EUt+

European University of Technology

Deliverable 31

D3.2.2a.b Evolution of Master curricula within the past year (Harmonized and then decentralized)

Del. Rel. 3.4

WP 3

Description: Evolution of Master curricula within the past year (Harmonized and then decentralized)

Comment: The present deliverable is public, but annexes are to be considered confidential

Dissemination level: **PU**-Public (main) / **CO**-Confidential (annexes)

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This initiative has received funding from the European Union's Erasmus+ programme under grant agreement 101004088 — EUt — EPP-EUR-UNIV-2020.

Foreword to deliverable 31

The aim of this deliverable 31/3.2.2ab is to show and analyse the evolution of Master curricula within the past years. The present report focuses on the activities developed in the first year of the EUt+ in Task 3.1, 'Building European vocational bachelor's degrees' and Task 3.2, 'Integrating existing Master degrees' with a focus put on the evolution of Master curricula.

In order not to multiply convergency processes and insofar as the evolution of Bachelor and Master in EUt+ is intricately linked, it has been chosen to treat the evolution of both in parallel. Thus, elements presented in this deliverable are repeated for coherence purposes from D29 Conversion analysis as they allow for an illustration of the global conversion process and parallel evolution of both Bachelor and Master. The choice not to duplicate the convergency processes but to trat them in parallel has shown increased efficiency as highlighted in the present deliverable.

Table of contents

Glossary

Cluster – A *cluster* is a group of curricula, in a given thematic, from at least three partner institutions which aims at an accelerated convergence to achieve, as soon as possible, a *European degree* with a single academic regulation, where the student can move freely across several EUt+ campuses. The *cluster* works towards a common pedagogical model based on the description given in the *European Degree in Engineering EUt+ reference guide*.

Competence - The proven ability to use knowledge, personal, social and methodological skills in a work or study environment and also for professional and personal development. In the context of the European Qualification Framework (EQF) competence is described in terms of responsibility and autonomy. (European Council, 2017)

Learning Outcomes - "At the end of [an educational activity to be specified], the student will be able to [production to be specified]". *European Degree in Engineering EUt+ reference guide.*

Basic Learning Outcomes – outcomes of a course unit.

Final Learning Outcomes – outcomes at the end of the degree.

Mobility Map - The Mobility Map is the list of the modules that each partner institution is offering to incoming students. The modules are described in basic learning outcomes. The Mobility Map details the pedagogical and technical information needed for the choice and the organization of students' study tracks. Each "home institution" chooses the modules that its students can choose among the modules offered by the welcoming institution.

Introduction

The present report focuses on the activities developed in the first year of the EUt+ in Task *3.1, 'Building European vocational bachelor's degrees'* and Task 3.2, '*Integrating existing Master degrees'*.

The activities of Tasks 3.1 and 3.2 followed the plan outlined in Deliverables 3.1.1/3.2.1.

This plan, which was refined during the first cluster wavenization process, describes the necessary steps to develop the framework for the implementation of the EUt+ Multi-campus university model and the foundation for a European Degree of Engineering comprising levels from Bachelor to Master. This process puts forward an approach that changes the focus from current *curricula* to competencies-based curricula, facilitating in this way the development of a common Competency Framework for the EUt+ Bachelor and Master programmes. It allowed for the definition of a set of Final Learning Outcomes for each programme in the first cluster wave for Bachelor and Master and for the development of the 'Mobility Maps', the lists of the curricula (modules) that each partner institution is offering by semester to incoming students.

1 Curricula conversion process

Tasks 3.1 and 3.2 started the work on converging the *curricula* in February 2021 by defining the framework and plan of activities needed to fulfill the tasks' objectives. Due to the COVID pandemic, all meetings were organized online. The EUt+ workshop of the eight partners, held 30th - 31st March 2021 was key to elaborating a common strategy for implementation. During the event around 45 participants worked together on two topics: *a)* defining ("dream") an ideal EUt+ degree structure and *b)* problems and difficulties that could be encountered while trying to achieve the ideal version of the project and potential solutions. The content and analysis of the workshop is attached to this report as Annex 1. The obtained results were integrated in the harmonization plan for the Bachelor and Master programmes that were defined in the Deliverables 3.1.1 and 3.2.2 which were submitted in May 2021:

- Deliverable 3.1.1 Vocational Curricula – contains the common plan for the harmonizing of the bachelor curricula from partner universities
- Deliverable 3.2.1 Master Degree – contains the plans towards the integration of master degrees that focused on short and long terms activities.

1.1 Validation of the strategy for convergence

The 'MoA for the Creation of EUt+ Bachelor in Engineering and Master in Engineering programmes, by evolution and convergence of existing partner programmes signed by the eight partners on 24th September 2021 in Limassol is an essential step in validation of the strategy for convergence. It sets out the trajectory to harmonization of the Bachelor and Master programmes and, as an annex, provides the 'Competency Framework for the European University of Technology Bachelor in Engineering and Masters in Engineering'.

The MoA describes the EUt+ engineering programmes common objectives and emphasises the ruling principles for such a programmes. It establishes the common understanding of a degree as a learning environment (supportive, challenging and visionary where the

student follows a supervised process to validate a (minimal) path of discovery, thematic and geographic. EUt+ Bachelor in Engineering and EUt+ Master in Engineering degrees share common competencies frameworks and a set of Final Learning Outcomes (FLO)that are defined for each programme. For each Bachelor and Master programme, the FLO are specific and are defined during the conversion process.

The convergence trajectory implemented by the partners is designed to lead progressively towards a unique European degree and accreditation at the European level. To reach this goal, clusters of pre-existing national *curricula*, where partners from different EUt+ campuses (at least three EUt+ partner institutions) work together in defining and implementing the convergence path, will be created. At Master level, innovative new programmes developed jointly by the partners will also be offered. These new programmes will follow the 12 featuresof the European Degree as closely as possible.

