Thailand and EU partners' countries will be made. This report in a form of a SWOT analyse will identify the strengths and weaknesses in Thai and EU universities , the common points, but also the differences The aim of this outcome is to identify the main good practices and aspects in the EU and Thai universities curricula's in order to be included in the new foreseen curricula. The report will emphasis on the This report will be a part of the first WP1 progress report presented at the second PEC meeting.	
	Due date	M6	
	Languages	English, Thai	
Target groups	☒ Teaching staff ☐ Students ☐ Trainees ☐ Administrative staff ☐ Technical staff ☐ Librarians ☐ Other		
	If you selected 'Other', please identify these target groups. (Max. 250 characters)		
Dissemination level	☐ Department / Faculty ☒ Institution	☒ Local ☐ Regional	☒ National ☒ International

Task 1.2 concept by Minho

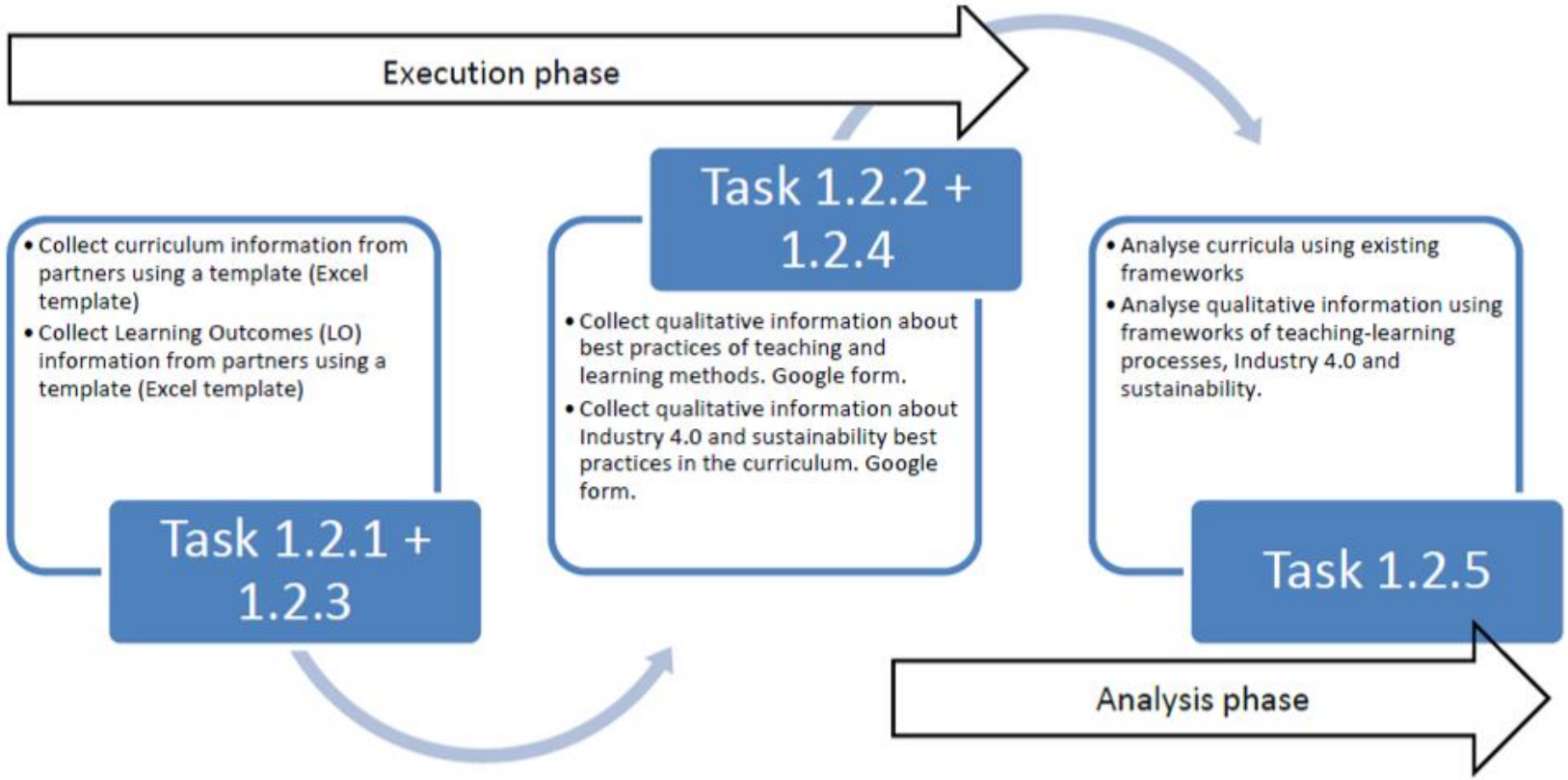

Figure 2: Execution and analysis phases of Task 1.2 methodology

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Task 1.2 concept by Minho

- An Excel template is developed and is already distributed among the partners to collect information about curriculum structure, areas of specialization and learning outcomes.
- A form is being developed to collect information about best - practices of type of educational experiences based on innovative learning environments with a student centred approach (i.e. active learning strategies).
- *Reviewing MSIE curricula (tasks 1.2.1 and 1.2.3) will be based on data collected from partners, using an Excel file as a template*

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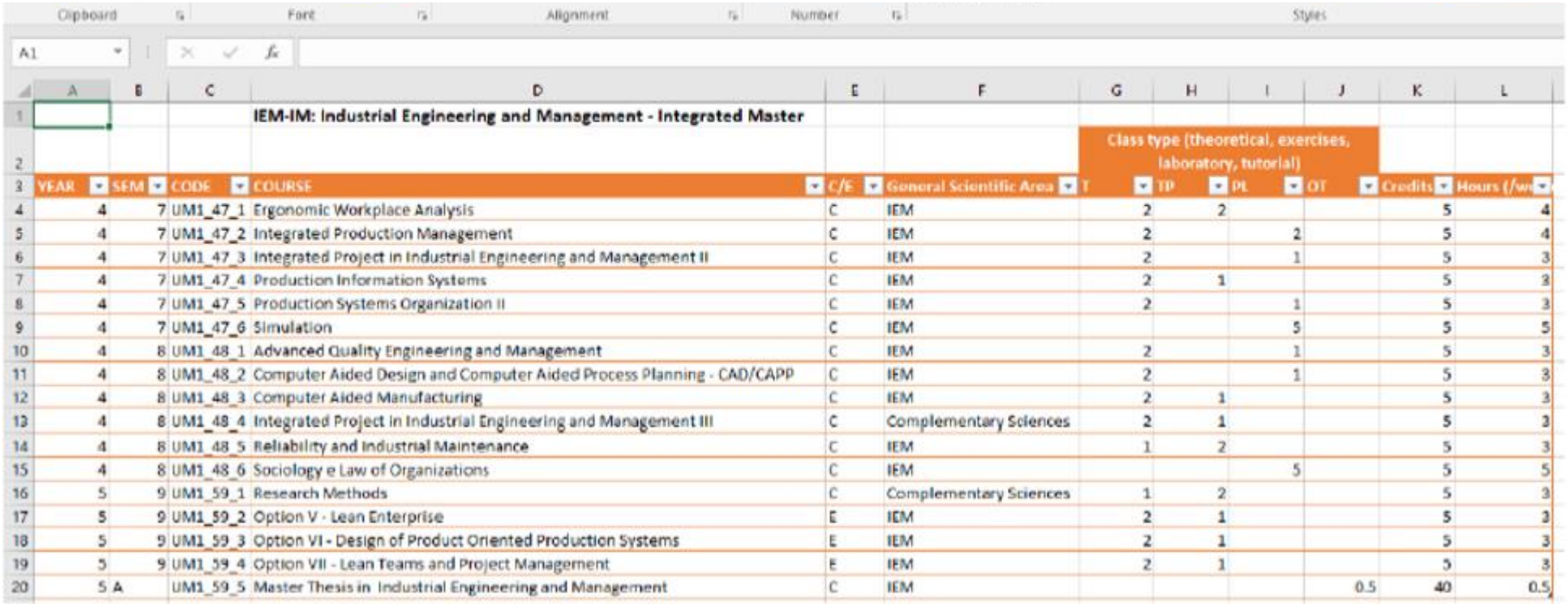
Task 1.2 concept by Minho

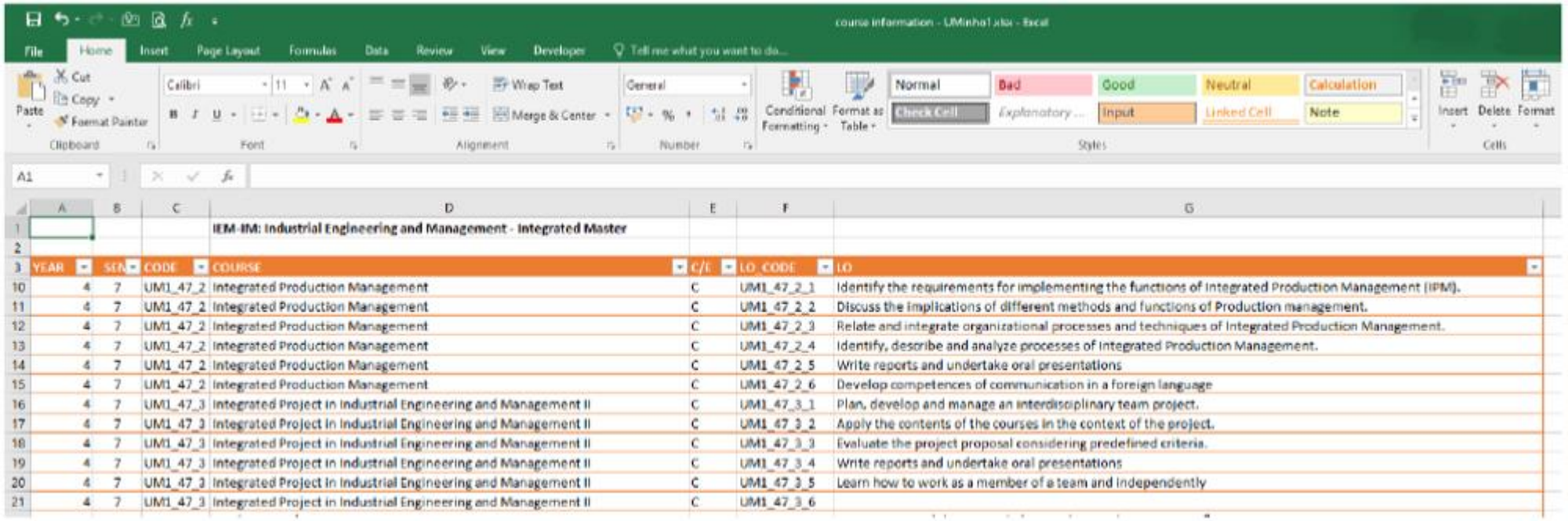
- First, we collect information from the courses, class types, hours of contact, credits and number of enrolled students. Please check next figure as an example



