The Quality Assurance Matrix and Indicators (per WP)

A Quality Assurance Matrix was defined at the beginning of the project. This matrix is presented in deliverable **D5.1 Project Handbook**. Main indicators are detailed in a table of KPI. Every task and activity have indicators which are filled out by the task's leaders:

- **WP1: 28** indicators (7 for T1.1, 7 for T1.2, 4 for T1.3, 5 for T1.4, 5 for T1.5)
- **WP2: 32** indicators (8 for T2.1, 7 for T2.2, 7 for T2.3, 7 for T2.4, 3 for T2.5)
- **WP3: 23** indicators (7 for T3.1, 5 for T3.2, 8 for T3.3, 3 for T3.4)
- **WP4: 26** indicators (8 for T4.1, 7 for T4.2, 8 for T4.3, 3 for T4.4)
- **WP5: 11** indicators (4 for T5.1, 7 for T5.2)

The detailed results are described in the table of achieved results, they are summarized per WP and Task in the following table:

WP1/Task	Quality Assurance Indicator	Evaluation	Measurable Indicators
WP1 – T1.1	The quality of the literature review referenced • High relevance between the subject of the literature and project topic. • The referenced articles are peer reviewed • The referenced articles have been selected from tier-1 and tier-2 conferences and journals. • The referenced articles are taken from well reputed research databases	- Internal	• Number of literatures referenced: **67** • **92%** of the referenced articles have been published in recent years • Mean value of total citations of literature referenced: **78%**
	- The curricula analyzed in the literature review	- Internal	• **26** curricula and programs studied
	- The teaching methods analyzed for the four domains in EU and in Asia	- External	• Number of teaching methods analyzed for the four domains in EU: **14**
	- The learning method analyzed for the four domains - A study of knowledge and skill requirements		• Number of teaching methods analyzed for the four domains in Asia: **19** • Number of learning method analyzed for the four domains: **14**
WP1 – T1.2	- A questionnaire is developed in collaboration with industry - The number of SMEs surveyed in partners countries - The sectors and size of the SME's	- External	• Number of SMEs surveyed in partners countries: **295** • Number of small companies surveyed: **47** • Number of medium and big size companies surveyed: **218** • The global number of replies: **265**

	- The number of replies returned
	- Number of workshops
	- Quality of the reports studied/investigated
	- Maturity model defined successfully in collaboration between the industry and academic partners
	- A quality analysis is completed successfully
	- Quality of the recommendations based on this analysis
		- External
		
		- Internal
			• Number of replies per partner country:
			  • China: **87**
			  • Malaysia: **86**
			  • Thailand: **92**
			
			• Number of relevant reports studied/investigated: **8**
			
			• Number of workshops organized in PC country: **4**

WP1 – T1.3	- A quality gap analysis is completed successfully
	- Quality of the recommendations based on this analysis
	- The curricula coverage according to the importance of the topics for companies
	- A high-quality skill model is developed.
	- The new skill model allows to quantify and qualify knowledge transference based on KPIs associated to the maturity in the 4 Shyfte domains.
		- Internal
		
		- External
		
		- Internal
		
		- Internal
		
		- Internal
			• Number of topics offered by HEIs Asian curricula that correspond to Industry 4.0 required skills studied: **35**
			  • **6** are vital for companies
			  • **9** are of very high importance for companies
			  • **8** are of high importance for companies
			  • **4** are not very important for companies
			  • **7** are not important for companies
			  • **1** has not yet been considered by companies
			• Curricula coverage according to the importance of the topics for companies: **12**
			  • On 6 which are vital, **4** are covered
			  • On 9 which are of very high importance, **3** are covered
			  • On 8 which are of high importance, **3** are covered
			  • On 4 which are not very important, **1** is covered
			  • On the 8 last (not important, not yet been considered) **1** is covered
			• Number of recommendations based on the gap analysis: **12**
			• Number of publications: **7** publications in conferences for the WP1-T1 to T3

