

Cross-Border Multidisciplinary Curriculum in the Automotive and Motorsport Industry

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This study is a part of WP5 "Planning and piloting the joint cross-border multi-disciplinary curricula in the automotive and motorsport industry". The context is European, as it is impossible to plan Finnish-Russian cross-border curricula due to the current political and academic restrictions. It is done in accordance with the internal and external project instructions, in close cooperation with XAMK project team.

1. Background and motivation behind the topic

The idea of a curriculum that engages several levels of education and is at the same time inherently cross-border (transcultural, international) is to form a so-called core skeleton of knowledge, skills, and competences. Various levels, superstructures deepening individual topics and at the same time expressing specific areas of knowledge corresponding to specific training modules, will be added to it.

We can start by reflecting on the future needs that characterise the cross-border automotive and motor sport industries. Should these two industries be separated? On the one hand yes, since the clusters involved in the production and maintenance of automotive products do not have the direct purpose of producing sports cars and training specialists involved in sports car events such as Formula, carting or Grand Prix competitions. On the other hand, the whole modern concept of business, regardless of sphere and level of activity, introduces more and more elements of the game to engage younger consumer groups and to develop products and services oriented towards the end consumer.

Gamification and elements of gambling are inherent in various components of economic activity. Consumers want more interaction with company representatives. Moreover, businesses often involve consumers in the development of their products and services, shaping thinking and identity at the level of game interaction. Therefore, a full integration of elements of the automotive and motorsport industries appears to be in the future. Therefore, these two industries as part of separate elements (modules) will be considered together.

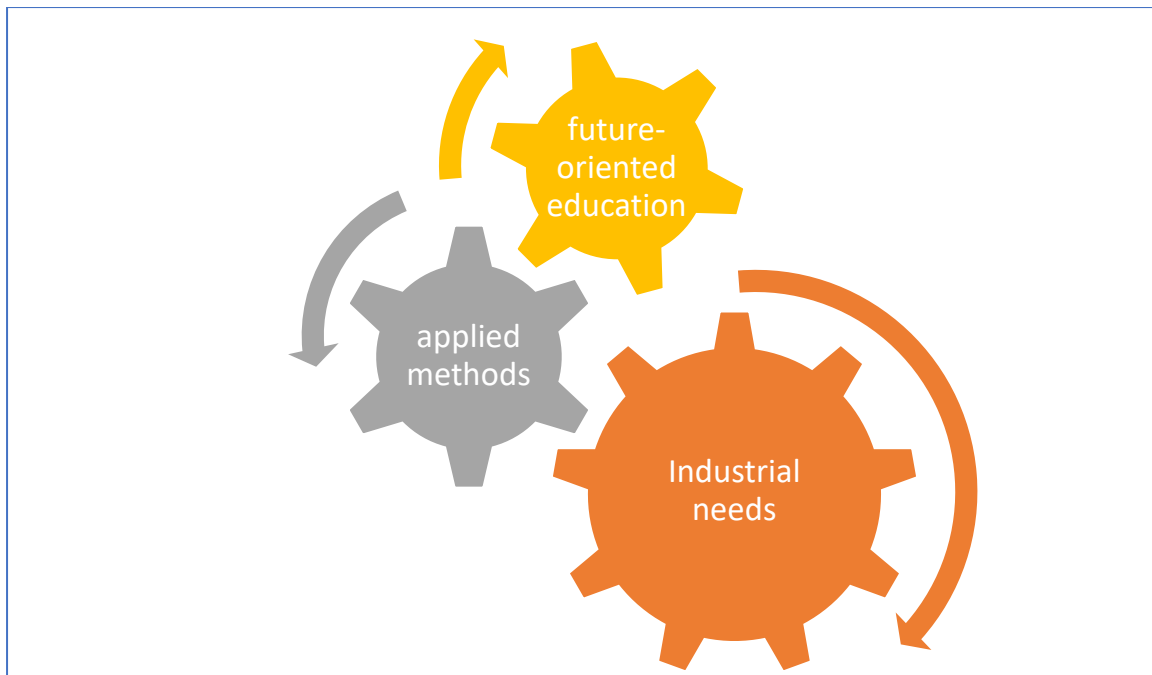


Figure 1. Basic components of applied education course or module targeted at future industry needs (developed by the author).

A classical course or module consisting of several short courses is not fully suitable to reflect future industrial needs, as the structure, methods and aims of future-oriented education are markedly different from classical forms of education (Figure 1). To begin with, simply developing a curriculum based on the existing learning objectives and scope of the courses is not quite right.