1.2 Development of the common Competency Framework and LearningOutcomes

The foundation stone of the conversion process is the common **Competency Framework** that was defined for all the European University of Technology Bachelor and Master in Engineering programmes. The concept, developed during the March 2021 EUt+ Workshop, switches the focus from current *curricula* to competencies-based *curricula*. The list of mandatory competencies shared by the different partners the EUt+ embeds a set of shared competencies that students should/could acquire during their academic path, at whichever EUt+ campus they choose to study.

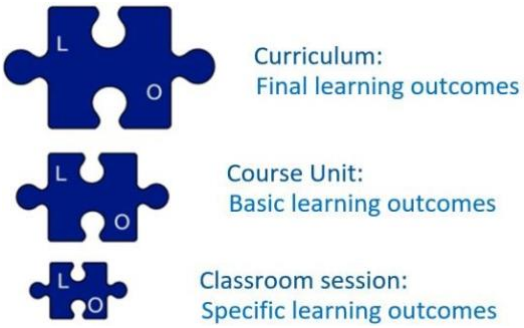
As well as the common competency framework, for each selected Bachelor or Master programme, a set of **Learning Outcomes** (LOs) is established. These are specific to the programme and are developed as part of the cluster activity. The LOs are defined by academic experts and persons responsible for the specialisation from all involved partner universities taking into account the EUt+ ideals and the specific constraints related to those specialisations/programmes.

The definition for the pedagogical competency and the learning outcome that are used inEUt+, aligned with the scientific literature in the field of pedagogy and EU initiatives, are as follows (extract from: Annex 3 – *European Degrees in Engineering EUt+ Reference Guide V.1*):

- **(Pedagogical) competences:** "know how to act and manage complex situations" JacquesTardif's definition based on the work of Noam Chomsky: it provides a corpus of competencies that is very stable over time, that describes particularly well the "character traits" of a student trained in a given institution or programme, and that is robust to changes in professions and disciplines. It best formalises the "digital footprint of a school" beyond the affective "alma mater", while providing a clear pedagogical framework for effective and persistent learning. In this sense, the corpus of pedagogical competences constitutes the fixed point of the "learning contract" between the school/university and the student.
- Example of a pedagogical competence (extracted from the EUt+ Master Pedagogical Competences): "Piloting a process or system reliably and efficiently; deciding, planning and organizing with a holistic vision; anticipatingand preventing direct or indirect local impacts of a system on its territory, whilebeing aware of the global challenges."

+ **Learning outcomes:** "At the end of [an educational activity to be specified], the student will be able to [production to be specified]". [a pedagogical activity to be determined] = any pedagogical activity which can be a 2-hours lecture, a full semester, a project or a period in a company... [Output to be determined] = any ability that the student will haveacquired as long as it is precisely defined,
  - Example of Learning outcomes: "expressing the gradient in the three usual coordinate systems", "describing with suitable mathematical tools the hydrodynamic speed field", or "having the C1 level in German".

Furthermore, for practical reasons, adistinction is made between:



Final Learning **O**utcomes

Basic Learning **O**utcomes

Specific Learning **O**utcomes

In the context of the European degrees of the EUt+, the target programmes are definedin terms of *Final Learning Outcomes*. They are the precise description of the learning outcomes the student should have gained at the end of the degree and are specific to the specialisation.The descriptions of the modules (or the smallest exchangeable unit) are made by *basic learning outcomes*. Generally, one basic learning outcome per ECTS (or a little less) is listed. This is the basis for discussions between academics in the clusters.

For each programme, the target number of Final Learning Outcomes (FLOs) is 15 to 20for a Bachelor in Engineering and 25 (or slightly more) for a Master in Engineering (in which case the Master learning outcomes will include, explicitly or not, the Bachelor LOs).

The EUt+ Competence Framework for Bachelor in Engineering [Annex 4] graduates is presented in Table 1.

Table 1 EUt+ Competence Framework for Bachelor in Engineering

Identifying, analysing, formulating and solving technical or sociotechnical problems by relying on basic science, technical knowledge, practical skills, with critical awareness of the wider multidisciplinary context of engineering.

Proposing the design and the implementation of sustainable and reliable technical solutions; adapting original and resilient systems, integrating all technical constraints; managing a process or a system with rigor and know-how. Considering the local impact of a system, while being aware of global challenges. Knowing how to be accompanied when necessary for the integration of societal, human, environmental, normative and economic constraints over the entire life cycle.
Organizing a technical team or a small structure in an international and multilingual context. Receiving and transmitting information with the various trades required to carry out the tasks. Interacting with a large variety of profiles, supporting the integrity of the work and empowering social and ethical responsibilities, such as integrity, diversity, and inclusion.
Applying a quality and/or validation process at any level; verifying information; reporting reliably and clearly, contributing to a continuous improvement process, estimating performance and margins for improvement and progress.
Working in changing environments or under new constraints, assessing and completing training and self-training needs; self-training in one's field and related fields, integrating new practices after training.

The EUt+ Competence Framework for Master in Engineering [Annex 5] graduates is presented in Table 2.

Table 2 EUt+ Competence Framework for Master in Engineering

Identifying, analysing, formulating and solving complex technical or sociotechnical problems even in a new situation by relying on advanced science, in-depth knowledge and solid practical skills, with critical awareness of the wider multidisciplinary contextof engineering.
Conceptualising and designing original, resilient, sustainable, and reliable solutions orsystems, integrating all technical, societal, human, environmental, normative and economic constraints over the entire life cycle.
Effectively functioning in a team as a member and managing a team in an international, transdisciplinary, and multilingual context, empowering social and ethical responsibilities, such as integrity, diversity, and inclusion.
Piloting a process or system reliably and efficiently; deciding, planning and organizingwith a holistic vision; anticipating and preventing direct or indirect local impacts of a system on its territory, while being aware of the global challenges.
Evaluating performance, margins for improvement and progress. Implementing the most appropriate and relevant methods for quality control, validation and advancement.
Exchanging, receiving, and transmitting information and ideas to different levels of qualifications as well as to the civil society; assessing information and making judgements; evaluating and completing training; committed to lifelong learning.
Leading or supporting innovation processes from the implementation of the proposals, based on the state of the art to the mobilisation of skills, tools and

1.3 Development of the Mobility Maps

Development of the Mobility Maps is a key activity and output of the clusters. The Mobility Maps offer the *curricula* for mobility, pre agreed with their assigned ECTS, thus allowing the students to acquire their FLOs in whatever EUt+ campus they choose to study.