WP1 – T1.4	- The relationships between the skills and the Shyfte four domains are defined
	
	- The "required" skill set are identified
	
	- The "required" maturity levels of the trainees are identified
	
	- An efficient learning framework is defined
	
	- The modules' syllabus are defined
		- Internal
		
		- External
		
		- Internal
		
		- Internal
			• Number of skills set per domain:
			  • Industrial Engineering Management: **7**
			  • Software Engineering and Big Data Analytics: **4**
			  • Wireless and Networks Analytics: **5**
			  • Artificial Intelligence: **3**
			• Number of modules defined per domain:
			  • Industrial Engineering Management: **29**
			  • Software Engineering and Big Data Analytics: **18**
			  • Wireless and Networks Analytics: **17**
			  • Artificial Intelligence: **15**
			• Numbers of generic/per sector modules
			• Number of modules' syllabus:
			  • **9** modules syllabus defined for IE domain
			  • **7** modules syllabus defined for Business Mgt domain
			  • **5** modules syllabus defined for SE& Bigdata domain
			  • **6** modules syllabus defined for Wireless domain

WP1				• **13** modules syllabus defined for AI domain • Number of publications: **2** publications in conferences for the WP1-T4

WP1 – T1.5	- A learning strategy per domain is defined
	- The sessions for training of the trainers are scheduled
	- The sessions for training of the students are scheduled
		- Internal
		
		- Internal
		
		- Internal
				• Number of detailed syllabus defined per domain
				    • **16** detailed syllabus defined for domain 1
				    • **5** detailed syllabus defined for domain 2
				    • **6** detailed syllabus defined for domain 3
				    • **13** detailed syllabus defined for domain 4
				• Number of training sessions of the trainers scheduled
				    • **14** ToT sessions scheduled for domain 1
				    • **4** ToT sessions scheduled for domain 2
				    • **6** ToT sessions scheduled for domain 3
				    • **6** ToT sessions scheduled for domain 4
				• Number of training sessions for the students are scheduled
				    • **12** ToS sessions scheduled for domain 1
				    • **4** ToS sessions scheduled for domain 2
				    • **6** ToS sessions scheduled for domain 3
				    • **10** ToS sessions scheduled for domain 4
				• Number of potential trainers projected
				    • **12** trainers identified for domain 1
				    • **5** trainers identified for domain 2
				    • **6** trainers identified for domain 3
				    • **10** trainers identified for domain 4
				• Number of potential students projected: **>300**
				    • **100 to 120** students trained from CMU & KU (domain1)
				    • **100 to 120** students trained from CDU& CUIT (domain2)
				    • **40 to 50** students trained from UPM& UTM (domain3)
				    • **40 to 50** students trained from UTM& UPM (domain4)

WP2/Task	Quality Assurance Indicator	Evaluation	Measurable Indicators
WP2 – T2.1	- The modules identified for the Industrial Engineering domain (based on the skills set and level of the trainees) - The modules identified for the Business Mgt domain (based on the skills set and level of the trainees) - The training session for the trainers occurred - The maturity level is defined for each category of students - The training session for the students occurred	- Internal - External - Internal	1. Number of modules developed for IE domain: **6** 2. Number of modules developed for Business Management domain: **5** 3. Number of trainers trained from CMU & KU: **111** 4. Number of staff per partner trained: **8** 5. Number of staff completing quality assessment: **75** 6. Number of students trained from CMU and from KU: **137** 7. Number of students completing quality assessment: **82** 8. Number of students satisfied: **93.45%** of the students are globally satisfied