	A	B	C	D	E	F	G	H	I	J	K	L
1				IEM-IM: Industrial Engineering and Management - Integrated Master								
2							Class type (theoretical, exercises, laboratory, tutorial)					
3	YEAR	SEM	CODE	COURSE	C/E	General Scientific Area	T	TP	PL	OT	Credits	Hours (/we
4	4	7	UM1_47_1	Ergonomic Workplace Analysis	C	IEM	2	2			5	4
5	4	7	UM1_47_2	Integrated Production Management	C	IEM	2		2		5	4
6	4	7	UM1_47_3	Integrated Project in Industrial Engineering and Management II	C	IEM	2		1		5	3
7	4	7	UM1_47_4	Production Information Systems	C	IEM	2	1			5	3
8	4	7	UM1_47_5	Production Systems Organization II	C	IEM	2		1		5	3
9	4	7	UM1_47_6	Simulation	C	IEM			5		5	5
10	4	8	UM1_48_1	Advanced Quality Engineering and Management	C	IEM	2		1		5	3
11	4	8	UM1_48_2	Computer Aided Design and Computer Aided Process Planning - CAD/CAPP	C	IEM	2		1		5	3
12	4	8	UM1_48_3	Computer Aided Manufacturing	C	IEM	2	1			5	3
13	4	8	UM1_48_4	Integrated Project in Industrial Engineering and Management III	C	Complementary Sciences	2	1			5	3
14	4	8	UM1_48_5	Reliability and Industrial Maintenance	C	IEM	1	2			5	3
15	4	8	UM1_48_6	Sociology e Law of Organizations	C	IEM			5		5	5
16	5	9	UM1_59_1	Research Methods	C	Complementary Sciences	1	2			5	3
17	5	9	UM1_59_2	Option V - Lean Enterprise	E	IEM	2	1			5	3
18	5	9	UM1_59_3	Option VI - Design of Product Oriented Production Systems	E	IEM	2	1			5	3
19	5	9	UM1_59_4	Option VII - Lean Teams and Project Management	E	IEM	2	1			5	3
20	5	A	UM1_59_5	Master Thesis in Industrial Engineering and Management	C	IEM				0.5	40	0.5

Task 1.2 concept by Minho

- In a second sheet, we ask information from learning outcomes in order to identify the expected competences to be developed by the graduates.



	A	B	C	D	E	F	G
1				IEM-IM: Industrial Engineering and Management - Integrated Master			
2							
3	YEAR	SEM	CODE	COURSE	C/E	LO_CODE	LO
10	4	7	UM1_47_2	Integrated Production Management	C	UM1_47_2_1	Identify the requirements for implementing the functions of Integrated Production Management (IPM).
11	4	7	UM1_47_2	Integrated Production Management	C	UM1_47_2_2	Discuss the implications of different methods and functions of Production management.
12	4	7	UM1_47_2	Integrated Production Management	C	UM1_47_2_3	Relate and integrate organizational processes and techniques of Integrated Production Management.
13	4	7	UM1_47_2	Integrated Production Management	C	UM1_47_2_4	Identify, describe and analyze processes of Integrated Production Management.
14	4	7	UM1_47_2	Integrated Production Management	C	UM1_47_2_5	Write reports and undertake oral presentations
15	4	7	UM1_47_2	Integrated Production Management	C	UM1_47_2_6	Develop competences of communication in a foreign language
16	4	7	UM1_47_3	Integrated Project in Industrial Engineering and Management II	C	UM1_47_3_1	Plan, develop and manage an interdisciplinary team project.
17	4	7	UM1_47_3	Integrated Project in Industrial Engineering and Management II	C	UM1_47_3_2	Apply the contents of the courses in the context of the project.
18	4	7	UM1_47_3	Integrated Project in Industrial Engineering and Management II	C	UM1_47_3_3	Evaluate the project proposal considering predefined criteria.
19	4	7	UM1_47_3	Integrated Project in Industrial Engineering and Management II	C	UM1_47_3_4	Write reports and undertake oral presentations
20	4	7	UM1_47_3	Integrated Project in Industrial Engineering and Management II	C	UM1_47_3_5	Learn how to work as a member of a team and independently
21	4	7	UM1_47_3	Integrated Project in Industrial Engineering and Management II	C	UM1_47_3_6	

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MSIE4.0 - PARTNER	University of Minho

TEACHING AND LEARNING BEST PRACTICES
Identify active learning strategies (see glossary):
Project-Based Learning
Identify the teaching and learning context (course, year, semester, number of students, interdisciplinary approach, stakeholders, etc.)
Course: Industrial Engineering and Management Integrated Master Year: 4th (first of the master degree) Semester: First Number of students: 65 (2017/18) Interdisciplinary approach: yes, integrating 5 courses of the semester Stakeholders: Students, Course Teachers (5), Team Tutors (3 teachers), and industrial companies (6)
Short description (In practice how It works? Any relation to Industry 4.0 and sustainability?
The following text is an excerpt of the following reference: Lima, R. M., Dinis-Carvalho, J., Sousa, R. M., Alves, A. C., Moreira, F., Fernandes, S., & Mesquita, D. (2017). Ten Years of Project-Based Learning (PBL) in Industrial Engineering and Management at the University of Minho In A. Guerra, R. Ulseth, & A. Kolmos (Eds.), PBL in Engineering Education: International Perspectives on Curriculum Change (pp. 33-52). Rotterdam, The Netherlands: Sense Publishers. Our program is an Integrated Master degree in Industrial Engineering and Management, an engineering program of 5 consecutive years (10 semesters), in which the master program is not separated from the bachelor. The PBL model adopted for the 7th semester involves the development of a project within industry, incorporating the knowledge and competences inherent to all the courses of the semester. Typically, 5 to 6 teams of students are created (each one with 7 to 9 students) and each company, depending on its size, may receive 1 or 2 teams. The courses of the semester are: (i) Organization of Production Systems II (OSP2 – Lean concepts), (ii) Information Systems for Production (SIP), (iii) Production Integrated Management (GIP), (iv) Ergonomic Study of Workplaces (EEPT), (v) Simulation (SIM) and (vi) Integrated Project on Industrial Engineering and Management II (PIEGI2). The course PIEGI2 formally includes the PBL concept on the curriculum, and its grading system considers not only the developed technical competences but also transversal competences, as well as peer assessment. Along the years, the typology of these projects has followed a common pattern, mentioned at the beginning

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Task 1.2 concept by Minho

- We expect that each project partner can fill in
  - *at least two best practices by teaching-learning strategies and*
  - *two by I4.0 and sustainability.*
  - *This means 4 entries by project partner.*
- Finally, the data will be analysed using a mixed approach between a quantitative approach (descriptive statistics) and qualitative data analysis procedures. A final report will be developed.

- *The collection of data about best practices on learning methods, industry 4.0 and sustainability (tasks 1.2.2 and 1.2.4) will be done in a qualitative way, asking partners to fill a form for each best practic*e.

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• Task 1.2.5 Analysing curricula, and teaching and learning methods

- **We will classify (Task 1.2.5 - first) these courses using the following IEM areas of knowledge (Lima, Mesquita, Amorim, Jonker, & Flores, 2012; Mesquita, Lima, Flores, Marinho-Araujo, & Rabelo, 2015):**
- 1 Production Management (including Production System Design)
- 2. Automation
- 3. Quality
- 4. Economics Engineering
- 5. Operations Research
- 6. Computer and Information Systems
- 7. Ergonomics and Human Factors
- 8. Logistics
- 9. Maintenance
- 10. Project Management
- 11. Sustainability
- 12. Product Design
- 13. Simulation

In a second worksheet, we will collect information from learning outcomes, and will classify and analyse (Task 1.2.5 - first) them using a framework of competences based on Mesquita et al. (2015) and Prifti, Knigge, Kienegger, and Krcmar (2017). This classification will be done by two researchers and reviewed by a third researcher.
Finally, a report will be developed summarizing all the information collected and analysis developed.

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UMinho

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Industrial Engineering and Management Curriculum Profile: Developing a Framework of Competences

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UMinho

Defining the Industrial and Engineering Management Professional Profile: a longitudinal study based on job advertisements

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Table 1. Definition of the professional practice areas.