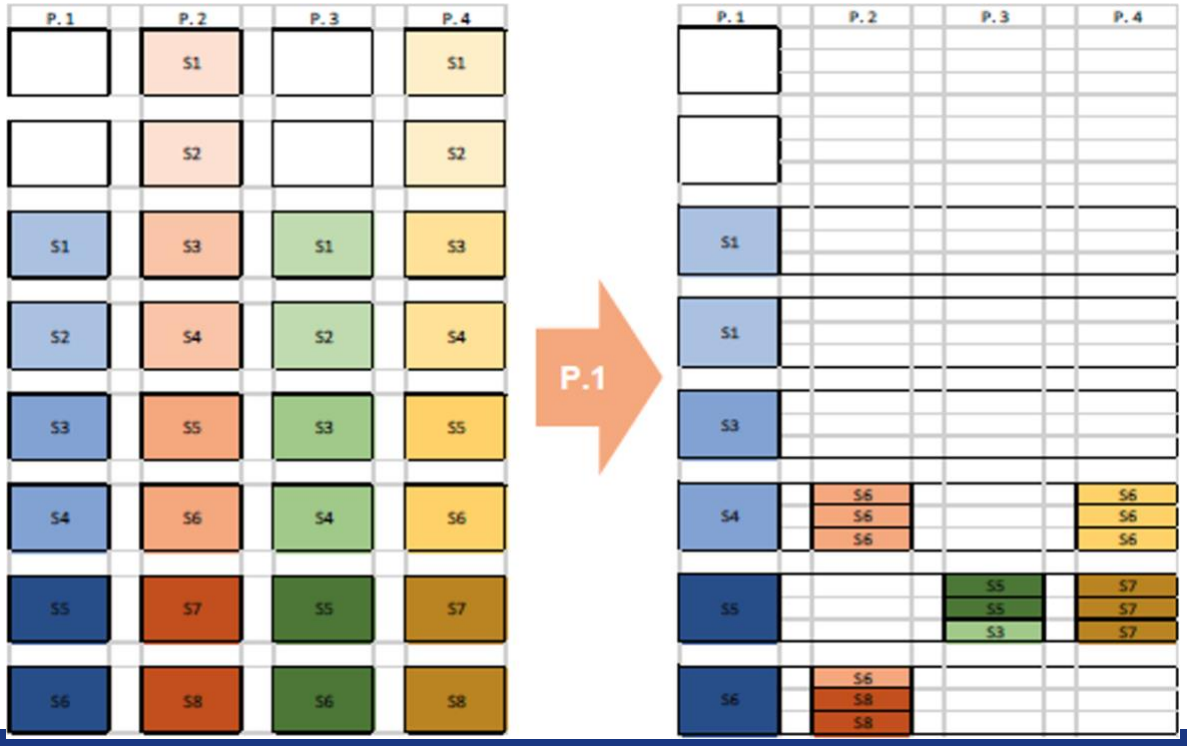
An example for a student mobility at Bachelor level is presented below; a student from Partner 1 (P.1) may choose to take a semester at an EUt+ partner campus in semester 4 (S4) at Partner 2 (P.2) and Partner 4 (P.4), in semester 5 (S5) at Partner 3 (P.3) and Partner 4 (P.4) and in semester 6 (S6) in Partner 2 campus (P.2)

Formation of the Education Committee

In the past year the **EUt+ Education Committee** has pronounced on the formation of new clusters and provided advice to the Rectors' Board.

Formed in July 2022, the committee of representatives from all partners, primarily vice-rectors and directors of education and training, (Annex 2 - MoA – creation of Educational

Figure 1 Student mobility example



Committee) aims to ensure that the directions taken by the partners related to education and training are consistent with the EUt+ initiative and European systems and to agree on the trajectory towards convergence of the piloting of their structures. It collaborates closely with WP3.

In the development of the Mobility Maps, the matching process takes into account the associated LOs for each course in the cluster specialisation in the sending and receiving institution. For this process, the cluster members create a LO Matrix in which the specialization learning outcomes are associated with all courses in the *curricula* for each partner. These documents are further used to identify the courses with very similar LOs in partner universities, thus assuring mutual recognition. This process offers allows students to experience new content and specialised courses specific to the EUt+ partner and at the sametime achieve the same LOs despite the course content not being entirely identical.

In creating the mobility maps all partners focus on defining solutions for mobilities for at least one semester in autumn and one semester in spring. Besides the regular specialisation/programme courses, dedicated courses in the national language and culture ofthe receiving country are included in the mobility maps. The list of these courses was provided by WP2–Task 2.1.

The Mobility Maps are first evaluated at faculty level and then agreed between partner universities. The final documents are shared with WP2, WP5 and WP7 in relation to their taskobjectives (ex.: create promotion materials for student mobility, promotion events, etc.).

2 Bachelor conversion implementation in 2021

The programme harmonisation was implemented based on the common plan defined in Deliverable 3.1.1. The Clusters in the first wave were guided through the process by the WP3coordinators, 3.1 task manager and liaisons.

In the first EUt+ implementation year, three clusters were selected. The selection process was performed according to the description given in deliverable 3.1.1 and took place during April and May 2021. The selected specializations were presented and approved by theSteering Committee. In the first wave the selected specializations were:

- Mechanical Engineering
- Telecommunication and Networks Engineering
- Civil Engineering.

In the **Mechanical Engineering Cluster**, representatives from all participant partners joined the programme. The cluster coordinator is Joaquín F. Roca from UPCT. H-Da initially joined the cluster as observer, then fully integrated in the activity of the cluster. TUDublin started as a highly active partner but was unable to dedicate the necessary resources due to the demands of their institutional restructuration.