The developed curriculum reflects the multidisciplinary needs of automotive and motorsport industries, although integrating student needs to grow across three educational levels according to the European Qualification Framework (2022). The curriculum has utilized the Race4Scale conducted events (e.g., Future Lab, Winter Schools, Innovation Camps, Teacher Weeks, Industry Days) and accumulates a number of project research outcomes (Nemilentsev, Kujanpää, and Kettula 2021; Villman 2022). The landscape of research and possible interconnections are feature in Figure 2.

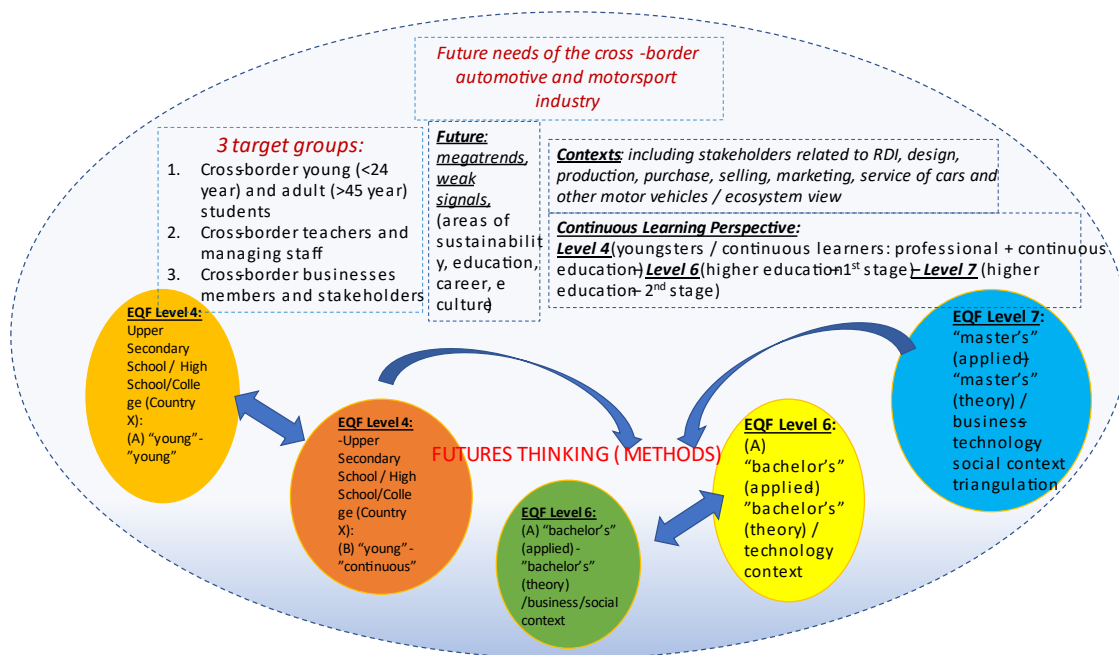


Figure 2. The landscape view of the cross-border interdisciplinary curriculum setting in the automotive and motorsport industries (developed by the author).

2. Target Groups

The first step is to describe the target groups of the training. We want to train both young (up to 24 years old) and older students (over 45 years old). Why two such different groups of students? Because continuing education does not have any return restrictions and more experienced participants in the educational process often want to change the profile of their previous education. And the two groups of students should not be divided into different study groups. On the contrary, they should be taught together: older students will share their life and professional experience, while younger students will teach their older counterparts modern technical and social techniques and explain digital interaction in an accessible modern language. In general, both young and older students act as full-fledged co-developers of future-oriented education. Modules are not developed for them, but they are involved in the development of the modules themselves. Thus, for example, part of course X can be offered as a completely free module (part) for students: they themselves prepare the part which, for whatever reason, is important to them and is missing (or not emphasized enough) in the course.

It is impossible to create an effective curriculum for prospective students that is responsive to their needs and professional goals without taking into account the quality of the teaching itself and the management of the education process as a whole. For this reason, the next target groups are teachers and managerial staff in higher, secondary and other involved institutions. Part of the curriculum should therefore include a module on future-oriented pedagogy and management skills in interdisciplinary work.

Finally, another target group is international business representatives. As the curriculum itself has a cross-border character, the basics of interaction with cross-border international projects and international cases should not be developed from theoretical sources, but from direct contact with the business community.

3. Continuous learning perspective

The curriculum has a long learning perspective as it is designed for students of different levels and ages, in accordance with the European Qualification Framework. In particular, at Level 4, the curriculum is open to high school students as well as young and older students in secondary vocational education (such as colleges). At Level 6, students from bachelor university programmes of an applied or more classical scientific type participate. Finally, at Level 7, science and applied science students at master's level participate in our cross-curriculum.

4. Focus/components of the automotive and motorsport industries in the curriculum

The educational programme will include informative packages on various aspects of automotive and motorsport industries. Components and stakeholders of both industries will be considered conjointly – in composition of the automotive and motorsport ecosystem featuring the international (cross-border) dynamics. It should be clear at this point that the developed curriculum will not support solely technical knowledge/skills/competences nor it aims at focusing one-sidedly on socio-economic or sport collaboration.