Area	Definition
Automation	In the industrial Automation area of practice, engineers should troubleshoot, repair and maintain automated industrial equipment, such as computer numerical control (CNC) equipment and robots (Groover, 2015; Study.com, 2016).
Economics Engineering	The application of economic principles in the engineering problem by solving process; for example, analysing the economics of different alternatives, analysing industrial costs and being involved in the financial management of organizations (Watts & Chapman, 2016).
Ergonomics and Human Factors	"Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance" (International Ergonomics Association, 2016).
Supply Chain Management	"The design, planning, execution, control and monitoring of supply chain activities with the objective of creating net value" for industrial and service companies (APICS, 2013d).
Maintenance	Management process of organization, planning and implementation of corrective maintenance, preventive maintenance, and continuous improvement of industrial and service business organizations (IDCON, 2016).
Industrial Optimization	Industrial optimization make a link between mathematics, engineering and management, using as operations research, heuristics or simulation, for achieving the best possible solution for a problem for industrial and service companies, in terms of a specified objective (APICS, 2013c; Bangert, 2012).
Product Design	"The conversion of a need or innovation into a product, process, or service that meets both the enterprise and customer expectations. The design process consists of translating a set of functional requirements into an operational product, process or service" (APICS, 2013a; Dym et al., 2014).
Production Management	Design, improvement and management of systems that deliver products and services. This area is related with the design and improvement of production systems and the activities of production planning and control activities for the efficient and effective use of those production systems (Halevi, 2001; Martin-Vega, 2001; Vollmann et al., 2005).
Project Management	Application of "knowledge, skills, tools, and techniques to project activities to meet the project requirements" (Project Management Institute, 2013, p. 6).
Quality	"The analysis of a manufacturing system at all stages to maximize the quality of the process itself and the products it produces" (American Society for Quality, 2016).
Marketing	"The design, pricing, promotion, and distribution of goods to create transactions with businesses and consumers" (APICS, 2013b).

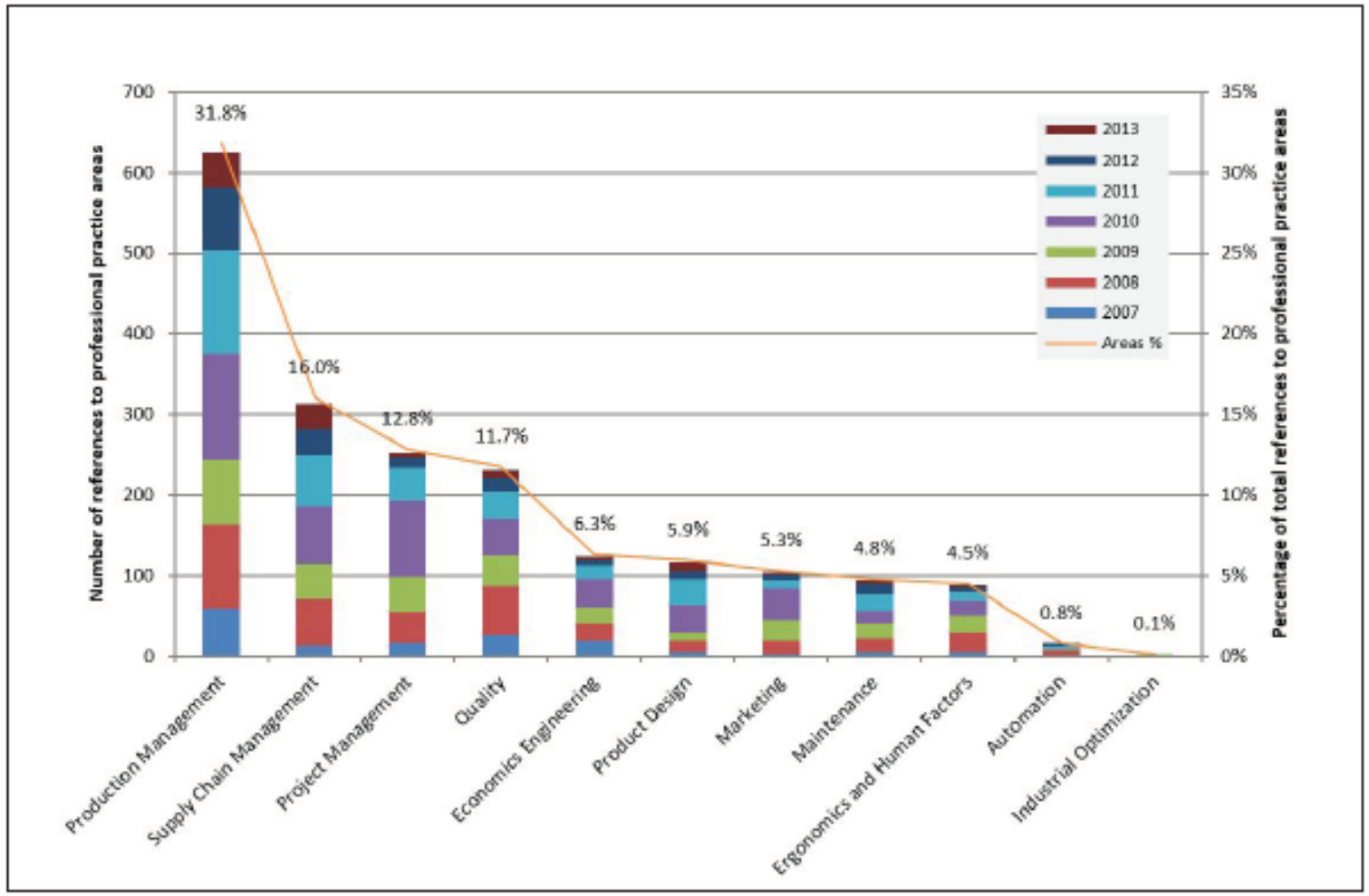

Figure 1. Job advertisements analysis: professional practice areas.

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Discussion Issue

Mostly less than 50% relevance to

- **Smart production**
- **Sustainability**

No best practice presented among Thai U

- No information?

Inconsistency of evaluation of %relevance

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Best Practice Learning Idea?

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Existing shortcoming?

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Different sources

Fraunhofer IAO

Fraunhofer IAO | Service and Human Resources Management

Fraunhofer IAO

TOPICS SERVICES SERVLAB JOBS AND CA

Service and Human Resources Management | Fraunhofer IAO . Topics . Work and Competencies in Industry 4.0

Work and Competencies in Industry 4.0

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

Global Challenge Insight Report

The Future of Jobs

Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution

January 2016

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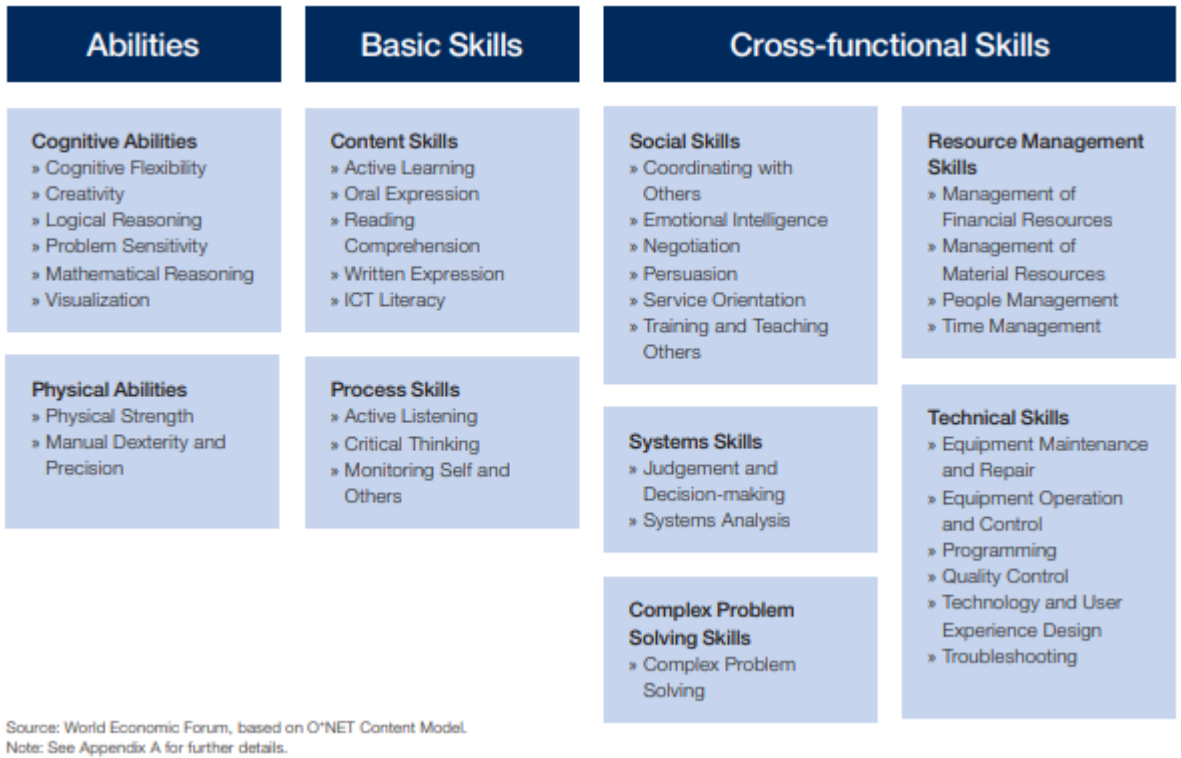

Abilities	Basic Skills	Cross-functional Skills	
Cognitive Abilities » Cognitive Flexibility » Creativity » Logical Reasoning » Problem Sensitivity » Mathematical Reasoning » Visualization	**Content Skills** » Active Learning » Oral Expression » Reading Comprehension » Written Expression » ICT Literacy	**Social Skills** » Coordinating with Others » Emotional Intelligence » Negotiation » Persuasion » Service Orientation » Training and Teaching Others	**Resource Management Skills** » Management of Financial Resources » Management of Material Resources » People Management » Time Management
Physical Abilities » Physical Strength » Manual Dexterity and Precision	**Process Skills** » Active Listening » Critical Thinking » Monitoring Self and Others	**Systems Skills** » Judgement and Decision-making » Systems Analysis	**Technical Skills** » Equipment Maintenance and Repair » Equipment Operation and Control » Programming » Quality Control » Technology and User Experience Design » Troubleshooting
		Complex Problem Solving Skills » Complex Problem Solving	

Source: World Economic Forum, based on O*NET Content Model.
Note: See Appendix A for further details.