The specialisations names and responsible persons or 'programme coordinators' involvedin each cluster activity are presented in the following table:

Table 3 Cluster of Mechanical Engineering

Cluster of Mechanical Engineering	
Partner University	**Specialisation/Programme**
University of Technology of Troyes[UTT]	Mechanical Engineering
Darmstadt University of Applied Sciences [h_da]	Mechanical Engineering
Riga Technical University [RTU]	Engineering Technology, Mechanics and Mechanical Engineering
Technological University Dublin[TUDublin]	Mechanical Engineering

Technical University of Sofia [TUSofia]	Mechanical Engineering
Cyprus University of Technology [CUT]	Mechanical Engineering
Cyprus University of Technology [CUT]	Mechanical Engineering
Cyprus University of Technology [CUT]	Mechanical Engineering

The **Telecommunication and Networks Cluster** was joined by seven of the EUt+ partners. The specialisations names and programme coordinators involved in the cluster activities are presented in the following table:

Table 4 Cluster of Telecommunication and Networks

Cluster of Telecommunication and Networks Engineering	
Partner University	**Specialisation/Programme**
University of Technology of Troyes[UTT]	Networks and Telecommunication
Riga Technical University [RTU]	Telecommunication
Technological University Dublin [TUDublin]	Telecommunication
Technical University of Sofia [TUSofia]	Telecommunication
Cyprus University of Technology [CUT]	Electrical Engineering

Technical University of Cartagena [UPCT]	Telecommunication Systems Engineering
Technical University of Cluj-Napoca [TUCN]	Telecommunication Technologies and Systems

The **Civil Engineering Cluster**, included five of the EUt+ partners as not all partners offer this engineering specialization. The cluster coordinator is Camelia Negrutiu from TUCN. The cluster started with 4 partners (TUDublin, CUT, UPCT and TUCN) and was enlarged to 5 partners, h_da joining the cluster at a later date.

Table 5 Cluster of Civil Engineering

Cluster of Civil Engineering	
Partner University	**Specialisation/Programme**
Darmstadt University of Applied Sciences [HDa]	Civil Engineering
Technological University Dublin [TU Dublin]	Civil Engineering
Cyprus University of Technology [CUT]	Civil Engineering
Technical University of Cartagena [UPCT]	Civil Engineering
Technical University of Cluj-Napoca [TUCN]	Civil Engineering

The activity in the first wave of clusters started with on-line monthly meetings in June, July and September 2021. From autumn of 2021 face to face became possible and a series of physical, on-line or hybrid or meetings were organised. During Autumn and Winter of 2021, tasks 3.1 and 3.2 representatives took part in four EUt+ physical meetings:

- **EUt+ Limassol Meeting – 20th – 24th September 2021**: Task 3.1 focused on defining thegeneral competency framework for an EUt+ Bachelor and Master programme. During the meeting a Memorandum of Agreement [Annex 2] that refers to the competency framework was signed by the rectors of all eight partners.
- **EUt+ Darmstadt I Meeting – 10th – 15th October 2021**: Task 3.1/3.2 focused on defining the LOs for the cluster programmes/specialisations.
- **EUt+ Darmstadt II Meeting – 2nd – 5th November 2021**: Task 3.1/3.2 focused on creating the *Curricula* Matrix in each partner university and defining the first draft for the Mobility Maps.
- **Sofia Meeting- 7th – 9th December 2021**: Task 3.1/3.2 focused on obtaining the final version of the Mobility Maps and selecting the second cluster wave specialisations/programmes.

During this process, each cluster defined a set of: competence derived general learning outcomes, basic learning outcomes and common technology knowledge learning outcomes

Around 30 to 38 such LOs were established by each cluster. Beside these three categories eachcluster defined specific domain and specialisation LOs. The documents listing the LOs can be found in Annex 6. These LOs are further refined (during the second year of implementation) in order to achieve the desired number of 15 to 20 final LOs for a specialisation/programme.

The Final LOs for each programme were then associated with the courses in the *curricula* of each partner and the LO Matrix [Annex 7] were produced. During the second EUt+ meetingin Darmstadt, the clusters finalised and verified these FLOs for each of the partners ensuring a common understanding in learning outcomes for each course.

The Mobility Maps for the first cluster wave were developed during Nov. 21 – Feb. 22. The target for the partners in each cluster was to identify at least two semesters (autumn and spring) at the other partner universities that would enable student mobility. An example of such Mobility Map for TUCN (sending institution) and RTU (receiving institution) (Cluster

of Mechanical Engineering) is presented in figure 2. Similar maps were developed by the other partners in the cluster.

At the physical meeting in Cartagena, 1 – 4th February 2022, the clusters continued towork on refining the Mobility Maps for bachelor programmes. The addition of national language and culture courses aligned the *curricula* for mobility with the multilingual and multi-cultural objectives of EUt+. A framework was agreed for effective promotion of the mobility maps to students in collaboration with Task 5.1. As example, the mobility maps achieved by the Mechanical Engineering and Civil Engineering clusters are presented in annexes.

The activity in the clusters continues with addition of new mobility semesters and of participating partners. In the long term, the ambition of task 3.1 and 3.2 is to fulfil the conditions to pass to a single European Degree respecting the 12 Characteristics of a EuropeanDegree defined in European Degrees in Engineering EUt+ Reference Guide.

3 Master conversion implementation in 2021

Deliverable D30- D3.2.1, Task 3.2 which outlined the 'Common plan for the merging, harmonisation, decentralisation and concentration of Master *curricula*' referred to elements in common with the Bachelor plan. In the same way, the implementation plans are consistent for Bachelor and Master. Cluster participants were initiated in the development and use of the conversion implementation method with the harmonisation of Bachelor programmes. The Master clusters benefited from this experience and also from the simplification of a shorter study period (Typically 3-4 semesters over 18-24 months instead of 36 months for Bachelor).

The first wave cluster specialisations for Bachelor and Master were selected using the same process as outlined above in Task 3.1. They are:

- Mechanical Engineering

- Telecommunications and Networks
- Civil Engineering.

As teachers at the partner universities work on both Bachelor and Master programmes, theprogramme coordinators in the clusters also were the same.

The key stages of evolution of the task are:

Stage 1

Definition of the basic, general and specialised learning outcomes.

