Improving Malaysian HE Knowledge Towards

a Wood and Furniture Industry 4.0



Deliverable 2.4: Joint Curriculum Validation

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1. INTRODUCTION

Wood and furniture industry is very important for socio-economic field in Malaysia. This industry provides significant employment opportunities in the rural areas of the country. Malaysia has been globally known as a big producer/exporter of wood products, e.g. saw logs and sawn timber. The products are being utilized as one of the main materials in construction sector. Whereas, wood panels such as plywood, particleboard and fibreboard are being used as essential components for furniture (Ratnasingam et al., 2016*). At the same time, the recent trend in Industry 4.0 is increasing nowadays (Nagy et al., 2018*). The trend changes most of the works. Robots may work with people, and will massively produce industrial output. Manufacturing information will be remained available throughout the production's value chain. Therefore, Industry 4.0 is observed as a revolution for the machine, changes of job profile and the skills improvement for wood and furniture industry. New players with special business models will be materialized, parallel with the development of new sets of education and training.

These fundamental changes are being developed by the university, industry and woodrelated institution. Universities as major stakeholders play an important role to develop new knowledge and skills for Industry 4.0 to be implemented in wood and furniture area. Ministry of Higher Education Malaysia (MOHE) has proposed major reforms to Malaysia's higher education system in order to accelerate the changes, by introducing Malaysia Education Blueprint 2015-2025 (Ganapathy, 2016*). In the meantime, the formulation of the National Timber Industry Plan (NATIP) back in 2009 (Ratnasingam et al., 2019*) further emphasized the commitment of the government to foresee the further development of the wood-based industry, materials supply, workforce, markets, automation, design and branding, as well as entrepreneurship. Malaysian Investment Development Authority (MIDA) (Anonymous, 2017*) has also recently viewed the potential development and extension of Malaysian furniture hub, where all industry-related activities are housed at one location for the benefit of all industry players for the preparation of Industry 4.0.



2. JOINT CURRICULUM STRUCTURE

Following all these justifications, MAKING 4.0 is establishing a European-Malaysian collaborative consortium with the objective to develop an innovative Master Degree for engineers of furniture smart factories that will modernize High Education (HE) degrees, by focusing on the ICTs skill needs to increase competitiveness of the wood and furniture industry of Malaysia. It is obvious that the present project fits the regional and national priority of the Erasmus+ call CBHE for the Region of Asia in the kind of curriculum development projects in manufacturing and processing, and also other priorities such as engineering and engineering trades and forestry at master level. The program, namely "Master of Advanced Technologies and Innovation for Wood-Based Industry", is currently being developed by this consortium.

Table 1 shows the module of this master program, which consisted of five (5) modules, carrying forty (40) credits:

- a. Module 1: Processes and Production of Furniture
- b. Module 2: Intelligent and Sustainable design
- c. Module 3: Wood and New Materials
- d. Module 4: Innovation Management
- e. Module 5: Internship & Dissertation

Table 1: Module of the Master Program

Modules of the Master	ECTS
Processes and Production of Furniture.	16
Intelligent and Sustainable design.	4
Wood and New Materials.	6
Innovation Management.	4
Practicum / Internship	5
Master Thesis	5
Total Malaysian Credits	40

There are compulsory and elective courses in the program. Table 2 displays the credits amount of 28 (70%) and 12 (30%) for compulsory and elective courses, respectively.

Course Clasification	Credit Value ECTS	Percentage %
Compulsory	28	70,0%
Elective (Optional Subjects)	12	30,0%
Total Credit Value	40	100,00%

Table 2: Credits for Compulsory and Elective Courses



Table 3 shows the structure of Master of Advanced Technologies and Innovation for Wood-Based Industry and its courses within two (2) semesters. Ten (10) courses must be taken in Semester 1, while seven (7) courses in Semester 2. All courses carry 2-credits value, except internship and project courses in Semester 2, which carry 5-credit value for each course. For the internship course, a 10-week attachment would begin in Week 5 onwards.

Table 3: The Structure of Master of Advanced Technologies and Innovation for Wood-Based Industry and its courses within two (2) semesters: (a) list of courses by modules, (b) list of courses by semesters.