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Abilities

Cognitive Abilities
- Cognitive Flexibility
- Creativity
- Logical Reasoning
- Problem Sensitivity
- Mathematical Reasoning
- Visualization

Physical Abilities
- Physical Strength
- Manual Dexterity and Precision

Basic Skills

Content Skills
- Active Learning
- Oral Expression
- Reading Comprehension
- Written Expression
- ICT Literacy

Process Skills
- Active Listening
- Critical Thinking
- Monitoring Self and Others

Cross-functional Skills

Social Skills
- Coordinating with Others
- Emotional Intelligence
- Negotiation
- Persuasion
- Service Orientation
- Training and Teaching Others

Systems Skills
- Judgement and Decision-making
- Systems Analysis

Complex Problem Solving Skills
- Complex Problem Solving

Resource Management Skills
- Management of Financial Resources
- Management of Material Resources
- People Management
- Time Management

Technical Skills
- Equipment Maintenance and Repair
- Equipment Operation and Control
- Programming
- Quality Control
- Technology and User Experience Design
- Troubleshooting

Source: World Economic Forum, based on O*NET Content Model.
Note: See Appendix A for further details.

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Content

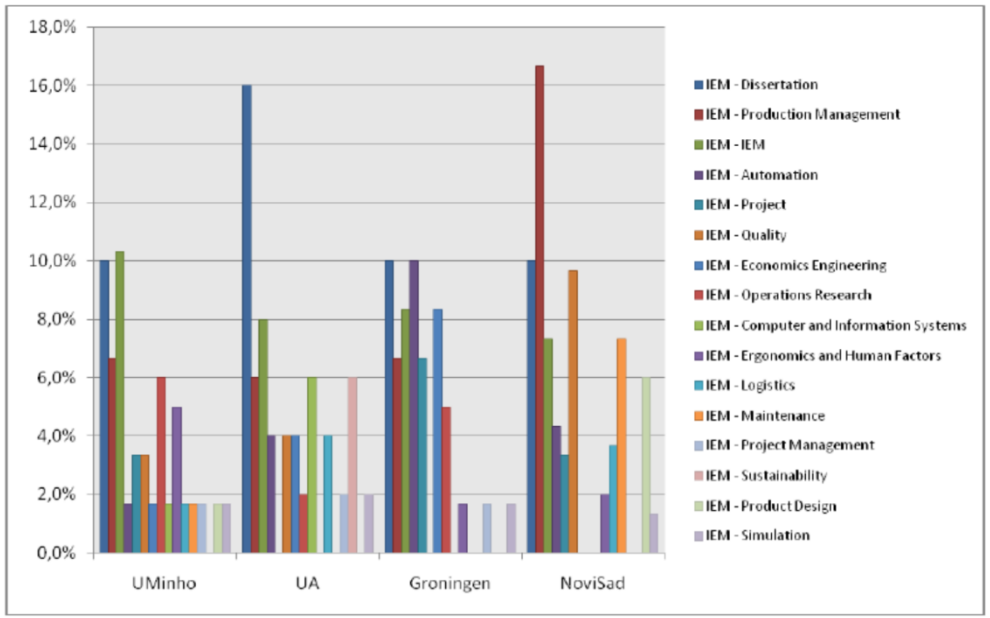

Figure 2. Curriculum knowledge areas analysis based on IEM specific areas

Computer-Aided Design in Manufacturing
Computer Control in Manufacturing

Discussion of Task 1.2

- **KKU**
- Computer Integrated Manufacturing
- Flexible Manufacturing Systems
- Applications of Industrial Robot

- **PSU**
- Automatic Manufacturing Systems
- Material Handling System
- System Simulation/Advanced Computer Simulation
- Scheduling Theory

- KMUTNB
- Computer-Aided Design in Manufacturing
- Computer Control in Manufacturing
- System Design and Process Improvement
- Manufacturing System Design
- Applied Operations Management in Supply Chain
- Applied Operations Research in Supply Chain and Logistics Management
- Engineering Product Design: A Systematic Approach
- Production Sequencing and Scheduling Methods
- **AIT**
- Product Design and Development
- AI and Neuro-Fuzzy Theory
- Eco-Design and Manufacturing Systems
- Industrial Packaging Design and Technology
- CAE & CAM for Product Development
- Advanced E-Design
- Scheduling and Sequencing

Best Practice Learning Idea?

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Existing shortcoming?

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WP1-1.3: Assessing needs of industry and student

- The comprehensive analysis of needs of industry and students (all partners will conduct a survey with companies assigned in their regions in the list and with the help of the Associated Partners.

  - Task 1.3.1 Preparing a survey form for identifying the needs of industry for MSIE graduates to support their success in Thailand 4.0 and Industry 4.0
  - Task 1.3.2 Preparing a survey form for the needs of prospective students for preparing them for Thailand 4.0 and Industry 4.0
  - Task 1.3.3 Conducting survey for companies and organizations in the list
  - Task 1.3.4 Conducting survey from students
  - Task 1.3.5 Identifying the needs of industry and students

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WP1-1.3: Assessing needs of industry and student

The finding of statistics for SME company in Thailand shows that there are more than 30,000 SME. By assuming that the high impact SME in Thailand is at least 1,000, the samplng table of YAMANE indicates that the minimum of 91 companies shall be listed based on the 10% error.

Tourism	Seafood Processing	Electronic
Agro Processing	Textile Industry	Construction/Manufacturing
Aerospace	Automotives	Logistic and Transport
Packaging and Commerce	PetroChemical	Automation
IT	Wood/furniture	

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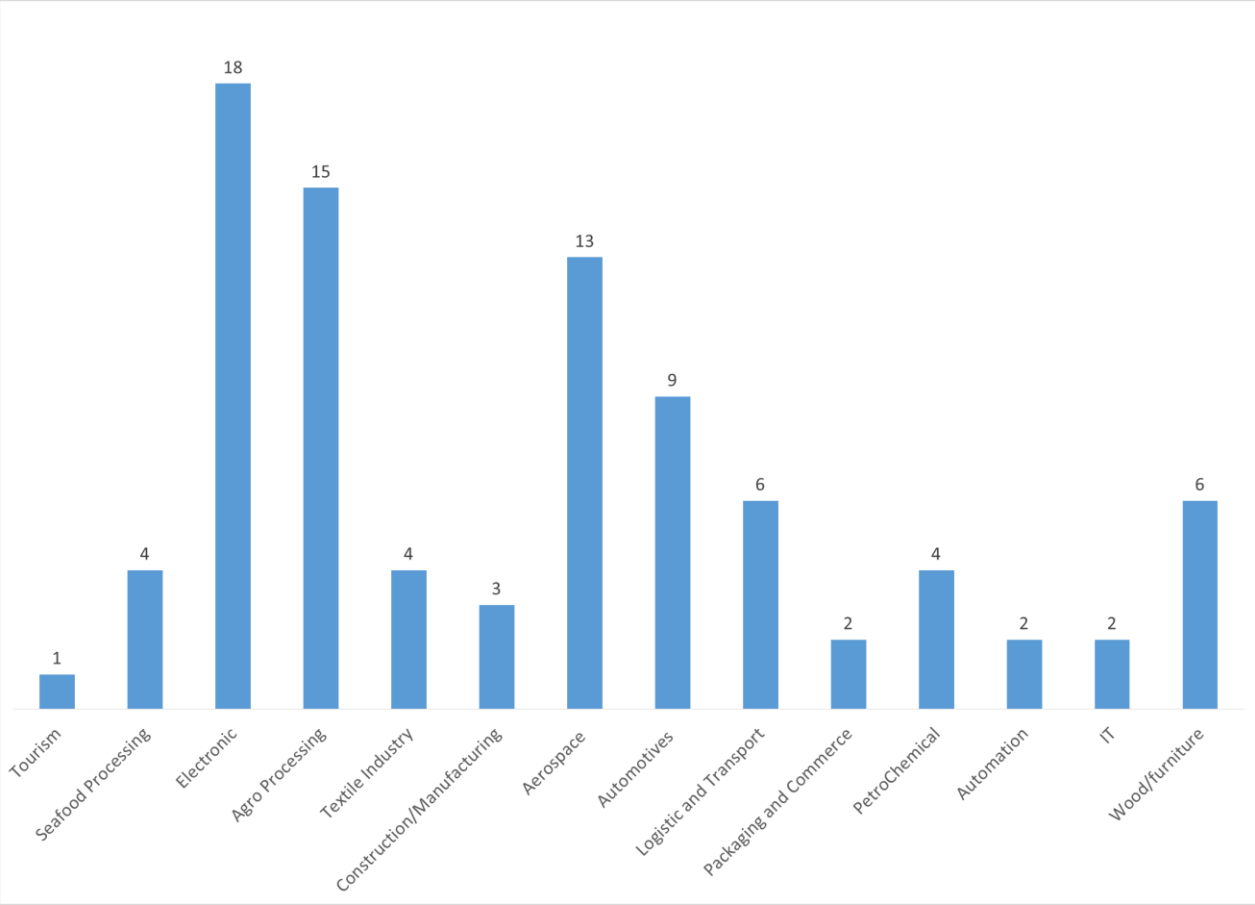
Classification of 80 companies