Definition of final learning outcomes – which describe concretely what the studentscan do at the end of their Master degree.

Stage 2

Curricula matrix – Mapping of participating partners' Masters courses in each specialisation/programme (description, the associated number of European credits, teaching language) [Annex 13].

Addition of language and culture courses with ECTS - Information provided by WP2, aimed to support students' intercampus mobility and to conform with the EUt+ goal of multilingualism.

Stage 3

Creation of the Mobility Maps (by semester, sending and receiving campus). These EUt+ Master's *curricula* in Mechanical Engineering and Telecommunications and Networks were made available to Masters' students across the EUt+ partners in February -March 2022 for intercampus mobilities from the beginning of the first semester in the academic year 2022.

The Master is the continuity of the student's learning pyramid, often a deepening of previous education through advanced specialized knowledge. Whilst, in the beginning of

the process, Master in Engineering clusters began to work in the same way as the Bachelor, by harmonizing the existing programmes of each partner, some differences emerged.

For instance, students at UTT are required to complete a 'projet de fin d'études' ('end of studies project' and to undertake an internship with a company, as is typical in France, but this is not the case for all the EUt+ partners. Work in Civil Engineering is not the same in every European country. Historically, the development of specialised courses has been influenced by the focus of the region where the institutions are located.

Therefore, the convergence of programmes at Master level proved to be more difficult as a result of the highly specialised content and also of incompatibilities in accreditation regulations in each partner's country. The two clusters, Mechanical Engineering and Telecommunications and Networks were able to achieve this, but the complexities propelled the Civil Engineering cluster towards creating a new joint European Master, which has been included in the 2nd wave of clusters.

4 Plan for the next implementation period

4.1 Implementation of the second wave clusters

The selection process for the second wave of Clusters started in November 2021. Its aim, to decide on the Bachelor and Master specialisations (programmes) that would be implemented for the next academic year 2022 - 2023.

A list based on the matrix of potential candidates used to identify the programmes for the first wave was circulated through the university representatives. Partners were invited to add other specialisations and to indicate clearly their university's interest in those listed.

A short description was requested from programme heads for consultation by and to enable the other EUt+ partners to better position themselves. Contact persons at each university were included.

Subsequently, a second wave 'short list' was made based on at least three EUt+ partner institutions wishing to participate, one of which proposing to lead the new cluster. This list was discussed at the Steering committee before being presented to the Rectors for final selection. It can be noted that specialisations such as Electrical Engineering and Electrical Systems were considered too vast and were put aside for further definition between the partners and potential inclusion in a third wave.

Final selection of the second wave of clusters was agreed in the MoA signed by the Rectors in Cartagena, 4th February 2022, Appendix to the MoA for the 'Creation of EUt+ Bachelor in Engineering and Master in Engineering Programmes, by Evolution and Convergence of Existing Partner Programmes'.

For **Bachelor programmes** the following clusters were created in the **second wave**:

Table 6 Cluster of Industrial Engineering – Bachelor

Cluster of Industrial Engineering – Bachelor	
Partner University	Specialization/Programme
University of Technology of Troyes[UTT]	Génie Industriel
Darmstadt University of Applied Sciences [H_da]	BSc Logistics Management
Technical University of Sofia[TUSofia]	Industrial Engineering -Bachelor
Technical University of Cartagena[UPCT]	Grado en Ingeniería de Organización Industrial yLogísitica
Technical University of Cluj-Napoca[TUCN]	ManufacturingEngineering

Table 7 Cluster of Architecture- Bachelor

Cluster of Architecture – Bachelor	
Partner University	**Specialization/Programme**
Darmstadt University of Applied Sciences [h_da]	Bachelor of EngineeringArchitecture
Riga Technical University [RTU]	Bachelor of Architecture
Technological University Dublin[TUDublin]	B. Arch (TU832)
Technical University of Cartagena[UPCT]	Bachelor Degree in Architecture Fundamentals
Technical University of Cluj-Napoca[TUCN]	Architecture (Bachelor and Master integrated)

Table 8 Cluster of Food Science and Technology

Cluster of Food Science and Technology – Master NEW PROGRAMME	
Partner University	**Specialization/Programme**
Technological University Dublin [TUDublin]	Environmental Sustainability and Health
Technical University of Sofia [TUSofia]	Technology of bread and bakery products
Cyprus University of Technology[CUT]	Postharvest Biology and Technology
Technical University of Cartagena[UPCT]	Food Science & Technology

Table 9 Cluster of Industrial Engineering

Cluster of Industrial Engineering - Master	
Partner University	**Specialization/Programme**
University of Technology of Troyes[UTT]	Génie Industriel
Darmstadt University of Applied Sciences [h_da]	Master in Business Administration with specialisation in Logistics
Technical University of Sofia [TUS]	
Technical University of Cartagena[UPCT]	Máster Universitario en Ingeniería de Organización Industrial y Logísitica
Technical University of Cluj-Napoca[TUCN]	Virtual Engineering and Competitive Manufacturing

For **Master programmes** the following clusters were created in the **second wave**:

Table 10 Cluster of Architecture

Cluster of Architecture- Master	
Partner University	**Specialization/Programme**
Darmstadt University of Applied Sciences [H_da]	Master of EngineeringArchitecture
Riga Technical University [RTU]	Master of Architecture
Technological University Dublin [TUDublin]	Master of Architecture
Technical University of Cartagena [UPCT]	Master in Science and Technology of building in Architecture
Technical University of Cluj-Napoca [TUCN]	Architecture (Bachelor and Master integrated)

4.2 Students' mobility support

EUt+ Intercampus student mobility is organised and overseen by WP5 - Task 5.1 in collaboration with the Erasmus Coordinators and International Relations departments of each partner. The general framework and the commitment of all partners in implementing the students mobilities as part of their *curricula* was defined in the Agreement – 'Facilitation of student mobility between EUt+ partners' [Annex 12].