	- Quality assessment of the training session - Analysis of the training quality questionnaire - One improvement plan per module is defined - All the modules are updated	- External - Internal - Internal	
WP2 – T2.2	- The modules identified for Software Engineering and bigdata analytics domain (based on the skills set and level of the trainees) - The training session for the trainers occurred - The maturity level is defined for each category of students - The training session for the students occurred - Quality assessment of the training session - Analysis of the training quality questionnaire - One improvement plan per module is defined - All the modules are updated	- Internal - External - Internal - External - Internal - Internal	9. Number of modules developed for Software Engineering and bigdata analytics domain: **5** 10. Number of trainers trained from CDU & CUIT: **31** 11. Number of staff per partner trained: **5** 12. Number of staff completing quality assessment: **28** 13. Number of students trained from CDU and from CUIT: **142** 14. Number of students completing quality assessment: **92%** 15. Number of students satisfied: **91%** of the students are globally satisfied
WP2 – T2.3	- The modules identified for wireless and network analytics domain (based on the skills set and level of the trainees) - The training session for the trainers occurred - The maturity level is defined for each category of students - The training session for the students occurred - Quality assessment of the training session - Analysis of the training quality questionnaire - One improvement plan per module is defined - All the modules are updated	- Internal - External - Internal - External - Internal - Internal	16. Number of modules developed for wireless and network analytics domain: **7** 17. Number of trainers trained from UPM: **56** 18. Number of staff per partner trained: **3** 19. Number of staff completing quality assessment: **31** 20. Number of students trained from UPM: **69** 21. Number of students completing quality assessment: **72%** 22. Number of students satisfied: **92,5%**
WP2 – T2.4	- The modules identified for Artificial Intelligence domain (based on the skills set and level of the trainees) - The training session for the trainers occurred - The maturity level is defined for each category of students - The training session for the students occurred - Quality assessment of the training session - Analysis of the training quality questionnaire - One improvement plan per module is defined - All the modules are updated	- Internal - External - Internal - External - Internal - Internal	23. Number of modules identified for Artificial Intelligence domain: **12** 24. Number of trainers trained from UTM: **53** 25. Number of staff per partner trained: **13** 26. Number of staff completing quality assessment: **31** 27. Number of students trained from UTM: **50** 28. Number of students completing quality assessment: **73%** 29. Number of students satisfied: **95%** of the students are globally satisfied

WP2 – T2.5	- The architecture of the 4 learning centers is defined	- Internal	30. Number of Skills 4.0 learning center implemented:**4**
	- the functionalities and main services are described (communication, identification, selection, registration, evaluation…).	- Internal	
	- The interactions between the global website and the local ones are identified		
	- A dissemination strategy is proposed	- Internal	31. Number of guidelines for teachers are defined (one per domain): **1**
	- A methodology for creation and testing is defined for the 4 Learning centers		32. Number of guidelines for students are defined (one per domain): **1**
	- A Business plan is defined for each Learning Center	- Internal	
	- A Knowledge-based framework is defined for each learning center		
	- A methodology for technical and business evaluation is defined for the Learning centers	- External	
		- External	

WP3/Task	Quality Assurance Indicator	Evaluation	Measurable Indicators
WP3 – T3.1	- Validation of the learning program by the companies (advisory board, experts…)	- External	• Number of professional experts per domain • Domain 1: **6** • Domain 2: **5** • Domain 3: **7** • Domain 4: **2**
	- Define an evaluation quality questionnaire for the trainers (per domain)	- Internal	• Number of external academic experts per domain/HEIs: • Domain 1: **4** • Domain 2: **5** • Domain 3: **5** • Domain 4: **2**
	- Define an evaluation quality questionnaire for the students (per domain)	- Internal	• Number of quality indicators defined: **14** • Number of questions per questionnaire: **22** • Number of trainers filling the evaluation questionnaire: **165** • Number of students filling the evaluation questionnaire: **70%** (out of 400) • % of the students that are globally satisfied: **80%**
WP3 – T3.2	- Define a Training Quality Plan	- Internal - Internal	• Number of indicators defined in the TQP per domain (pilot): • **22** questions to evaluate the training • **5** specific questions per domain (Pilot)