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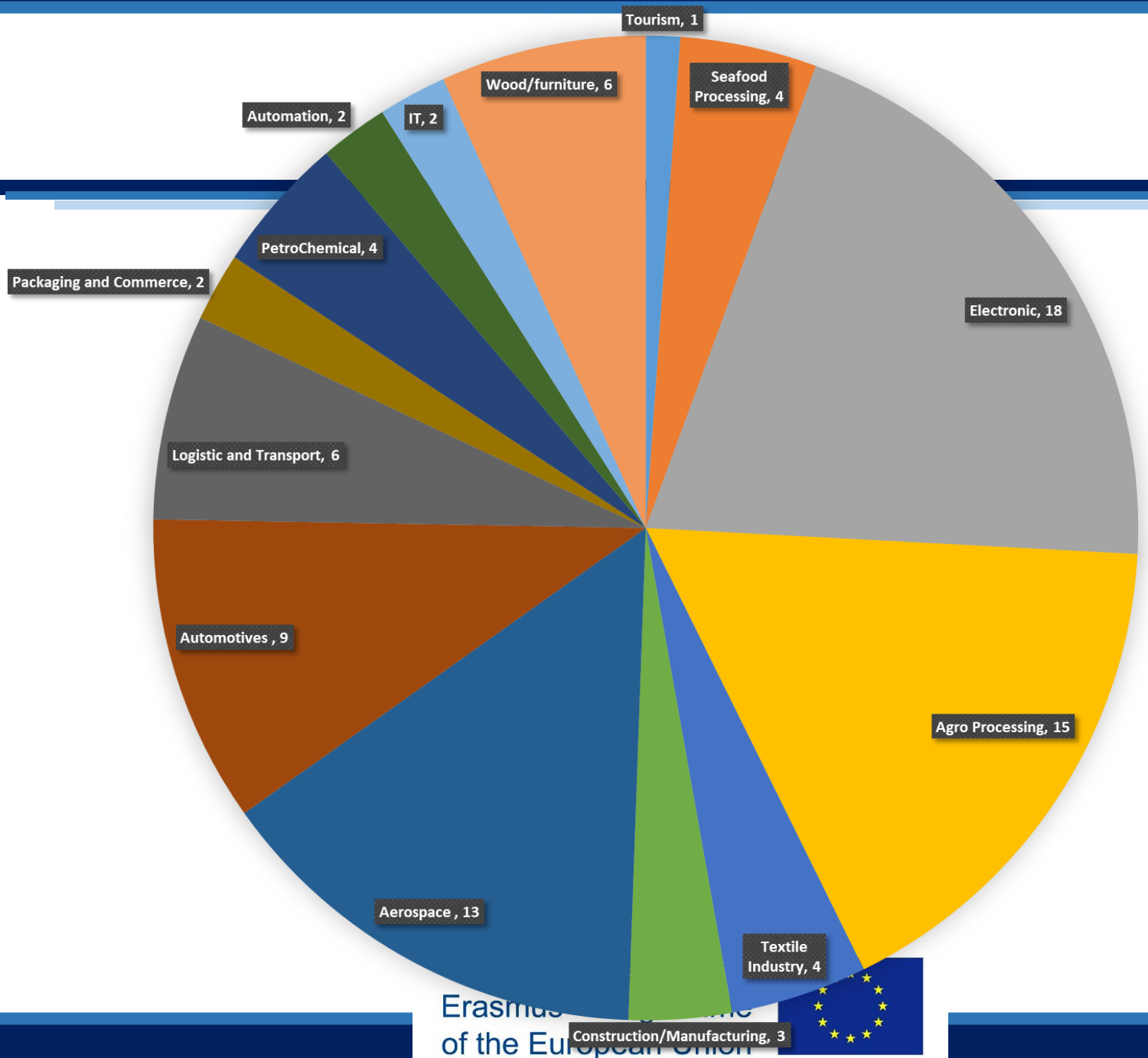

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List of companies

University	Cluster	Company
Chiang Mai University (CMU)	Wood Processing	Suksawad
	Seafood Processing	CP group
	Electronic	Hana Microelectronics Public Co., Ltd. (Lamphun)
		Murata Electronics (Thailand) Ltd.
		Fujikura Electronics(Ltd) Thailand
	Agro Processing	Betagro Agro Industry Co.,Ltd
		Northern Food Company Limited
		Pepsi-Cola Thai Trading Co.,Ltd.
	Textile Industry	Performance Manufacturing (Thailand) Ltd.
		Pattaya Lamphun Co., Ltd.
		Onsmooth Thai Co.,Ltd.
	Aerospace	Zodiac AirCatering Equipment (Thailand) Ltd.
	Automotives	Keihin (Thailand) Co., Ltd.
		Toyota Thailand
	Logistic and Transport	Logistics of 7/11 Thailand
	IT	Datamars (Thailand) Ltd.

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List of companies

Prince of Songkla University (PSU)	Wood Processing	APK Furnishing Parawood
		Xunthai Parawood
		SWP Parawood
		Panel Plus
	Rubber Processing	Rubber Processing
		Michelin
		Sritrang Agro Industry
		Siam Sempermed
	Tourism	PKCD
	Seafood Processing	MANA
		KIANG HUAT SEA GULL TRADING FROZEN FOOD PUBLIC Co., Ltd.
		Chotiwat Manufacturing Co.,Ltd.

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Khon Kaen University (KKU)	Electronic	Panasonic Electric Works (Khon Kaen) Co.,LTD
		Seagate Technology (Thailand) Ltd.
	Agro Processing	Kalasin Mit Sugar Co.,Ltd
		Mondelez (Thailand) Co.,Ltd
		CP Ram (Khon Kaen)
	Textile Industry	NK Apparel Co., Ltd.
	Logistic and Transport	Thai Beverage Logistics Co., Ltd.
		Cho Thavee Public Co., Ltd.
	Packaging and Commerce	Thai Containers Khonkaen Co., Ltd.
		Siam Global House Plc. (Khon Kaen)
King Mongkut's University of Technology North	Electronic	Ronda Thailand
		Daikin Industries (Thailand) LTD.
		Samsung Thailand (Thailand) LTD.
		TOSHIBA THAILAND (Thailand) LTD.
	Automotives	Komatsu Seiki (Thailand) Co., Ltd.
		Ford Thailand
		Nissan Motor (Thailand) Co., Ltd.
	Logistic and Transport	DHL(Thailand) Co., Ltd.
		Grand Home Mart.Co., Ltd.
		DKSH (Thailand) Co., Ltd

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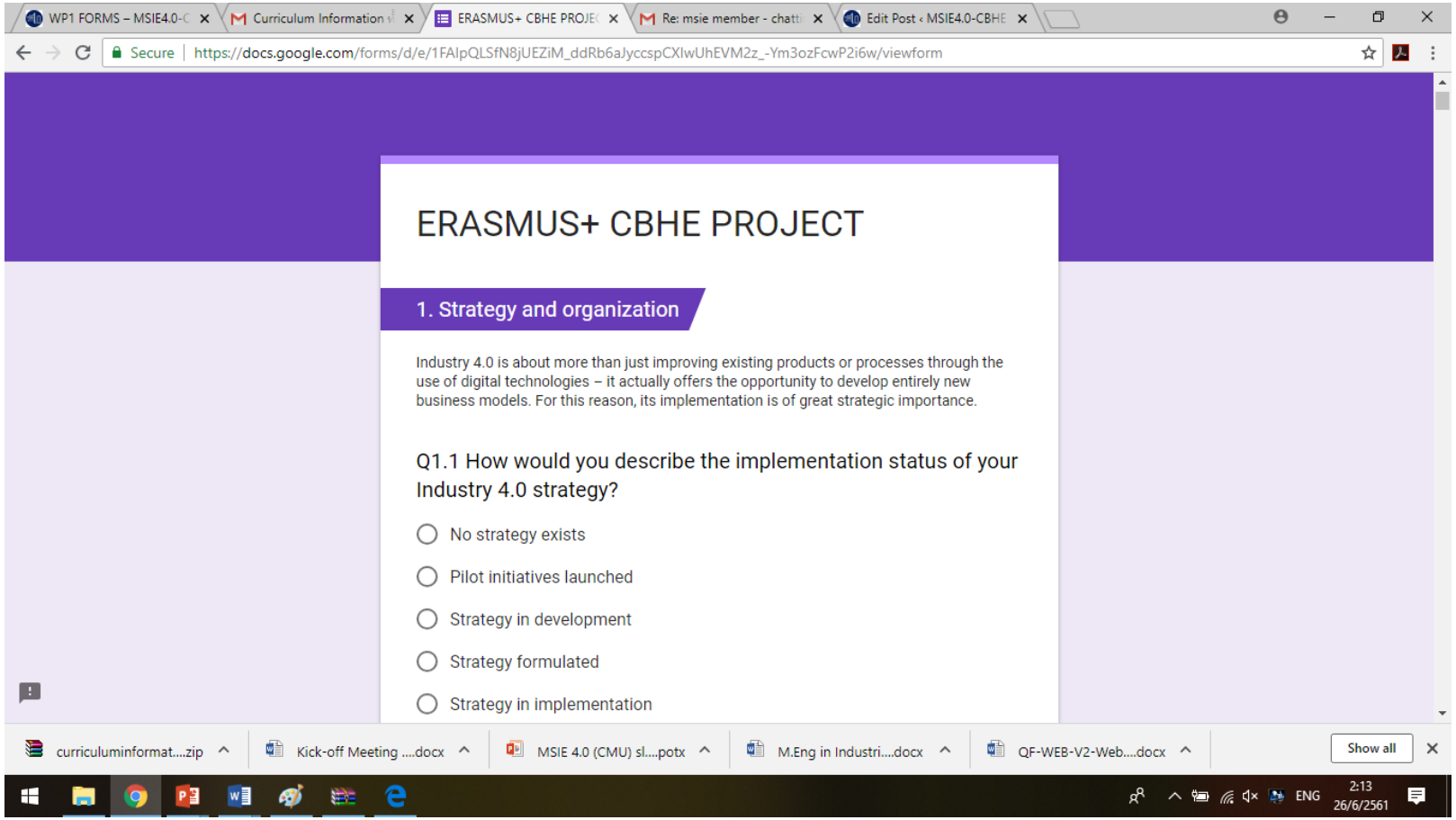
AIT	Electronic	SVI
		WD
	****Total of at least 4 Companies are requested to specified more	**Incomplete**
UPB	Electronic	MicroElectronica Voluntari
		Felix Electronic Services Bucharest
		Benchmark Romania
	Aerospace	TurboMecanica Bucharest
		Unison Engine Components Bucharest – General Electric Aviation
		Avioane Craiova
	Automotives	Group Renault Romania
		Ford - Craiova Engine Plant
		Pirelli Romania
	PetroChemical	Cameron Romania
		UPetrom 1 Mai Ploiesti
		UPet Targoviste
CUT	Electronic	Whirlpool
		Electrolux (Sosnowiec)
		Bosch und Siemens (BSH)
	Aerospace	Wielton
		ZF/TRW
		Linex