(а)
1		/

		IDE		
		FCTS	TYPE	Total ECTS
	Processes and Production of Eurniture, Elective subjects, Choose tw	0	TIFE	16
	Pipital Transformation in the Industry 4.0	2	6	10
	Digital Transformation in the industry 4.0	2	C	
	Automotion processes in the furniture sector.	2	C	
	Automation and mechanization. Low Cost Automation.	2	C	
	Additive manufacturing	2	C	
MODULE 1	Internet of Things (IoT) applied to wood-based industry	2	C	
	Wireless technologies for logistic and manufacturing	2	С	
	Network communications in the industry	2	E	
	Robotics applied to the wood-based industry	2	E	
	Augmented reality 2		E	
	Simulation and 3D Scanning	2	E	
	Cloud Computing and Big Data applied to wood-based industry	2	E	
	Intelligent and Sustainable design. Elective subjects. Choose two			4
	Eco and sustainable design	2	E	
MODOLL 2	Product design and digitalization.	2	E	
	Circular Economy in the wood and Furniture Sector	2	E	
	Wood and New Materials. Compulsory subjects. 6			
	Wood science	2	С	
WODULL 3	Materials for furniture manufacturing.	2	С	
	Material Processing	2	С	
	Innovation Management. Elective subjects. Choose two			4
	Innovation management systems	2	E	
MODULE 4	Technological surveillance and competitive intelligence.	2	E	
	Management Systems. Lean manufacturing	2	E	
	Internship			5
Internship &	Internship/Practicum	5	С	
Dissertation Master Thesis			5	
	Master Thesis	5	с	
			TOTAL ECTS:	40



MASTER OF ADVANCED TECHN	ologi	ES AND	INNOVATION FOR WOOD-BASED INDUSTRY		
FIRST SEMESTER			SECOND SEMESTER		
COURSES	TYPE	ECTS	COURSES	TYPE	ECTS
Processes and Production of Furniture. Elective subjects. Choose two		16	Wood and New Materials. Compulsory subjects.		6
Digital Transformation in the Industry 4.0	С	2	Wood science	С	2
Production processes in the furniture sector.	с	2	Materials for furniture manufacturing.	с	2
Automation and mechanization. Low Cost Automation.	С	2	Material Processing	с	2
Additive manufacturing	С	2	Innovation Management. Elective subjects. Choose two		4
Internet of Things (IoT) applied to wood-based industry	С	2	Innovation management systems	E	2
Wireless technologies for logistic and manufacturing	С	2	Technological surveillance and competitive intelligence.	E	2
Network communications in the industry	E	2	Management Systems. Lean manufacturing	E	2
Robotics applied to the wood-based industry	E	2	Practicum / Internship	С	5
Augmented reality	E	2	Master Thesis	С	5
Simulation and 3D Scanning	E	2	Total ECTS 2nd semester		20
Cloud Computing and Big Data applied to wood-based industry	E	2			
Intelligent and Sustainable design. Elective subjects. Choose two		4			
Eco and sustainable design	E	2			
Product design and digitalization.	E	2			
Circular Economy in the wood and Furniture Sector	E	2			
Total ECTS 1st semester		20			

Student Learning Time (SLT) for all 2-credit courses have to have face to face (F2F) hours kept very minimum, especially Semester 2 courses, because of the obligation of the students to do internship and project.

3. QUESTIONNAIRE – RESULTS AND OVERVIEWS

A total 54 respondents were involved in the survey on the 3_{rd} of December 2019 at the MAKING4.0 Seminar at UiTM Shah Alam, Malaysia.

Figure 1 shows the percentages fraction of the respondent. Teachers appeared to be the highest percentage, which held 40.7% (22 persons) during the survey. The second highest is students, 38.9% (21 persons), while the third highest is other entities, 20.4% (11 persons). From the record, other entities were from industrial players and business persons.



Figure 1: Percentages fraction of the respondent



Figure 2 shows the students' response towards the interest in joining this master program. (The response was rated from 1 to 5, with 5 being the highest).

According to the figure, 50% (10 persons) of the students selected scale 4, while 30% (6 persons) selected scale 5, make up 80% (16 persons) of the students are greatly interested in joining this master program.