Tasks 3.1 and 3.2 support the implementation of this activity through the following activities:

- Provision of the Mobility Maps (*curricula* modules for mobility) created in the clusters

- Dissemination of information at department level.
- Provision of academic support for incoming students.
- Follow up and evaluation of students' experience from a learning viewpoint. duringthe mobility, and provision of solutions to improve this experience.
- Support of the promotion activities for student mobilities in collaboration with Task 5.1 representatives and the universities' international relations / Erasmus departments.

In addition, WP3 has proposed the creation of 'Cluster Coordination Committees' (first discussed at the EUt+ meeting at Cluj Napoca in March 2022). These Committees are planned to support student mobility through coordination of academic conditions, management of issues arising from demand for available places and the provision of pedagogical support and materials. Coordination Committees are expected to be put in place for the first wave clustersfrom autumn 2022 and thereafter for the second and third wave clusters.

Here we provide a summary of student mobilities through the EUt+ in the first year of the project:

- Academic year 2020-2021: 41 students in Bsc, and 4 in Msc, 1 in PhD
- Academic year2021-2022: 61 for Bsc, 11 for Msc and 3 for Phd, and even a short cyclefor 45 students.

Due to the fact that the Mobility Maps were developed during 2021 the students mobilities through the clusters started only in 2022. However, there were already inter- campus student mobilities in the specialisations of the clusters in the academic year 2021. For example: In Telecommunications and Networks 13 students from UPCN went on mobility to EUt+ partners, (6 to UPCT, 3 to CUT, 4 to RTU) and in Mechanical Engineering there were a total of 25 students (2 to UPCT, 20 to CUT, 1 to h_da). These students may be considered the"pioneers" of EUt+.

WP3, especially cluster members, participated strongly in the promotion of the *curricula*

for mobility during February and March 2022 [Annex 9]. During these presentations and discussions, which took place at each EUt+ campus, the students were told about the advantages of the EUt+ multi-campus programme and the opportunity to study at any of the partner campus' offering their specialisation, following the *curricula* proposed in the Mobility Maps. It is estimated, according to the information provided by the partners' International or Erasmus Offices that a number of 59 students in Bachelor and 9 students in Master have chosen to make a mobility to one of the EUt+ universities inside clusters.

4.3 Teachers' mobility

The Teacher mobility programme aims to create stronger bonds between participating academics in the cluster programmes and at the same time stimulate the development of new learning/teaching and research activities between partners.

The mobilities allow academic staff to interact with colleagues at the EUT+ partner to share experience and expertise in relation to teaching materials and methods and to get to know the partner university's infrastructure and culture. This facilitates also the promotion to students in the teacher's home university in relation with the advantages in having mobilities in the partner university.

The implementation of the teachers' mobilities is supervised by Task 5.2. Representatives from Task 3.1/3.2 give support by promoting the opportunity at their university departments and inviting teachers from their specialisations to undertake such a mobility. To support this objective, a flyer was created by Task 3.1/3.2 explaining the framework and application process, providing guidance in relation to potential activities at the partner university [Annex 10]. An online '*market place*' was created where offers and requests for teacher mobilities are shared. The 2022 target for teacher mobility is a minimum of one teacher from each cluster from each partner university. The mobilities are supported using Erasmus + grants and/or alternative financial resources.

Taking in account the COVID restrictions, only a small number of staff mobilities were undertaken until now (16 during 2020 - 2021 academic year). A further 46 teachers have expressed their interest and to allow better understanding of the academic processes(evaluations) in partner universities, professors have been invited to participate in the final diploma committees or juries (e.g., 5 academic staff from Civil Engineering and Architecture for this 2022 session). During the EUt+ Meetings, all academic staff (around 20-30 teachers/meeting) joined visits to the host university laboratories. These visits subsequently generated opportunities for research exchange and teaching mobilities.

4.4 Mobility Follow-up

For the students moving intercampus following the cluster Mobility Maps starting from September 2022 fall semester), a survey with specific questions about their mobilities is beingprepared by WP5 – Task 5.1. in collaboration with the WP3 Task 3.1 and Task 3.2 representatives. Questions target the student's satisfaction level, level of recognition by the home campus of academic activities undertaken during mobility, management of the workload, their language and culture experiences, living and study conditions, interaction with colleagues and teachers and quality of teaching materials provided by the host university.

The results of these questionnaires will be studied following the pioneer student mobilities in 2022-2023 and contribute to future initiatives to continuously improve the student experience.

5 Future steps

This section evokes the past experiences and outlines the future mechanisms that will help the EUt+ to lead a concerted and integrated convergence process to build common EUt+ European degrees.

The first section recalls the actual achievements, the dynamic that has been created among partners within the alliance and how to take advantage of that to disseminate the EUt+ model. The second section is about the convergence process used by each specialisation/programme (cluster). Proposals are to organise future discussions to include legitimate bodies in the decision-making process and to pilot the convergence toward the European degree. The third section is about convergence paths. Two options are presented, the adaptation of existing *curricula* and the creation of new ones. To conclude this section points for consideration are identified and discussed.

5.1 Strategy for cluster extension

The strategy for cluster extension focuses in two directions, one to add new members to the already existing clusters, with the goal to include as many EUt+ partners as possible for the specialisation, and two to introduce new programmes in future clusters.

To date, clusters have been based on existing degree *curricula* offered at partner campuses with the exception of “Food Science and Technology “, a new master’s degree evolving from existing bachelor’s degrees. The success of the first clusters has had a 'snowball' effect and there are already requests from the partners to create new clusters. Some initiatives between partners have been started ahead of formalisation of a cluster: Environmental Engineering working group. The first and second cluster waves will be followed by a third wave in autumn 2022.

During the first wave, the number of partners joining initially increased over the period. Whilst the Mechanical Engineering cluster included all EUt+ partners, Telecommunications and Network Engineering cluster started with 6 partners and was later joined by CUT. Civil Engineering grouped initially 4 partners until h_da joined.

In the second cluster wave, established in February 2022 a similar pattern emerged. The “Food Science and Technology” cluster already has one new active partner (TU Sofia). RTU and CUT are also willing to join the “Industrial Engineering” cluster and will be fully part

of it after the Dublin meeting (May 2022) leading to group 7 partners among the 8 universities of the alliance EUt+.