UMinho	Aerospace	Bosch Car-Multimedia systems
		Continental ITA
		Leoni
		Continental Mabor
		PREH
	Automation	Critical
		ITEC
	IT	Primavera

University	Cluster														Region of Thailand
	Tourism	Seafood Processing	Electronic	Agro Processing	Textile Industry	Construction/Manufacturing	Aerospace	Automotives	Logistic and Transport	Packaging and Commerce	PetroChemical	Automation	IT	Wood/furniture	
Thammasat University (TU)			Mitsubishi	Cargill		Kohler (Thailand) Public Co., Ltd.	General Electric	Michelin			PPT Public Company Limited			Modern Form	
						SCG								SB furniture	
						Phruksa									

Google Doc



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Questionnaires for industry assessment

- This questionnaires has 23 pages consists of 3 parts

- Part 1: Industry 4.0 Adoption Scope (page 6-11)

1. Business strategy, Business Models, Product & Service Portfolio
2. Transversal & Domain related Competences:Employee

- Part 2 : Industry 4.0 Readiness Scheme (page 12-23)

1.Smart products & Co-created Design:

-To what extent can your products be controlled with IT, making it possible for them to communicate and interact with higher-level systems along the value chain?

2. Smart factory (Intelligence Manufacturing System):

-To what extent does your company have digitally integrated and automated production based on cyber-physical systems?

3. Smart operations (Controlling, Adjusting & Monitoring Process Real Time):

-To what extent are the processes and products in your company digitally modeled and capable of being controlled through ICT systems and algorithms in a virtual world?

4. Data driven services (Integrated Business&Operational Data Management):

-To what extent do you offer data-driven services that are possible only through the integration of products, production, and customers?

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Part1: Strategy

Part 1 :Assessment of Strategy Level

1. Business strategy, Business Models, Product & Service Portfolio
2. Employee

Strategy and organization

Business strategy, Business Models, Product & Service Portfolio
Industry 4.0 is about more than just improving existing products or processes through the use of digital technologies – it actually offers the opportunity to develop entirely new business models. For this reason, its implementation is of great strategic importance. We examine the current openness toward and the cultural interaction with Industry 4.0 using the following four criteria:

- Implementation status of Industry 4.0 strategy
- Operationalization and review of strategy through a system of indicators
- Investment activity relating to Industry 4.0
- Use of technology and innovation management

Employees

Transversal & Domain related Competences: "Employees help companies realize their digital transformation and are the ones most affected by the changes of the digital workplace. Their direct working environment is altered, requiring them to acquire new skills and qualifications. This makes it more and more critical that companies prepare their employees for these changes through appropriate training and continuing education"

- This analysis of employees dimension is to analyze employees skills in various areas and the company's efforts including needs to to acquire new skill sets

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Part2: Smart Product

1.Smart products and Co-created Design:

The smart co-created design product are a vital value of the company and the customer by allowing the customer to co-construct the service experience to suit their context. This requires value-based collaboration between stakeholders and users, in contrast to standard market research. The Co-design is the process where stakeholders (business or customers) can involve and participate during the design development process to ensure the results meet their needs and are usable.

Smart Product where physical products are equipped with ICT components (sensors, RFID, communications interface, etc.) to collect data on their environment and their own status. Only when products gather data, know their way through production, and communicate with the higher-level systems can production processes be improved and guided autonomously and in real time. It also becomes possible to monitor and optimize the status of the individual products. This has potential applications beyond production alone. Using smart products during the usage phase makes new services possible in the first place – through communications between customers and manufacturers, for example. This assessment in the area of smart products is determined by looking at the ICT add-on functionalities of products and the extent to which data from the usage phase is analyzed.

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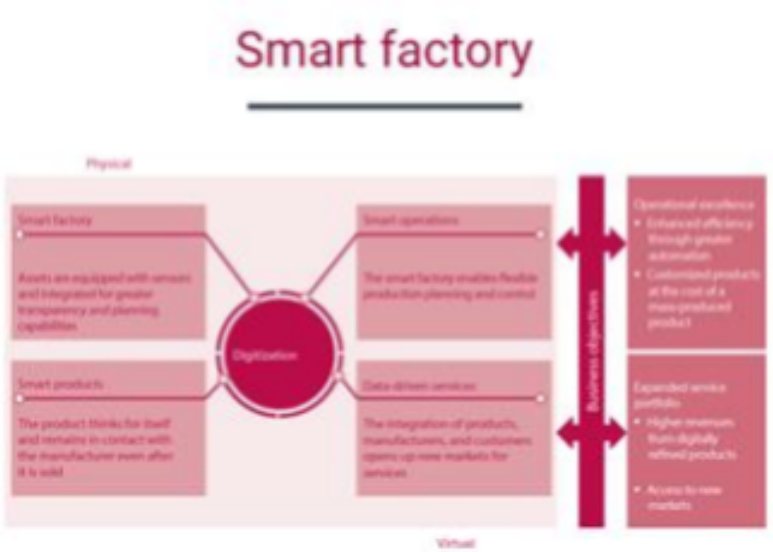
Part2: Smart Factory



2. Smart factory (Intelligence Manufacturing System):

Successful implementation of Industry 4.0 enables distributed, highly automated production. Unlike in traditional production, smart workpieces will control and monitor the production process and, in the final expansion phase, guide themselves autonomously through production. This happens in the environment of the smart factory. The smart factory is a production environment in which the production systems and logistics systems largely organize themselves without human intervention.

The smart factory relies on cyber-physical systems (CPS), which link the physical and virtual worlds by communicating through an IT infrastructure, the Internet of Things. Industry 4.0 also involves digital modeling through the smart gathering, storage, and processing of data. In this way, the smart factory concept ensures that information is delivered and resources are used more efficiently. This requires the real-time, cross-enterprise collaboration between production systems, information systems, and people. These integrated systems produce huge amounts of data that are processed, analyzed, and integrated into decision-making models.

A company's progress in the area of the smart factory is measured using the following four criteria:

- Digital modeling
- Data usage
- Equipment infrastructure
- IT systems

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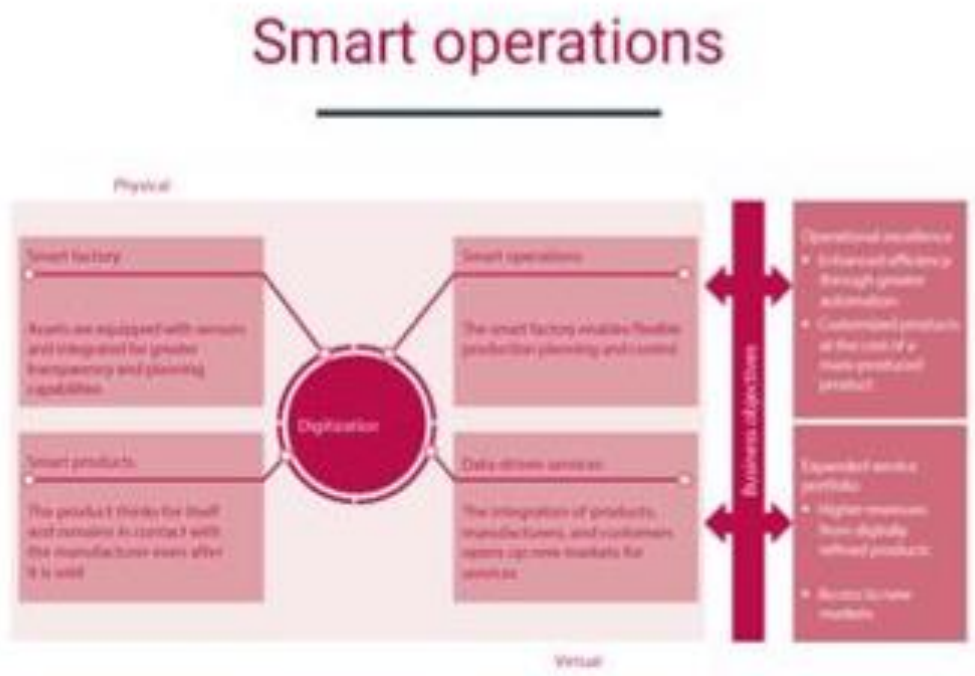
Part2: Smart Operations



3. Smart operations (Controlling, Adjusting & Monitoring Process Real Time):

The hallmark of Industry 4.0 is the enterprise-wide and cross-enterprise integration of the physical and virtual worlds. The advent of digitization and the plethora of data it has brought to production and logistics have made it possible to introduce what are in some cases entirely new forms and approaches to production planning systems (PPS) and supply chain management (SCM). This technical requirements in production and production planning necessary is to realize the self-controlling workpiece known as smart operations.