WP/Task	Quality Assurance Indicator	Evaluation	Measurable Indicators
	- Develop a Quality Management System (QMS) training session for trainers - Organize and Schedule quality audits to evaluate the skills 4.0 transfer and measuring the impact of these skills in SME's	- External	• **4** specific questions for the trainers • **14** indicators of Skills 4.0 transfer • Number of trainers trained on QMS: **12** • Number of trainers satisfied by the QMS training: **88%** globally satisfied • Number of potential quality managers per Learning Centers: **4** in domain 1; **2** in domain 2; **3** in domain 3 and **3** in domain 4 • Number of training quality audits scheduled per Learning Centers: **132** trainers trained during the ToT filled the quality questionnaires.
WP3 – T3.3	- Implementation of the Learning Centers audits - Evaluation of the Impact indicators - Assessment of the QMS system and continuous Improvement - Audits of SMEs in the Partners Countries with impact indicators conducted.	- Internal - External - External - External	• Number of trainings of the trainer's quality audits carried out: **37** Training sessions were audited • Number of indicators of Skills 4.0 transfer: **14** • Number of Trainers certified: **214** • Number of non-conformities: **NA** (the audits did not reveal any real non-conformity) • Number of improvement actions defined: **1** improvement plan per module • Number of improvement actions implemented: **1** improvement plan implemented per module • Numbers of SME's involved **13** • Number of companies salaries audited: **7** trainees from companies filled the quality questionnaires
WP3 – T3.4	- A sustainability assurance plan is designed with the HEIs partners and SMEs. - A SME's survey is done to assess the Learning Centers indicators - The sustainability plan ensures that the activities of the Learning Centers will continue beyond the end of the project.	- Internal - External - Internal	• Number of companies globally satisfied by the Learning materials (per domain, per country): **82%** • Number of companies globally satisfied by the Learning Centers services (per domain, per country): **82%** • Number of SMEs that would recommend learning centers (per domain, per countries): **84%**

WP4/Task	Quality Assurance Indicator	Evaluation	Measurable Indicators

WP4 – T4.1	- Shyfte project dissemination to other universities
	- Shyfte project dissemination to companies
		- External
		
		- External
			1. Number of entities where the project was spread:
			  • Domain 1: **22 entities in Thailand**
			  • Domain 2: **12 entities in China**
			  • Domain 3: **11 entities in Malaysia**
			  • Domain 4: **8 entities in Malaysia**
			  •
			2. Number of external universities identified to disseminate the project
			  • Domain 1: **18 universities in Thailand**
			  • Domain 2: **6 universities in China**

				• Domain 3: **7 universities in Malaysia**
				• Domain 4: **6 universities in Malaysia**
				
				3. Number of external industries identified to disseminate the project:
				   • ToT sessions: **9**
				   • Seminars & Workshops: **20**
				   • Visits: **4**
				
				4. Number of Shyfte proposed activities in universities: **5** seminars & exhibitions
				5. Number of Shyfte proposed activities in industry:
				   • **10** industrial workshops
				6. Number of events where the project was spread:
				   • **1** Keynote speaker in Int. conference
				   • **1** Special session in Int. conference
				   • **5** academic seminars
				   • **10** industrial workshops
				   • **7** papers in indexed int. journals
				7. Number of conferences, formal, informal meetings…:
				   • **20** international conferences
				   • **10** physical Plenary or PMB meetings
				   • **44** virtual Plenary or PMB meetings
				
				8. Number events/activity per partner in the Map:
				   • France: **5**
				   • Italy: **4**
				   • Portugal: **3**
				   • Thailand: **7**
				   • China: **7**
				   • Malaysia: **9**