This very positive dynamic is further extended by active candidates wishing to open new clusters. For example, “Electrical Engineering” or “Environmental Engineering” is already active as an informal group preparing to apply for the third cluster wave.

Now that process to create [Annex 1] clusters is well established, it is easier to promote and propagate the initiative and ease the work of cluster members.

More in-depth analysis of the shared *curricula* in each existing cluster is needed to condense the “Final Learning Outcomes” (Final LOs). The Final LOs are the keystone that structures the academic content of each cluster/ programme as mentioned in section 3.3 of this document. The aim is to identify the necessary *curricula* evolution to achieve convergence and widen the EUt+ offer for inter-campus student mobility.

These convergence issues are discussed in the next section (7.2).

5.2 Strategy for convergence

The EUt+ convergence strategy focuses on the harmonisation of partners ’national degree’ *curricula*, a critical step in the process of achieving a European Degree and includes the need to build partner relationships, convergence on process and procedures and the creation of governance structures to guide this transformation.

Mid-term convergence

In anticipation to the creation of an EU label, an EUt+ Label or Certificate [Annex 11 – European strategy for universities] will be created in addition to national degrees. It will be delivered for degrees which *curricula* comply with common rules and to students that satisfydefined conditions. The proposed conditions to convey this label, discussed within the alliance include: mobility, foreign language skills and obtained ECTS on partners’ campuses. The deliverance conditions will be basically related to shared features

described in the 'EUt+ European degree reference guide' document and will be tightened with time and aligned withthe future EU label.

Convergence: dynamic framework definition

The framework for convergence is not designed to reproduce the same academic content in all partners' university, but rather to value the specificity of each partner, of each curriculum.

The key stones of a future common degree are, on one hand, the final learning outcomes agreed among partners in the cluster and, on the other hand, the implementation of features of the "EUt+ European degree reference guide" (a multi-campus model, multilingualism, self-customisation of study track, modularity, evaluation...).

To structure the convergence, we need first to analyse and prioritise the features of the reference guide that should be shared and implemented in the degrees that join the EUt+ programme.

To prolongate the 2021 workshop, a new WP3 Workshop will be organized in September 2022 to disseminate WP3 achievements and goals to EUt+ colleagues and to decide which are the implementation priorities in T3.1 and T3.2 for the coming year.

Propositions made during this workshop will be transmitted to all partners to be discussed in local senates and returned with comments to end up with final proposal signed by rectors. We expect to be able to sign a MoA by the end of 2022 and to repeat this elaboration process on an annual basis. This will enable adaptation to difficulties and also agility to seize opportunities that could appear.

Monitoring the convergence

To support and monitor the convergence at cluster level, a Coordination Committee will becreated for each cluster, the principle of which was signed by rectors in May 2022.

The planned creation of these Coordination Committees in autumn 2022 will formalise the working groups that initiated the convergence in first wave clusters of WP3. Each Coordination Committee is planned to include former cluster members, students' representatives, staff from partners' International Relations/ Erasmus offices and WP3 representatives.

The Coordination Committee has two key roles:

- An operational role to analyse the mobility demands and organize the mobility flow according to the open positions each partner can offer (in collaboration with task 5.1 for students and task 5.2 for teachers).
- An academic role to discuss the convergence roadmap proposed by EUt+ and to propose regulation adaptations to implement the convergence in the cluster. For instance, it could concern:
  - Language credits and courses
  - Evaluation process
  - Issues relating to the compatibility of academic calendars
  - Refinement of FLOs
  - Academic follow-up of students in mobility and feedback analysis
  - Challenge based work and credits
  - Evolution of mobility
  - Issues such as recognition of EUt+ semester as a 'home' semester by the student's home university. E.g, La Commission des Titres d'Ingénieur, France requires students' presence in their home university for a minimum of 18 months during the final 3 years of engineer *curricula*.
  - Internship policy

Coordination Committee members will also be responsible for following the impact of convergence in their faculties. They will report to the EUt+ Education Committee after its formation in the second half of 2022. This committee will ensure that new study programmes are successfully set-up.

Convergence paths

Within the EUt+ initiative, 2 significant paths to build EUt+ degrees are explored:

- **Convergence of existing degrees** – Case of first wave clusters: Mechanical engineering(Bachelor and Master), Telecommunication and Networks Engineering (Bachelor and Master), Civil Engineering (Bachelor) and second wave clusters: Architecture (Master)and Industrial Engineering (Bachelor and Master).

Convergence of existing degrees is led according to the strategy described in section 5.2.

- **Creation of a new joint master's degrees** – This path is followed by Food Science andTechnology and Civil Engineering masters.

Creation of new joint master's degrees enable partners to define a single multi- campuses curriculum for all partners from the beginning. Student mobility is either planned and organised between the campuses similarly to *Erasmus mundus* programmes (Master of Food Science and Technology), or made fully compatible one with another by creating, for instance, a common backbone with different options in the different campuses (Master of Civil Engineering). A common regulation is adopted at the creation so that partners have the same vision.

Building *curricula* from a blank page enables the inclusion of the EUt+ degree features [Annex 3] from the beginning making these degrees more consistent with our target. However new degrees need to go through a national or other accreditation process which may create delays in their launch. The way to proceed is currently underdiscussion within WP3 and with the steering committee. We expect these first pilot programmes, if successful, to provide valuable feedback about the features that characterise the EUt+ degree and their implementation to fuel our reflexive analysis and contribute to the refinement of the EUt+ targeted features.

Challenges

The first challenge is to increase the number of intercampus mobilities (students, staff and teachers). This means working in collaboration with tasks 5.1, 5.2 for the mobility process itself, working with task 5.3 to offer students tools to build their own study track and task 7.1and 7.2 to foster EUt+ communication.