Figure 2: Students' response towards the interest in joining this master program

Figure 3 depicts the involvement of the teachers in this master program development. It shows that 60% of the teachers involves in this master program development towards the progression of Industry4.0.



Figure 3: Involvement in this master program development



Figure 4 indicates most of the respondents rated the highest scale in term of the relevancy and interest for Module 1 to 5 of the master program. In comparing between modules, most of the respondents with 5-scale rated tended to put their interest into Module 4 (Wood and New Materials) and Module 5 (Processes and Production of Furniture) of the program. This can be favored to the relevancy and importance of these topics towards the elemental understanding among students during their study period in the program.



Figure 4: Rate of the relevancy and interest for Modules 1 to 5

Figure 5 presents the 94.4% of the respondents confident that the distribution of the credits of the course will adapt to the program. Majority also confident that the distribution of the credits is consistent with the number of credits in each module.



Figure 5: Distribution of the credits and adaption to the program



Figure 6 declares that a total amount up to 90.8% of the respondents trusted that the joint curriculum greatly and somewhat (considerably great) covers the needs to prepare students for the industry 4.0 in the wood and furniture sectors.



Figure 6: Coverage of the joint curriculum in term of the students' need towards Industry4.0 in the Wood and furniture sectors.

Figure 7 reveals the great to somewhat (considerably great) distribution of modules, practical and thesis between the two semesters by the 92.6% of the total respondents. Only 7.4% of the respondents disagree with the distribution of the courses.



Figure 7: Distribution of modules, practical and thesis between the two semesters

Figure 8 demonstrates most of the respondents accepted (by picking scale 5 and 4) these facts; (i) with the knowledge obtained in this Master, participants will easily gain new skills, (ii) The



specified modules and their associated courses present a coherent structure which form a clear synergy, (iii) This course will support to close the gap of knowledge, skills and competencies of employees in the wood and furniture sector in Malaysia, (iv) After successfully passing the course the participants are prepared for a relatively new/growing market which will have an impact on the competitive advantage, (v) The participant will be satisfied with the knowledge obtained from the training.



Figure 8: Rates of the program

Figure 9 displays a total number of 74% of the respondents confident (by selecting scale 5 and 4) that the number of Elective and Compulsory courses suitable for the program. (The response was rated from 1 to 5, with 5 being the highest).



Figure 9: Suitability of the number of elective and compulsory courses



Figure 10 shows 25.9% of the respondents have listed out some courses that should be covered in the master program, shown in Figure 11, such as programming, commercialization, design workshops, technologies, big data/internet of things/ethical and furniture testing. However, most of the topics have been incorporated in the program structure and syllabus.





In case of "YES", what topic do you consider is not addressed?
9 respuestas
Programming
Commercialization, start-up
Design workshops
Design
More technologies
Big data/internet of things/ethical
Fffff
Too many courses
Furniture testing

Figure 11: List of the suggested additional topics by the respondents



According to Figure 12, (the response was rated from 1 to 5, with 5 being the highest) an amounted number of 85.2% of the total respondents have convinced (by selecting scale 5 and 4) that the modules described are appropriate to cover the Master program in Malaysia in term of content and structure. By viewing Figure 13, some positive remarks by the respondents have been recorded. However, some of the respondents have given their crucial opinion in relation to this current master program's development, such as; (i) a total 3 semesters are required for a bundle of 10 to 13 courses only, (ii) difficult to offer to wood tech faculty due to a lot of ICT courses, (iii) should put more industry players in the future's curriculum review.