WP4 – T4.2	- Awareness dissemination and acceptance of emergent skills - Development of a COST (European Cooperation in Science and Technology) proposal aligned with the dissemination of the Centers of Excellence;	- Internal - External	9. Number of awareness dissemination events: **47** 10. Number of partners involved: **37** other universities involved in the partners countries 11. Number of external entities involved: **33** 12. Number of Shyfte seminars & workshop: **20** 13. Number of partners: more than **60** external partners involved 14. COST proposal acceptance: Collaboration with **3 EU projects**: (1) Erasmus+ Enhance, (2) Erasmus+ ETAT, and H2020 SME 4.0 15. Number of initiatives argute to the COST: 3 seminars	
WP4 – T4.3	- The Website is online - The Website is updated regularly	- External - Internal	16. Number of website visitors: **NA** (a technical problem did not allow us to measure the nb of visitors since the beginning of the project).	

	Quality Assurance Indicator	Evaluation	Measurable Indicators
	- The events organized - Social Networks created and updated - Cluster of blogs indicators developed - Publication indicators - Conferences indicators	- External - External - Internal	17. Average time on page: **NA** (a technical problem did not allow us to measure the nb of visitors since the beginning of the project). 18. Number of events organized: **30** seminars, workshops, visits, meetings… 19. Number of events (conference, seminars, workshops…) in which Shyfte partners participate: more than **80** events (conferences, seminars…) 20. Social networks number of follows: **106** followers on Facebook 21. Social networks number of likes: **98** likes on Facebook 22. Social networks number of shares Cluster of blogs indicators: **NA** (a technical problem did not allow us to measure the nb of visitors on the website since the beginning of the project). 23. Number of visitors: idem 24. Number of topics: around **18** topics covered 25. Number of posts: **35** posts published 26. Number of papers published Conferences indicators: **20** papers presented in int. conferences 27. Number of people: more than **600** people (average of 30 people per session) 28. Number of organizations: more than **300** organizations concerned 29. Nb of Industrial companies: **NA** (difficult to measure the nb of companies involved in the int. conferences; especially online)

WP4 – T4.4	- Scientific and technical dissemination	- Internal
		
		- Internal
		
		- Internal
			30. Number of papers in scientific conferences (per domain):
			   • Domain 1: **4** conferences
			   • Domain 2: **5** conferences
			   • Domain 3: **4** conferences
			   • Domain 4: **4** conferences
			31. Number of publications in international scientific journals (per domain)
			   • Domain 1: **2** journals
			   • Domain 2: **3** journals
			   • Domain 3: **1** journal
			   • Domain 4: **2** journals
			32. Number of workshops & seminars organized: **15**

WP5/Task	Quality Assurance Indicator	Evaluation	Measurable Indicators
WP5 – T5.1	- The assigned tasks start and finish on time - The project Handbook is defined and validated - The project meetings are scheduled - The minutes of the meetings are done and validated	- Internal - Internal - Internal - Internal	1. The number of physical meetings: **10** 2. The number of virtual meetings: **44** **3.** The duration of each task is respected: **All** tasks have been completed on time overall (considering the 10 months extension of the project). 4. Number of deliverables finished on time: **24** deliverables are delivered on time

	- The deliverables are finished and validated on time - The periodic reports are done on time - The final report is ready on time	- Internal	
WP5 – T5.2	- The Quality Assurance Plan is defined and validated - The Quality Assurance Procedures are defined - A work plan with clear division of tasks and responsibilities between partners and timetable is produced - Conflicts are identified and resolved by the partners - Monitoring of the innovation being developed through the project	- External - Internal - Internal - Internal - External	**Quality Evaluation system** indicators: 5. Number of QA procedures defined: **4** main processes/procedures defined (registration, maturity level, training program, evaluation) 6. Number of PMB reports: **14** 7. Number of travel reports: **113** 8. Number of Timesheets produced (per person, per category): around **80** 9. Number of conflicts solved: **1** 10. Number of publications in international conferences: **20** 11. Number of international journals submitted: **7** accepted + **2** submitted