The current curriculum has clear international (cross-border) and future orientations. It is considered as a universal model applicable for continuous education on a certain educational level according to EQF as well as between several levels. The role of online modules increases as a partial result of the recent pandemic outbreaks in addition to the changing mindset of the “limitless” generation whose online life/work habits transform the educational reality extremely rapidly. Previously, school, college or university education could have been separated on online and offline (in-presence) study modules. Nowadays, such separation is no longer valid: in addition to student preferring to complete online or hybrid (i.e., a combination of on-site and online learning)

The more the courses deviate from the traditional applied or academic model of learning with lectures, seminars and examination weeks, the more this curriculum will meet the needs of a new generation of students. It can be assumed that the form of teaching should change significantly. In the few years we've spent during the Covid pandemic, students and faculty have gotten along just fine without face-to-face meetings. Communication from active conversations more and more moved to chats - whether it be Teams, Zoom or any other programs. In the old and already well-forgotten saying “brevity is the sister of talent”, in fact, the form of education so eagerly awaited by today's students is hidden. That is, before offering a model for the

future of international education, it is necessary to understand properly what the current generation of students loves.

Students prefer short rather than long courses with a clear grading system and a clear structure. Contrary to the popular belief that all students enter a certain department and a certain curriculum, most now like to take courses from different departments. If earlier the choice was limited to several additional courses from the Faculty of Foreign Languages, now students are interested in practical work with data. That is, the linguistic context has not gone away, but now it is programming languages and programs for system data analytics. In other words, the culture of business communication has been supplemented (completely absorbed) by the culture of digital analytical communication.

Priority is given to programs of a mixed applied type of a hybrid form of education with a predominance of research and innovative workshops in terms of compulsory disciplines. In addition, the line between the level of received application data is gradually blurred.

It is possible to educate about something (for example, about a specific branch of knowledge, about the process and forms), or it comes in the form of education within practical processes. The characteristics of the automotive and especially the motorsports industries are highly mobile and international hybrid ecosystems. It is almost impossible to teach a student to repair a car without involving him in tests both on the track (road) and in the garage. Moreover, flexibility and internationality are provided, among other things, through a virtual hybrid form and methodology of the educational process.

Training modules that need to be studied both at the school and at the secondary professional and higher levels:

- sustainable development & growth
- social and sustainable-driven innovations
- intercultural communication
- cross-border management/marketing
- selling pitch: sell your idea
- customer intelligence
- digitalization skills (VR, AR, ICT, blockchain, platform economy)
- project management
- future-oriented learning: scenario building, weak signals, megatrends
- stakeholder management & risk management
- global technological and business ecosystems
- technology of business & business of technology

It should be noted that these modules (usually 5-15 ECTS) are to be installed into more traditional study curricula at each educational level either as a part of core studies or as a combination of core and supplementary studies. Certain study modules should last over several study semesters, while others can be taught only in an intensive mode during one specified study semester.

The current illustrative model of competences required for the future-driven education in the cross-border and trans-disciplinary context is partially based on the model of Six Competences for the Future Education (2022). In order to succeed in the interdisciplinary cross-cultural work in business, technology or RDI projects, students of the automotive and motorsport departments as well as business- and technology-driven students should raise the following nine perspectives featured in Figure 3.