Figure 12: Appropriate of the modules to cover the Master program



9. Please, add any comment on the "MAKING 4.0 Joint Curriculum" that you consider: 19 responses
Tqvmuch
Muak
l like it. TQ
l like it
the seminar give me more information about furniture industry
Well done team Erasmus
The malaysian Industry on wood base are not ready to change to 4.0
Too many courses
 Need styling and design subject in the curriculum. Current practice in Malaysia, duration of Master's degree is 1.5 years and number of subjects between 10 to 13 only. Curriculum should fit on purpose.
Address to pursue the curicula
My concerns are 1) difficult to be offered for wood tech faculty due to a lot of ICT related subjects 2) the lecturers in our faculty might not relevant to teach some of the subjects
Implementation awareness
Very interesting course
MQA's student learning time in hours supports flexible & blended teaching-learning environments so a learner can be anywhere in the world but still able to sign up for the MAKING4.0 master's program, acquire the learning experience & achive all the learning outcomes.
Maybe 1 year and half needed
Requires more industry input (graduates are not industry ready)
Good luck
I think it is very interesting
Design and how to read drawing

Figure 13: Some additional comments from the respondents

4. CONCLUSIONS

In order to reach the general goal, some specific objectives were accomplished: the structure and contents of the master program, "Master of Advanced Technologies and Innovation for Wood-Based Industry", as well as the feedbacks from some respondents. It is concluded that most students (80% of the students) are greatly interested in joining this program. The community is also in favour with the structure, contents and modules introduced in the program, when 92.6% of the overall participants considered that the distribution of modules between the two semesters is in line with the needs.



5. **REFERENCES**:

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ANNEX – QUESTIONNAIRE USED TO OBTAIN THE FEEDBACKS

MAKING4.0 - Seminar Joint Curriculum evaluation

Please answer the following questionnaire about the Making4.0 Master's Degree Joint Curriculum.

*Required







1. Wich is your position? *

Mark only one oval.

C Teacher	Skip to question 3
C Student	Skip to question 2
Other	Skip to question 4

2. Would you be interested in joining this Master Degree? *

Mark only one oval.

	1	2	3	4	5	
Nothing interested	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	Highly interested

3. Are you directly involved in Making4.0 project? *

Mark only one oval.

Yes

 Please, rate the relevance and interest of each of the defined Modules for the Master. 1 to 5 (with 5 being the highest) *

Mark only one oval per row.

	5	4	3	2	1
Module 1. Key Enabling Technologies of Industry 4.0	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
Module 2. Intelligent and sustainable design	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
Module 3. Innovation Management	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
Module 4. Wood and New Materials	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
Module 5. Processes and Production of Furniture	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc



5. 2. Regarding the distribution of ECTS credits of the subjects, do you consider that it adapts to the programme and is consistent with the number of ECTS credits in each module. *

Mark only one oval.



 3. In your opinion how much does the Joint Curriculum cover the needs to prepare students for the Industry 4.0 in the wood and furniture sector? *

Mark only one oval.

- Greatly addresses the needs
- Somewhat addresses the needs
- Partially addresses the needs
- Does not addresses the needs
- 7. 4. What do you think about the distribution of Modules / Practices / Master Thesis between the two semesters? *

Mark only one oval.

- Greatly addresses the needs
- Somewhat addresses the needs
- Partially addresses the needs
- Does not addresses the needs



8. 5. Please, rate in order 1 to 5 (with 5 being the highest) the following statements: *

Mark only one oval per row.

	5	4	3	2	1
With the knowledge obtained in this Master, participants will easily gain new skills.	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
The specified modules and their associated subjects present a coherent structure which form a clear synergy.	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
This course will support to close the gap of knowledge, skills and competencies of employees in the wood and furniture sector in Malaysia.	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
After successfully passing the course the participants are prepared for a relatively new/growing market which will have an impact on the competitive advantage.	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
The participant will be satisfied with the knowledge obtained from the training.	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc

9. 6. In your opinion, is the number of Elective and Compulsory subjects suitable? *

Mark only one oval.



 7. Do you miss any specific topic that it is not addressed in the defined "Joint Curriculum" Mark only one oval.





11. In case of "YES", what topic do you consider is not addressed?

12. 8. Do you think that the modules described are appropriate to cover the Master's programme in Malaysia? (In terms of content and structure) *

Mark only one oval.

	1	2	3	4	5	
No at all	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	Completely

13. 9. Please, add any comment on the "MAKING 4.0 Joint Curriculum" that you consider:





Link to the questionnaire (template used to obtain feedback):

https://docs.google.com/forms/d/1OiZiHZKU8ELBpFoMa00tq7YtnN75ZQB3khflI2jE-P8/prefill