Industry 4.0 readiness in the area of smart operations is determined using the following four criteria:

- Information sharing
- IT security

Cloud usage
Autonomous processes

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Part2: Data Driven services

4. Data driven services (Integrated Business&Operational Data Management):

The objective of data-driven services is to align future business models and enhance the benefit to the customer. The after-sales and services business will be based more and more on the evaluation and analysis of collected data and rely on enterprise-wide integration. The physical products themselves must be equipped with physical IT so they can send, receive, or process the information needed for the operational processes. This means they have a physical and digital component, which in turn are the basis for digitized services in the usage phase of the products.Readiness in the area of data-driven services is determined using the following three criteria:

- Availability of data-driven services
- Share of revenues derived from data-driven services
- Share of data used

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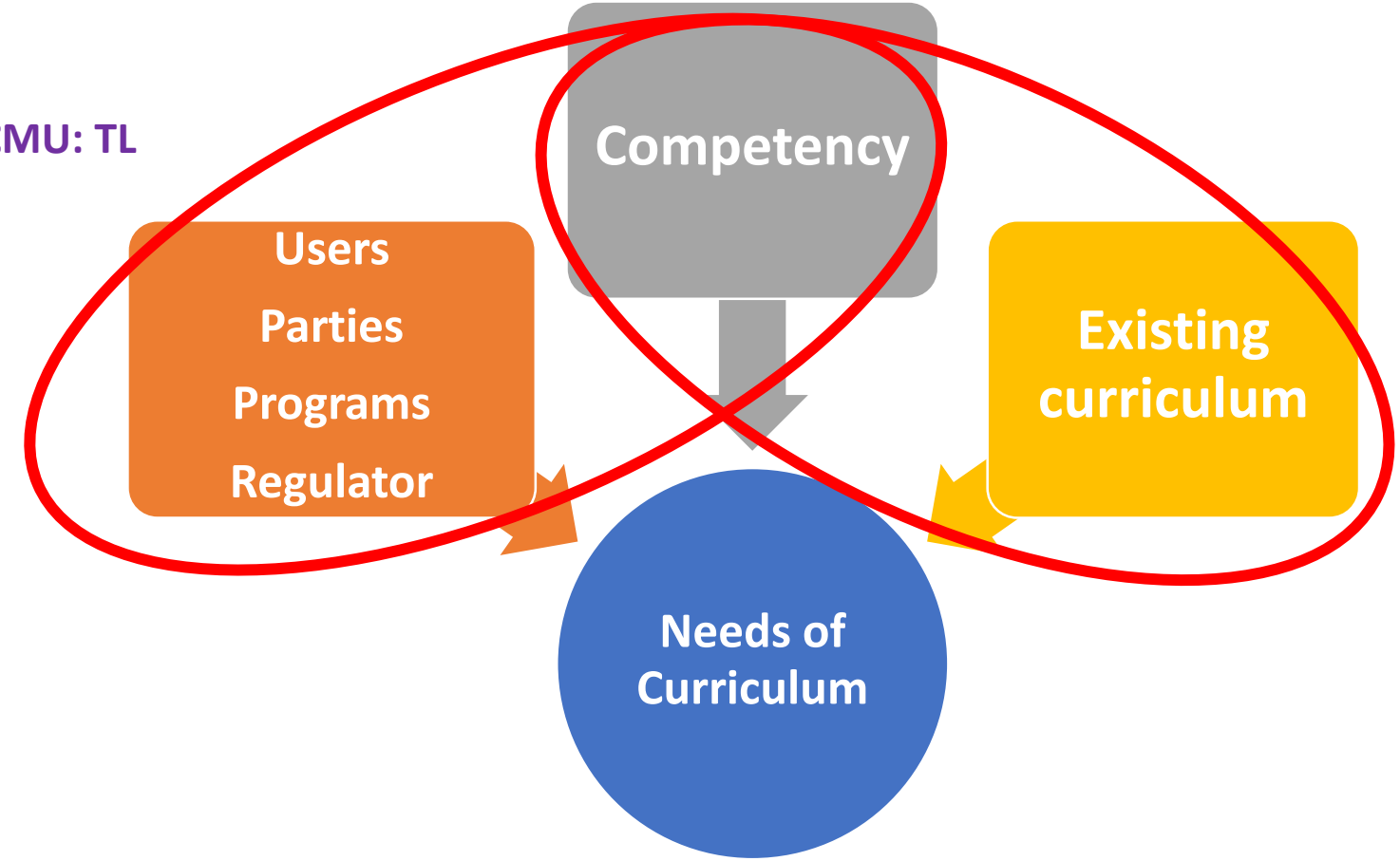
Rationale for Curriculum Development

CMU: TL

UMinho: TL



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Deliverables/results/outcomes

☑ CMU : TL

Task 1.3 Assessing needs of industry and students

- Task 1.3.1 Preparing a survey form for identifying the needs of industry for MSIE graduates to support their success in Thailand 4.0 and Industry 4.0
- Task 1.3.2 Preparing a survey form for the needs of prospective students for preparing them for Thailand 4.0 and Industry 4.0
- Task 1.3.3 Conducting survey for companies and organizations in the list
- Task 1.3.4 Conducting survey from students
- Task 1.3.5 Identifying the needs of industry and students

Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**1.3.**	
	Title	Assessment of learning and teaching tools and methods in Thailand and in EU partner countries	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	Following the same analyse schema a comprehensive analysis of teaching and learning methods being applied currently in Thailand and EU partners' countries, in a form of a report , will be achieved with the same target groups and it will be a part of the first WP1 progress report.	
	Due date	M6	
	Languages	English, Thai	
Target groups	☒ Teaching staff ☐ Students ☐ Trainees ☐ Administrative staff ☐ Technical staff ☐ Librarians ☐ Other		
	If you selected 'Other', please identify these target groups. (Max. 250 characters)		
Dissemination level	☐ Department / Faculty ☒ Institution	☒ Local ☐ Regional	☒ National ☒ International

WP1-1.4: Identifying gaps
UNESCO (1996) 4 ‘pillars:

UNESCO (1996) Learning: the treasure within. Paris: UNESCO.

what knowledge to learn,

what skills to acquire,

what experiences to undertake and

what personality to develop.

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WP1-1.4: Identifying gaps

Rationale Concept: *4 Main components of the curriculum*

purposes

experiences

methods

evaluation

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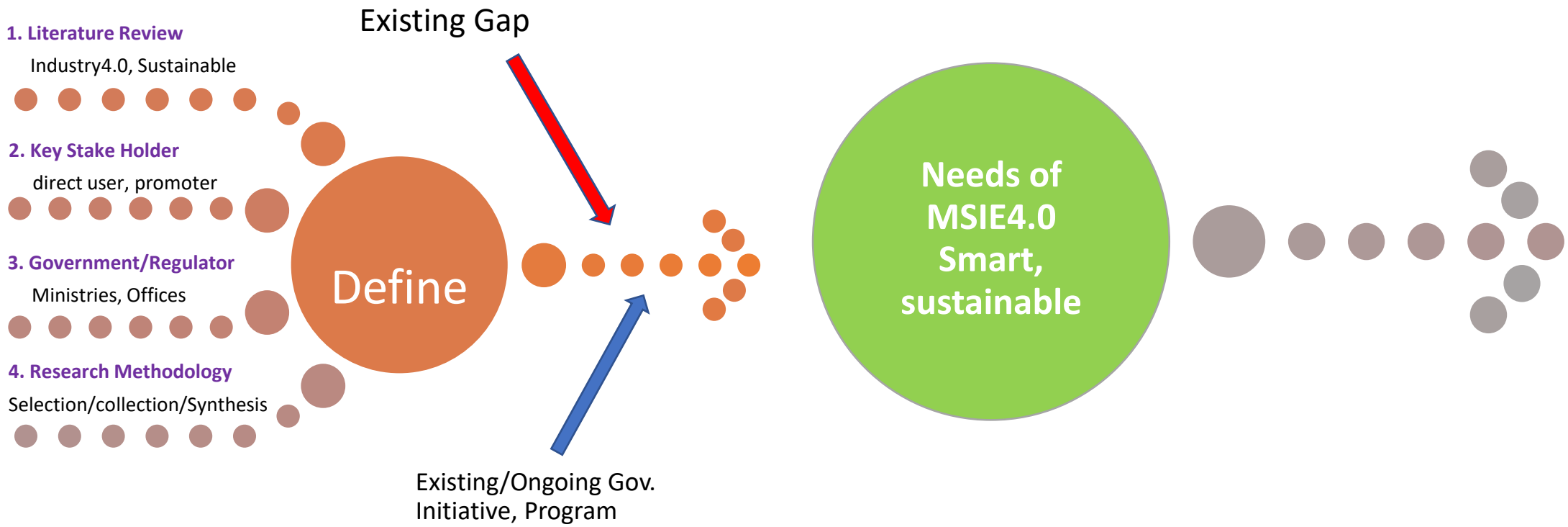
Methodology of WP1



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Questionnaire structure Identifying Needs