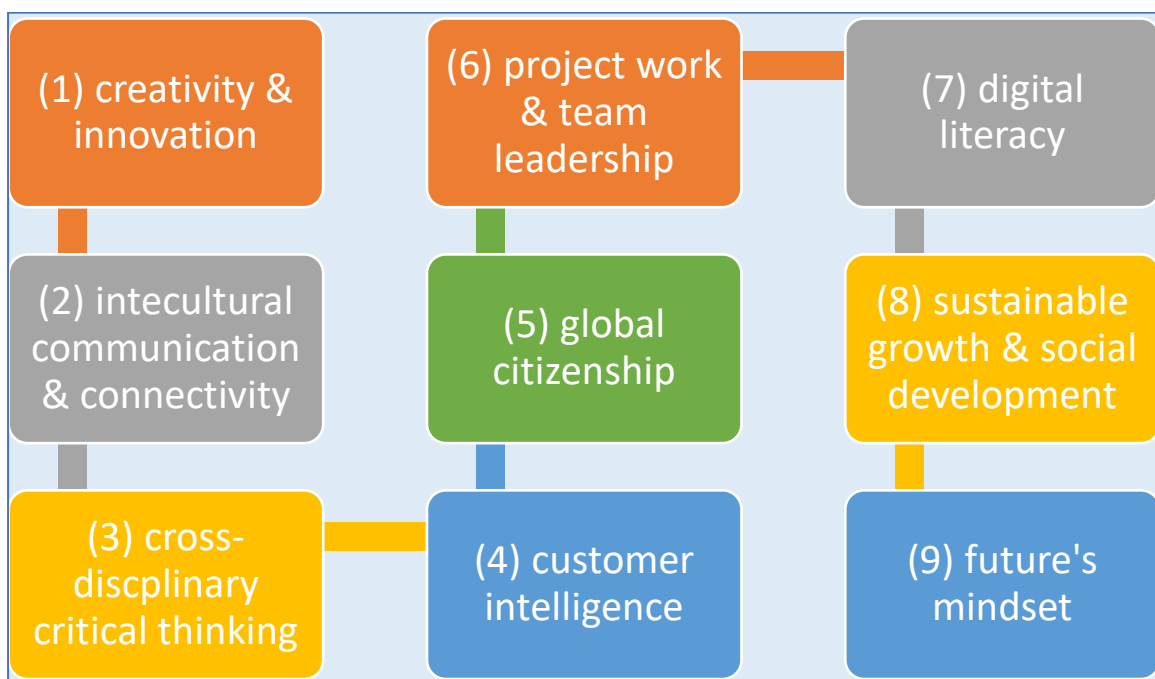


Figure 3. Future's competences – applied to development of future's competences in the automotive and motorsport industries (ecosystems)

We will use the ECTS credit points to describe the study extent. However, it is clear that colleges and schools may use other systems of evaluation and extent of its study curricula. 1 ECTS includes approximately 27 hours of a student's work in English.

Thus, each of the courses or modules (comprising several courses each) at gymnasium, college, university of applied sciences or science university level should include at least two competences from the figure.

- 1-2: "creativity & innovation" + "intercultural communication & connectivity"
- 1-3: "creativity & innovation" + "cross-disciplinary critical thinking"
- 1-4: "creativity & innovation" + "customer intelligence"
- 1-5: "creativity & innovation" + "global citizenship"

- 1-6: “creativity & innovation” + “project work & team leadership”
- 1-7: “creativity & innovation” + “digital literacy”
- 1-8: “creativity & innovation” + “sustainable growth & social development”
- 1-9: “creativity & innovation” + “future’s mindset”
- 2-3: “intercultural communication & connectivity” + “cross-disciplinary critical thinking”
- 2-4: “intercultural communication & connectivity” + “customer intelligence”
- 2-5: “intercultural communication & connectivity” + “global citizenship”
- 2-6: “intercultural communication & connectivity” + “project work & team leadership”
- 2-7: “intercultural communication & connectivity” + “digital literacy”
- 2-8: “intercultural communication & connectivity” + “sustainable growth & social development”
- 2-9: “intercultural communication & connectivity” + “future’s mindset”
- 3-4: “interdisciplinary critical thinking” + “customer intelligence”
- 3-5: “interdisciplinary critical thinking” + “global citizenship”
- 3-6: “interdisciplinary critical thinking” + “project work & team leadership”
- 3-7: “interdisciplinary critical thinking” + “digital literacy”
- 3-8: “interdisciplinary critical thinking” + “sustainable growth & social development”
- 3-9: “interdisciplinary critical thinking” + “future’s mindset”
- 4-5: “customer intelligence” + “global citizenship”
- 4-6: “customer intelligence” + “project work & team leadership”
- 4-7: “customer intelligence” + “digital literacy”
- 4-8: “customer intelligence” + “sustainable growth & social development”
- 4-9: “customer intelligence” + “future’s mindset”
- 5-6: “global citizenship” + “project work & team leadership”
- 5-7: “global citizenship” + “digital literacy”
- 5-8: “global citizenship” + “sustainable growth & social development”
- 5-9: “global citizenship” + “future’s mindset”
- 6-7: “project work & team leadership” + “digital literacy”
- 6-8: “project work & team leadership” + sustainable growth & social development”
- 6-9: “project work & team leadership” + “future’s mindset”
- 7-8: “digital literacy” + “sustainable growth & social development”
- 7-9: “digital literacy” + “future’s mindset”
- 8-9: “sustainable growth & social development” + “future’s mindset”

5. Clusterization – collective mindsets (4 realms) / intersection of future’s competences

In total, there are four clusters that are described further. All aforementioned competences are distributed about these four clusters.

Cross-culture Inter-disciplinary clusters:

- Future-oriented creative mindset
- Culturized interdisciplinary mindset

- Digitalized project mindset
- Sustainable-driven social mindset

Now these newly-created study modules will be describe between the EQF levels according to the Race4Scale visual representation.