The second challenge is to structure WP3 to enable the monitoring of an increasing number of clusters which requires the development of the proposed strategy in section 5.2, but also, in the future, being attentive to the following points:

1- Expanding the collaborative relationships with partner institutions relative to the clusters' specialisations (Directors of Education, Senates, student boards).
2- Reinforced quality control of the work in the clusters: Definition of clear KPI's for the implementation of the EUt+ European Degree framework. Monitoring of mobilities. To beestablished in collaboration with Task 8.2.
3- Structuration and management of transversal tasks touching multiple work packages toavoid duplication and achieve cohesive proposals. A non-exhaustive list of these transversal tasks is: language (T2.1), mobility (T5.1 at T5.2), inclusivity (T2.2 and T2.3), e- portfolio (T5.3), a shared information and data base system (T6.2), communication (T7.1, T7.2), external partners' contact for projects (T7.4), internships or challenge-based classes(T3.5), new projects and funding (T3.4 et T8.1).

Conclusion

This deliverable explains the process followed by Task 3.1 in the conversion of existing Bachelor degree *curricula* and by Task 3.2 in the evolution of the Master degree during the first year of the EUt+ initiative. The strategy and the outcomes of the work done in the first cluster wave are evidenced.

During the first year of implementation the harmonisation process in Task 3.1 focused on implementing the proposed plan for the first bachelor cluster wave: The 3 clusters with

20 programmes from all EUt+ partners: UTT: 2, h_da: 2, RTU: 2, TUDublin: 2, TUSofia: 2, CUT: 3, UPCT: 3, TUCN: 3. As these clusters piloted the process proposed in Task 3.1, the creating of the necessary working framework and documents and the common understanding of the proposed harmonisation solution took longer than initially was estimated. All three bachelor clusters were able to create first versions of the Mobility Maps by the end of 2021 and further refine them in the first months of 2022 (e.g. introducing the language and culture courses). A total of 17 Mobility Maps were created. The Mobility Maps offer the *curricula* for mobility, preagreed with assigned ECTS thus allowing students to acquire their final learning outcomes in whatever university campus they study. Further steps that address the 12 features of the European degree are planned for these cluster in the second year.

In 2021, Task 3.2 focused on the harmonisation process and the implementation of the proposed plan for the selected Master specialisations resulting in the creation of 3 clusters and 20 programmes from EUt+ partners. The implementation of the proposed harmonisationfaced several drawbacks due to differences in the partners' *curricula* and the narrow field of specialisation at Master level. In this context the representatives from participating programmes tried to identify suitable semesters for the mobility. Some of the proposed solutions were to select the final semester for the mobility or to develop new common Master programmes, such as was decided by the Civil Engineering Cluster. A total of 17 Mobility Mapswere created.

The programmes for the second wave clusters were selected by the Steering Committee in February 2022. These clusters are: Industrial Engineering Cluster (bachelor & master), Architecture Clusters (bachelor & master) and Food Science and Technology (master). The first two clusters were created from already existing programmes in the partner universities (10 programmes from 7 EUt+ partners). The Mobility Maps of these clusters are expected to be finalised in autumn 2022 and is estimated that student mobility will start in spring semester 2023.

The Food Science and Technology Cluster proposed a new master programme with the participation of 4 EUt+ partners. The development of the *curricula* and the programme implementation of the new master programmes depends largely on accreditation of these new degrees by national agencies and is therefore subject to potential delay.

Students and teachers' mobility processes have been designed and implemented. As a result of the work of done in the 3.1 and 3.2 Tasks, notably the creation of Mobility Maps of harmonised *curricula*, students have been able to apply for a semester at an EUt+ campus withthe assurance that the courses and associated ECTS will be recognised across the consortium.The WP3 collaborated closely with WP5 in establishing the calendar and organisation of student and teacher mobilities. These processes should produce their first results in autumnsemester of 2022.

Creation of Cluster Coordination Committees is planned for September 2022. These committees will formalise the clusters working groups within EUt+ and are expected to be active in the implementation of the ongoing convergence of *curricula* that implies coordination changes in all partner institutions. An annual WP3 workshop commencing September 2022 at the EUt+ meeting in Troyes is planned.

During the implementation process, certain challenges were encountered. One important issue concerns the language of instruction as the courses are mainly taught in the partners' national language. In response to this potential barrier to mobility it was agreed that all the universities will provide supporting documents in English or one of the other academic languages (French, German, Spanish), and will offer language courses for the students on mobility. These initiatives support the EUt+ objective of multilingualism. Another issue concerns the differences in the academic calendar between the eight partners, that complicate the fulfilling of a student/teacher mobility, due to differences both in the course schedules and the exam's period. This has promoted ongoing discussions as the partners seeksolutions. Also, for the new masters, the national accreditation processes differ in each partners' country, and this represents a significant problem in the recognition of some specialisations by all universities.

The long-term objective in Task 3.1 and 3.2 is to fulfil the conditions in order to progress to a single European Degree respecting the 12 Characteristics of a European Degree as defined in European Degrees in Engineering EUt+ Reference Guide. The harmonisation process on the Bachelor level as well as the new masters are tailored to respect these 12 features. The introduction of a European Label will be an important step in this process.

Annexes

Annex 1 – D3.1.1 + D3.2.1 Workshop analysis (already submitted, for information only)

Annex 2 – MoA for the Creation of EUt+ Bachelor and Master in Engineering

Annex 3 – European Degree Reference Guide (already submitted, for information only)

Annex 4 – Competency framework Bachelor EUt+

Annex 5 – Competency framework Masters EUt+

Annex 6 – LOs clusters 1st wave Bachelor and master (in convergence process)

Annex 7 – LO Matrix Task 3.1 (in convergence process)

Annex 8 – Mobility Maps Task 3.1 (in convergence process)

Annex 9 – Student Promotional Events

Annex 10 – EUt+ Teacher Mobility framework 2022.03

Annex 11 – EUt Agreement: Student Mobility between EUt+ Partners Facilitation Student Mobility

Annex 12 – LO Matrix Task 3.2 (in convergence process)

Annex 13 – Mobility Maps Task 3.2 (in convergence process)

Annex 14 – Creation of EUt+ Bachelor's and Master's in Engineering

Annex 15 - Presentation Mobility

Annex 16 - MoA second wave clusters (Feb 2022)