Demographic of Industries
(Size, Type, Impact,location,etc)

what knowledge requires

what skills to acquire,

what experiences to undertake and

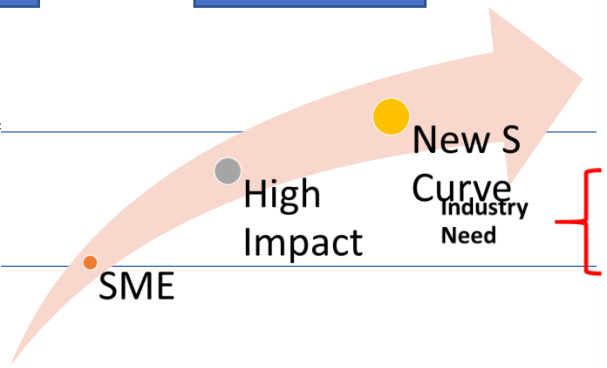
what personality to develop

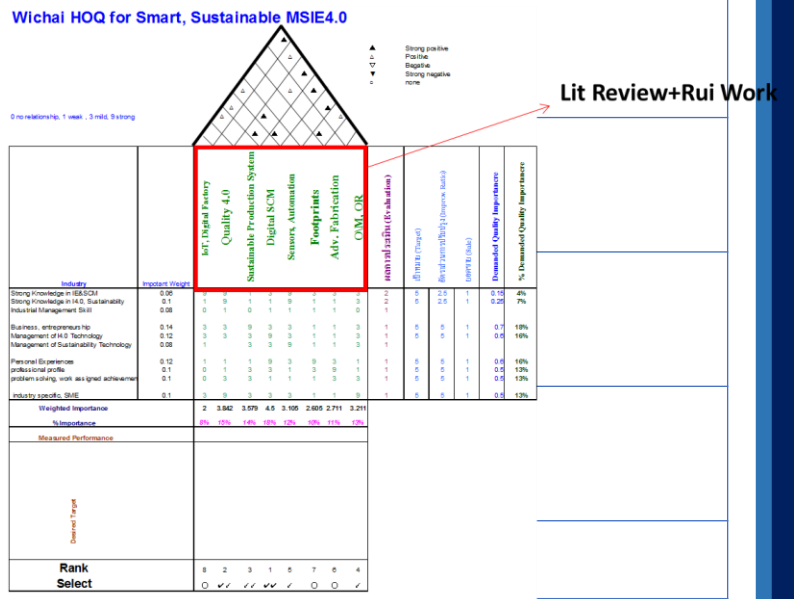
Others key factors

IE Job Factors

- Automation
- Economics Engineering
- Ergonomics and Human Fact
- Supply Chain Management
- Maintenance
- Industrial Optimization
- Product Design
- Production Management
- Project Management
- Quality
- Marketing

Industry Factors





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ESG?

ESG

2015

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Deliverables/results/outcomes

Task 1.4 Identifying gaps

- Task 1.4.1 Comparing the needs of industries in Thailand and European partners' countries
- Task 1.4.2 Identifying gaps between the needs of industry and the competence of MSIE graduates

☑ UMinho : TL

Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**1.4.**	
	Title	Analysis of needs of industry and students	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	A comprehensive analysis of the needs of industry for MSIE graduates to support their success in Thailand 4.0 and Industry 4.0 and of the needs of students for preparing them for Thailand 4.0 and Industry 4.0. Also concerning the EU industry and student needs, in a form of a report, will be achieved and it will be a part of the second WP1 progress report.	
	Due date	M9	
	Languages	English, Thai	
Target groups	☒ Teaching staff ☐ Students ☐ Trainees ☐ Administrative staff ☐ Technical staff ☐ Librarians ☐ Other		
	If you selected 'Other', please identify these target groups. (Max. 250 characters)		
Dissemination level	☐ Department / Faculty ☒ Institution	☒ Local ☐ Regional	☒ National ☒ International

Deliverables/results/outcomes

Task 1.5 Identifying competitive factors for the curriculum

☑ CMU : TL

Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**1.5.**	
	Title	Gaps between the needs and graduates' competences	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	An analysis of gaps between the actual competence of MSc graduates in Industrial Engineering and the real needs of industry for Thailand 4.0 and Industry 4.0 and in EU countries referring to Europe 2020 goals will be made and presented in a form of a report and t will be a part of the second WP1 progress report.	
	Due date	M10	
	Languages	English, Thai	
Target groups	☒ Teaching staff ☐ Students ☐ Trainees ☐ Administrative staff ☐ Technical staff ☐ Librarians ☐ Other		
	If you selected 'Other', please identify these target groups. (Max. 250 characters)		
Dissemination level	☐ Department / Faculty ☒ Institution	☒ Local ☐ Regional	☒ National ☒ International

Deliverables/results/outcomes

Task 1.6 Developing recommendations for the specifications and areas of specialization for the curriculum

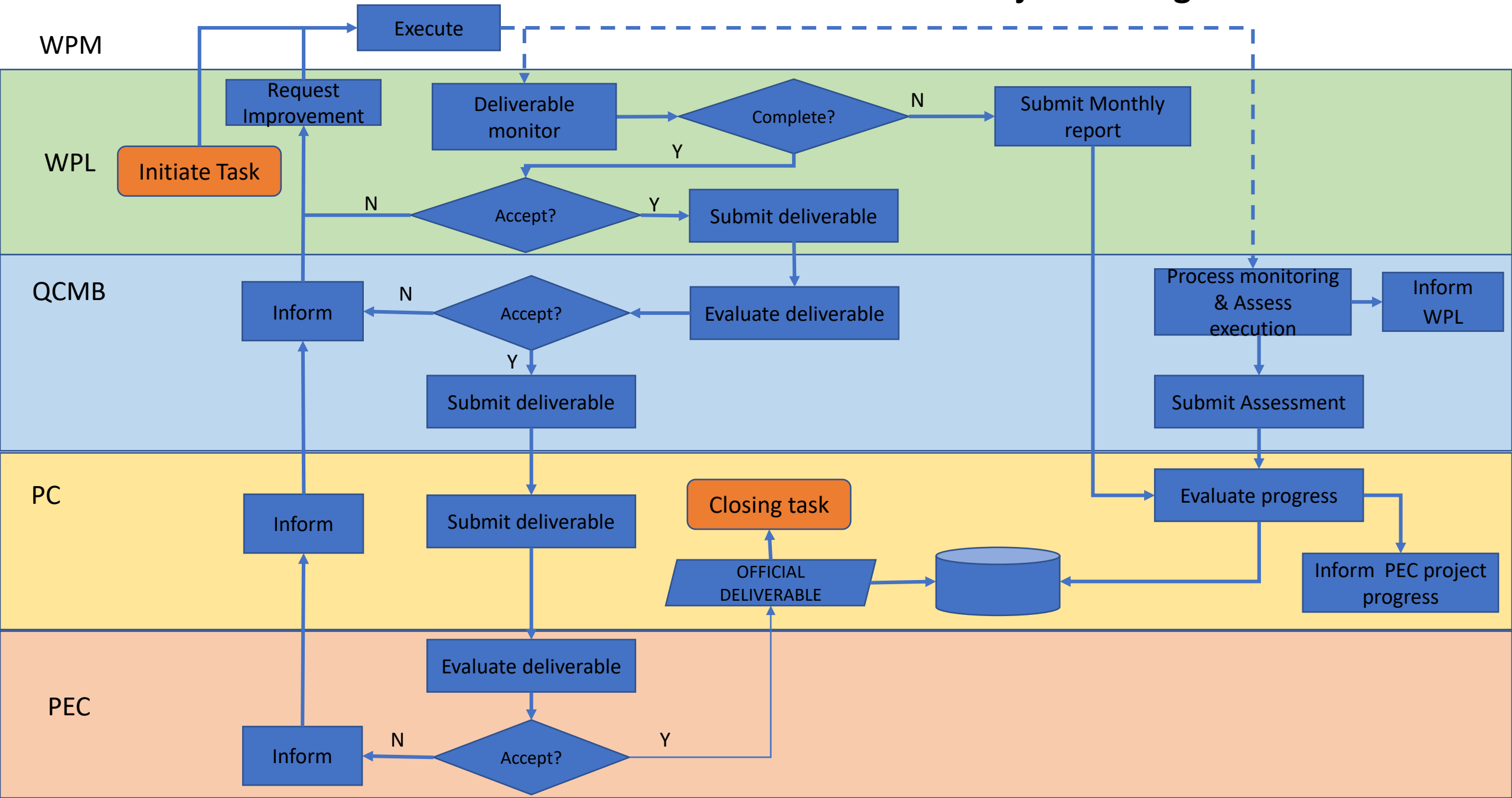
☑ CMU : TL

Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**1.6.**	
	Title	Competitive factors for the curriculum	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	Based on a wide analyse of the target group needs, the identified gaps and on world trends and developments in the Industrial Engineering, the factors that will provide competitive advantage to the curriculum will be identified and presented in a form of a report who will be a part of the second WP1 progress report.	
	Due date	M11	
	Languages	English, Thai	
Target groups	☒ Teaching staff ☐ Students ☐ Trainees ☐ Administrative staff ☐ Technical staff ☐ Librarians ☐ Other		
	If you selected 'Other', please identify these target groups. (Max. 250 characters)		
Dissemination level	☐ Department / Faculty ☒ Institution	☒ Local ☐ Regional	☒ National ☒ International

Deliverables/results/outcomes

Expected Deliverable/Results/ Outcomes	**Work Package and Outcome ref.nr**	**1.7.**	
	Title	Recommendations for specifications and areas of specialization for the curriculum	
	Type	☐ Teaching material ☐ Learning material ☐ Training material	☐ Event ☒ Report ☐ Service/Product
	Description	The most important outcome of WP1 will be a report with the main conclusions concerning the actual gaps between the information developed for developing a proposed curriculum.	
	Due date	M12	
	Languages	English, Thai	
Target groups	☒ Teaching staff ☐ Students ☐ Trainees ☐ Administrative staff ☐ Technical staff ☐ Librarians ☐ Other		
	If you selected 'Other', please identify these target groups. (Max. 250 characters)		
Dissemination level	☐ Department / Faculty ☒ Institution	☒ Local ☐ Regional	☒ National ☒ International

Project Management Flowchart



MSIE 4.0

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Thank You

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