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

Each cluster is then grouped and described. Study modules are explained in each cluster. The earlier-described competences are put in brackets according to each study module in the Table 1.

Clusters	Study Modules			
Cluster 1: Future-oriented creative mindset	Innovation competences in the cross-cultural business/social/technological context (1-2, 1-3)	Project management for digital innovations and future growth (based on the competences 1-3, 1-7, 3-6)	Future sustainability and digitalization (based on the competences 1-9, 3-9, 4-8)	Stakeholder management and customer intelligence (based on the competences 1-4, 2-6, 4-8)
Cluster 2: Culturized cross-disciplinary mindset	Cross-border cultures and technology project work (based on the competences 1-6, 2-3)	Interdisciplinarity in technology-based work (based on the competences 1-6, 3-4)	Futures-driven interdisciplinary and digital competences (based on the competences 3-7, 5-6)	Cross-border project management for sustainability and social growth (based on the competences 4-6, 6-8)
Cluster 3: Digitalized project mindset	Global citizenship and digital innovations (based on the competences 2-5, 2-7, 6-7)	Cross-cultural collaboration and customer-driven projects (based on the competences 2-4, 4-7)	Matrix projects and sustainable technology-based/social-based innovations (based on the competences 3-8, 5-8, 8-9)	Development of the future-driven digitalized project mindset (based on the competences 6-9, 7-9)
Cluster 4: Sustainable-driven social mindset	Technology innovations and social development (based on the competences 1-5, 1-8)	Intercultural sustainability and future research (based on the competences 2-8, 2-9)	Intrapreneurship and global citizenship – in/for applied projects (based on the competences 3-5, 4-5, 4-9)	Digital sustainability and future-driven social development (based on the competences 5-7, 5-9, 7-8)

Table 1. A summative view of the study clusters and study modules as the parts of the cross-border curriculum (developed by the author).

5.1 Cluster 1: Future-oriented creative mindset

The interconnected competences in Cluster 1:

- 1-2: “creativity & innovation” + “intercultural communication & connectivity”

- 1-3: “creativity & innovation” + “cross-disciplinary critical thinking”
- 1-4: “creativity & innovation” + “customer intelligence”
- 1-7: “creativity & innovation” + “digital literacy”
- 1-9: “creativity & innovation” + “future’s mindset”
- 2-6: “intercultural communication & connectivity” + “project work & team leadership”
- 3-6: “cross-disciplinary critical thinking” + “project work & team leadership”
- 3-9: “cross-disciplinary critical thinking” + “future’s mindset”
- 4-8: “customer intelligence” + “sustainable growth & social development”

Description of the cluster:

Cluster 1 includes courses focused on digitalization, future growth, innovation competences, project management, stakeholder management, and customer intelligence. The logic behind these courses is students’ immersion in the real business-technological-cultural processes with various strategic aspects. Organizations are analyzed through an ecosystem view with the primary role of stakeholder analyses. Development strategies worked out by the student groups (i.e. learning circles) are future-oriented and customer-driven. Students’ innovation and development skills are raised in the interdisciplinary framework. Digitization, digitalization and digital transformation are balanced with the real of sustainable development goals (SDGs).

Proposed cross-border study modules (5 ECTS each) in the Cluster 1: “Future-oriented creative mindset”

- *Innovation competences in the cross-cultural business/social/technological context (1-2, 1-3)*
- *Project management for digital innovations and future growth (based on the competences 1-3, 1-7, 3-6)*
- *Future sustainability and digitalization (based on the competences 1-9, 3-9, 4-8)*
- *Stakeholder management and customer intelligence (based on the competences 1-4, 2-6, 4-8)*

Innovation competences in the cross-cultural business/social/technological context (5 ECTS):

- ✓ Learning objectives: to raise students’ awareness of the intercultural context in organizational creativity processes; to improve students’ capabilities of decision making in international interdisciplinary innovation tasks; to develop students’ mindset in the intersection of business, social and technological contexts;

- ✓ Content focus: (a) creativity and innovation processes in organizations; (b) cross-cultural business management; (c) social and technological cross-cultural innovations; (d) innovation toolbox and creative problem solving;
- ✓ Implementation modes: 4-hour workshops joined as an innovation camp with practical learning, applied theory classes, guest lectures of industry experts; student-driven “flipped classes”;

Recommended levels of study:

- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

Project management for digital innovations and future growth (5 ECTS):

- ✓ Learning objectives: to develop students’ team collaboration and project-oriented learning on the real business and technological cases with digital innovations; to increase students’ awareness of the futures research methods in the applied project work; to master students’ skills of innovation management in the digital context; to work out feasible future scenarios that foster digital innovations;
- ✓ Content focus: (a) growth-oriented project management; (b) management of digital innovations; (c) futures research methods and growth trends in the business and technological fields;
- ✓ Implementation modes: field trips to project companies focusing on digital innovations; growth hackathons; guest lectures of project managers in the field of digital innovations; student presentation and workshops;

Recommended levels of study:

- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

Future sustainability and digitalization (5 ECTS):

- ✓ Learning objectives: to study principles of sustainable development in the technological context; to analyze Sustainable Development Goals (SDGs) from the digitalization principles; to design digitalization strategies with the focus on sustainable-led innovations;

- ✓ Content focus: (a) sustainable growth and sustainable development; (b) digitization, digitalization, and digital transformation; (c) sustainable-led innovations and digitalization processes;
- ✓ Implementation modes: student group work on designing sustainable-led innovations; expert reviews of SDGs; hybrid teaching and simulations of digitalization processes in the business, cultural, and technological contexts.

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)

Stakeholder management and customer intelligence (5 ECTS):

- ✓ Learning objectives: to develop a stakeholder approach in decision making; to analyze customer and stakeholder relations in the real business setting; to practice an ecosystem view of business, cultural and technological processes; to process customer strategies in organizations; to define various customerships;
- ✓ Content focus: (a) stakeholders and stakeholder management; (b) customerships and customer strategies; (c) stakeholder and customer analyses;
- ✓ Implementation modes: 75% of the project work done with international businesses; 25% demo sessions and expert team meetings with mentors; students act in learning circles (i.e. development teams) as external consultants;

Recommended levels of study:

- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

5.2 Cluster 2: Culturized cross-disciplinary mindset

The interconnected competences in Cluster 2:

- 1-6: “creativity & innovation” + “project work & team leadership”
- 2-3: “intercultural communication & connectivity” + “cross-disciplinary critical thinking”
- 3-4: “interdisciplinary critical thinking” + “customer intelligence”
- 3-7: “interdisciplinary critical thinking” + “digital literacy”
- 4-6: “customer intelligence” + “project work & team leadership”

- 5-6: “global citizenship” + “project work & team leadership”
- 6-8: “project work & team leadership” + sustainable growth & social development”

Description of the cluster:

Cluster 2 includes course focused on the international, cross-cultural and cross-disciplinary competences developed in/through project work. Aspects of sustainability, future-oriented digital competences and social growth are given prior attention.

Proposed cross-border study modules (5 ECTS each) in the Cluster 2: “Culturized cross-disciplinary mindset:

- *Cross-border cultures and technology project work (based on the competences 1-6, 2-3)*
- *Interdisciplinarity in technology-based work (based on the competences 1-6, 3-4)*
- *Futures-driven interdisciplinary and digital competences (based on the competences 3-7, 5-6)*
- *Cross-border project management for sustainability and social growth (based on the competences 4-6, 6-8)*

Cross-border cultures and technology project work (5 ECTS):

- ✓ Learning objectives: to increase knowledge in the technology-driven intercultural project; to train intercultural soft skills; to analyze technology projects from the international cross-cultural perspective; to develop intercultural strategic thinking and to work out strategies of intercultural project work
- ✓ Content focus: (a) management of technology-driven projects; (b) intercultural competences; (c) strategies of intercultural project work
- ✓ Implementation modes: 100% project-based evaluation; students in small groups facilitate intercultural analysis in an external technology-driven project; guest workshops of intercultural experts; collaboration with technology experts;

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)

Interdisciplinarity in technology-based work (5 ECTS):

- ✓ Learning objectives: to study basics of interdisciplinary project work in technology-oriented project environment; to develop a holistic view of interdisciplinarity in the international cross-border setting; to train interdisciplinary skills in a number of technology-oriented project tasks
- ✓ Content focus: (a) interdisciplinarity and project work; (b) cross-border projects and interdisciplinary tasks; (c) interdisciplinary creative approaches in learning and work tasks
- ✓ Implementation modes: a number of interdisciplinary projects given to each student team; guest experts of international matrix-type organizations with the interdisciplinary project portfolio; the module is 100% project-based

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

Futures-driven interdisciplinary and digital competences (5 ECTS):

- ✓ Learning objectives: to develop future thinking in the interdisciplinary project work; to increase digital competences of learners in futures-oriented project; to broaden learners’ futures mindset while solving work-related digital tasks
- ✓ Content focus: (a) futures research and futures competences; (b) digitalization and digital competences; (c) interdisciplinary digital projects and futures mindset
- ✓ Implementation modes: 100% project(s) given by the commissioning companies; students make the futures development scenarios for the given project tasks; digital ICT experts co-teach certain digital-based parts of the course;

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)

Cross-border project management for sustainability and social growth (5 ECTS):

- ✓ Learning objectives: to raise competences in sustainable-led and social-led cross-border projects; to develop cross-border mindset for sustainability and social-led innovations; to work out sustainability scenarios for cross-border projects; to strengthen business modelling skills of learners in the field of sustainability and social growth
- ✓ Content focus: (a) cross-border project competences; (b) sustainability and sustainable-led innovations; (c) social growth and social-driven projects; (d) business model developing in the frames of sustainability and social growth
- ✓ Implementation modes: 100% project(s) given by the commissioning companies; guest lectures and student-led conferences (flipped classroom) on the topics of sustainability and social growth; social-impact cross-border workshops with the invitation of foreign industry and social organizations' representatives.

Recommended levels of study:

- ✓ EQF Level 6: "Bachelor's applied – Bachelor's theory" (context: business-social)
- ✓ EQF Level 6: "Bachelor's applied – Bachelor's theory" (context: technology)
- ✓ EQF Level 7: "Master's applied – Master's theory" (context triangulation: business-social-technology)

5.3 Cluster 3: Digitalized project mindset

The interconnected competences in Cluster 3:

- 2-4: "intercultural communication & connectivity" + "customer intelligence"
- 2-5: "intercultural communication & connectivity" + "global citizenship"
- 2-7: "intercultural communication & connectivity" + "digital literacy"
- 3-8: "cross-disciplinary critical thinking" + "sustainable growth & social development"
- 4-7: "customer intelligence" + "digital literacy"
- 5-8: "global citizenship" + "sustainable growth & social development"
- 6-7: "project work & team leadership" + "digital literacy"
- 6-9: "project work & team leadership" + "future's mindset"
- 7-9: "digital literacy" + "future's mindset"
- 8-9: "sustainable growth & social development" + "future's mindset"

Description of the cluster:

Cluster 3 focuses on development of intercultural cross-border project mindset in the global sustainable context. Aspects of global citizenship and variety of innovation contexts (i.e., including technology-based and social-based innovations) are trained in the cluster modules. Future orientation is strongly seen in the project tasks of the modules.

Proposed cross-border study modules (5-15 ECTS each) in the Cluster 3:
 “Digitalized project mindset”

- *Global citizenship and digital innovations (based on the competences 2-5, 2-7, 6-7)*
- *Cross-cultural collaboration and customer-driven projects (based on the competences 2-4, 4-7)*
- *Matrix projects and sustainable technology-based/social-based innovations (based on the competences 3-8, 5-8, 8-9)*
- *Development of the future-driven digitalized project mindset (based on the competences 6-9, 7-9)*

Global citizenship and digital innovations (5 ECTS):

- ✓ Learning objectives: to nurture a global citizenship perspective among learners; to train applications of digital innovations in the global citizenship setting; to analyze future-oriented digital innovations; to develop future scenarios of global citizenship
- ✓ Content focus: (a) concept of global citizenship; (b) future scenarios of global citizenship; (c) digital innovation in the global citizenship context;
- ✓ Implementation modes: intermix of applied teaching with workshops in the public sector (urban context); simulations of global development scenarios;

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)

Cross-cultural collaboration and customer-driven projects (5 ECTS):

- ✓ Learning objectives: to develop customer-driven learning in the study and work projects based on cross-cultural projects; to raise cross-cultural awareness of learners in work-related projects; to learn how to collect and to apply customer-related data in academic and business cross-cultural projects;
- ✓ Content focus: (a) cross-cultural collaboration; (b) customer orientation in business and academic project work; (c) development and management of customer-driven projects
- ✓ Implementation modes: at least 1 business and 1 academic cross-cultural project; 100% project-oriented learning and assessment; individual and group project indicators;

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

Matrix projects and sustainable technology-based/social-based innovations (5 ECTS):

- ✓ Learning objectives: to study matrix projects; to raise awareness of technology based innovations; to train social-based innovation thinking; to develop sustainable approach in solving interdisciplinary technology- and social-based innovation projects;
- ✓ Content focus: (a) matrix project collaboration; (b) technology and social orientation in interdisciplinary project work; (c) development and management of matrix projects
- ✓ Implementation modes: 100% project-oriented learning and assessment; individual and group project indicators; industry visits

Recommended levels of study:

- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

Development of the future-driven digitalized project mindset (5 ECTS):

- ✓ Learning objectives: to train planning and management of digitalized interdisciplinary projects; to raise awareness of future-driven innovations as a part of the project work; to train models and tecnics of ; to solve RDI tasks in interdisciplinary future-driven digitalized innovation projects;
- ✓ Content focus: (a) future-driven project collaboration; (b) digitalized project work; (c) development and management of future-driven digitalized projects
- ✓ Implementation modes: 100% project-oriented learning and assessment; individual and group project indicators; industry visits

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)

5.4 Cluster 4: Sustainable-driven social mindset

The interconnected competences in Cluster 4:

- 1-5: “creativity & innovation” + “global citizenship”
- 1-8: “creativity & innovation” + “sustainable growth & social development”
- 2-8: “intercultural communication & connectivity” + “sustainable growth & social development”
- 2-9: “intercultural communication & connectivity” + “future’s mindset”
- 3-5: “cross-disciplinary critical thinking” + “global citizenship”
- 4-5: “customer intelligence” + “global citizenship”
- 4-9: “customer intelligence” + “future’s mindset”
- 5-7: “global citizenship” + “digital literacy”
- 5-9: “global citizenship” + “future’s mindset”
- 7-8: “digital literacy” + “sustainable growth & social development”

Description of the cluster:

Cluster 4 is primarily focused on the social and sustainable future mindset, with its digitalization-driven and intercultural contexts. Technology innovation are counter-balanced with the objectives of social development. Project mindset is explained through intrapreneurship (i.e. corporate entrepreneurship) and global citizenship.

Proposed cross-border study modules (5-15 ECTS each) in the Cluster 4: “Sustainable-driven social mindset”:

- *Technology innovations and social development (based on the competences 1-5, 1-8)*
- *Intercultural sustainability and future research (based on the competences 2-8, 2-9)*
- *Intrapreneurship and global citizenship – in/for applied projects (based on the competences 3-5, 4-5, 4-9)*
- *Digital sustainability and future-driven social development (based on the competences 5-7, 5-9, 7-8)*

Technology innovations and social development (5 ECTS):

- ✓ Learning objectives: to build technological competences of students in the innovation tasks; to develop social skills of technology students in project work; to learn how to frame technology innovations in the social and other related contexts; to raise social mindset of students through creative project work;

- ✓ Content focus: (a) real of technology innovations; (b) priorities of social development in EU and global context; (c) cross-border technology-driven projects; (d) socio-technological project work
- ✓ Implementation models: company visits, 2 group study projects; individual tasks

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

Intercultural sustainability and future research (5 ECTS):

- ✓ Learning objectives: to develop students’ capability of conducting intercultural applied research projects; to train students’ intercultural skills with the focus on sustainable applications; to analyze various futures research methods and models in the intercultural work;
- ✓ Content focus: (a) sustainability in international and intercultural contexts; (b) applied practices of future research; (c) sustainable projects and future development; (d) scenario building in the cross-cultural setting;
- ✓ Implementation models: 360-degrees learning phenomena – study & business projects; reversed classroom – learning model; industry experts as part-time lecturers;

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)
- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)

Intrapreneurship and global citizenship – in/for applied projects (5 ECTS):

- ✓ Learning objectives: to develop students’ entrepreneurial and intrapreneurial skills; to apply the concept of global citizenship into the applied work setting; to practice strategy building for intrapreneurship-driven projects;
- ✓ Content focus: (a) entrepreneurship, intrapreneurship, and serial entrepreneurship; (b) project management and intrapreneurship skills;
- ✓ Implementation models: strategy club with serial entrepreneurs, intrapreneurs and project managers; multidisciplinary idea hacking with the focus on global citizenship;

Recommended levels of study:

- ✓ EQF Level 4: “High school – College” (interaction: “young – young”)

- ✓ EQF Level 4: “High school – College” (interaction: “young – continuous”)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)

Digital sustainability and future-driven social development (5 ECTS):

- ✓ Learning objectives: to analyse digital sustainability models; to foster social RDI projects and project applications; to train future research in the field of sustainability; to build forecasts of social development;
- ✓ Content focus: (a) simulations of social development; (b) digital sustainability in education, business, technology, and research work; (c) forecasting in social RDI setting;
- ✓ Implementation models: industry visits; simulations; RDI projects; individual and group scenario development;

Recommended levels of study:

- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: business-social)
- ✓ EQF Level 6: “Bachelor’s applied – Bachelor’s theory” (context: technology)
- ✓ EQF Level 7: “Master’s applied – Master’s theory” (context triangulation: business-social-technology)

6. Conclusion

The automotive and motorsport industry is undergoing significant and prompt changes, which causes inevitable challenges to multiple layers of training and educational organizations. Future-oriented education is vastly searched, especially taking growing needs of adult learners that would like to change their first profession and meet needs of the future industry needs. The ecosystem view on education needs and interconnectedness of multiple study elements with future competences were reflected in this study.

The current report described the cross-border multidisciplinary curriculum in the automotive and motorsport industry. Various levels of education in the classic research-wise and applied contexts were taken into consideration. The four clusters of study modules are fully based on the contextualized educational competences that reflect future needs in education, socio-economic, technologic, and cultural development. Each study module is described through its learning objectives, content focus, and implementation models. Suggested levels of education for each study module indicate the appropriate timing and structure for conducting respective modules.

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