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EUROPEAN UNIVERSITY OF TECHNOLOGY

Deliverable 60

D4.5.4a Annual Activity Report and upgrading of the convergence plan

Del. Rel. No D4.20

WP 4

Description: Main research results and networking activities towards a convergence plan

Comments:

Dissemination level: **PU**-Public

https://www.univ-tech.eu/phase-1-results

Foreword to deliverable 60

Deliverable 50 (4.5.4a) is the first annual report regarding the joint activities undertaken during the first year of the project by EUt+ alliance towards the establishment of common research units and institutes. The most important step towards this direction is the preparation of the Memorandum of Agreement for the creation European Research Institutes (ERIs). So far there is interest from the following thematic networks to become ERIs:
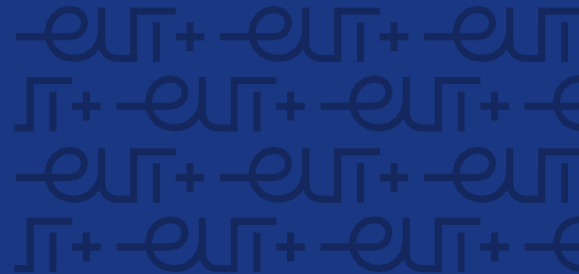
+ European Culture and Technology Laboratory (ECT Lab+),
+ European University of Technology Institute of Nanomaterials and Nanotechnologies (EUTINN),
+ EUt+ Sustainability Lab,
+ EUt+ Data Science Research Institute,
+ European Laboratory for Pedagogical Action - Research And Student-Centred Learning (ELaRA)

Networking activities, in the framework of the above-mentioned thematic networks, such as workshops at the EUt+ level, have already taken place by the second quarter of 2021, or have been planned for later in 2021. Information on those workshops is reported in the current deliverable. The aim is that, by the end of 2022, one of the thematic networks will be transformed to a research institute. Given the progress achieved so far, we expect that ECT Lab+ is very likely to be the first EUt+ research institute while the aim is that three of the above thematic networks to become research institutes by the end of the EUt+ project lifespan, while the other two will be considered for the next round of EUt+ research institutes.
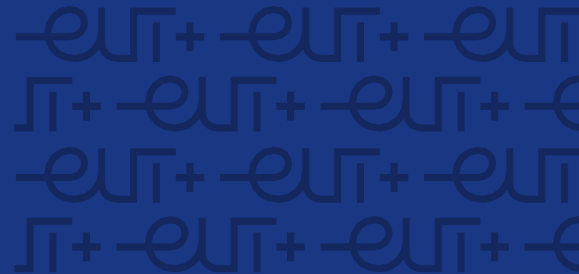
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Acronyms

UTT: Universite de Technologie de Troyes
h_da: Hochschule Darmastadt
RTU: Rigas Tehniska Universitate
TU Dublin: Technological University Dublin
TUS: Technical University of Sofia
CUT: Cyprus University of Technology
UPCT: University Politecnica de Cartagena
UTCN: Universitatea Tehnica Cluj-Napoca

ERI: European Research Institute
ERO: European Research Office
MoA: Memorandum of Agreement

Introduction

Work Package description

The purpose of WP4 is to organize and mutualize all research and transfer activities within the EUt+ consortium, in a structuring approach and in connection with research training aspects. A preliminary analysis of research activities across the EUt+ alliance has demonstrated the impressive potential of EUt+ for boosting the global growth of each region thanks to a macro-level approach. Indeed, whereas only 40% of individual campuses' priorities overlap with local regional priorities, a total of 93% match is achieved at the EUt+ alliance level. Nevertheless, organizing research activities at the EUt+ level, without limiting the academic freedom for researchers, in a coordinated fashion is expected to highly advance both applied and basic research in a measurable manner.

Pooling research strengths of EUt+ partners will reinforce the EUt+ alliance as a whole and create synergies, in an approach similar to the mutualization of S3 (Smart Specialization Strategy) strengths and general pooling of systems and activities. This aspect, purely centered on mutualizing quality research, will be taken care of in Task 4.5. All of EUt+ partners are technology driven institutions, some with an additional foundation in social sciences, arts and humanities, others with a closer orientation on engineering. Together, EUt+ partners can capitalize on existing research labs, which open up synergies and in the next step new technical solutions by either complementing or extending existing expertise. Linking research activities and joining efforts will provide the foundation for enabling European technology thinking human first and enabling the activity of the work packages other tasks at the same time. The other four tasks operate at a more structural and organizational level.

Task Description

Task 4.5 takes care of:

+ completing the task of identifying the partners' specific research strengths and mapping out interlinking potential and opportunities for joining efforts to achieve mutual project creations;

+ ***conceiving and implementing a strategy to foster fruitful research collaborations at the EUt+ level and beyond;***

+ setting up a map of research competencies and developing means to display them to interested parties in our ecosystem in print and via the Internet;

+ establishment of strong thematic networks prefiguring research institutes;

+ creating common research institutes on identified research strengths and opportunities: one institute to be launched by the end of the first year (2021), for a total of three common research institutes at the end of the three-years funding period and seven by 2025;

+ organizing annual meetings of the engaged labs in the various research fields

Purpose of the document

In simple words, the purpose of this document is to report the main research results achieved during the first year of the project (1/11/2020 – 31/10/2021) along with suggested modifications of the convergence plan (see Deliverable 4.5.1[1]) towards the

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[1]D4.18: Convergence Plan towards common research units and institutes

creation of common research units given the experience acquired during the first year of the project. In this context, it serves mainly the second goal of Task 4.5 stated above.

1 Research Activities

In this section we report the main research results achieved so far in the context of EUt+ and by the EUt+ community. These results are further classified into two main activities: Grant proposals submitted by the EUt+ consortium and networking activities conducted in the framework of the (already) established thematic networks.

1.1 Grant Proposals

Building on the collaboration between members established within the EUt+ alliance, a total of 10 joint grant proposals have been submitted during the 1st year of EUt+. Six of them were accepted, highlighting areas of collaboration between the members and jointly led activity reinforcing networking within the Alliance. Summary information for the accepted grant proposals is given below:

Proposal title: **Universal language for academic description and information exchange**

Acronym: LUDEIA

Call:

Programme: Erasmus+

Date submitted: April 2021

Status: Approved

Lead partner: UTT

EUt+ participants:

UTT	H-DA	RTU	TU Dublin	TUS	CUT	UPCT	UTCN
√	√	√	√	√	√	√	√

Table 1: EUt+ participants in the LUDEIA grant proposal

Description: LUDEIA aims to build the foundations of a standard of "universal description" of academic and education information. Rather than a unified global information system, LUDEIA is experimenting the construction of a "pre-standard", allowing current local information systems (IS) secure and encrypted data exchanges thanks to standardization of data formats and the implementation of inter-IS connector devices. As a result, the local ISs will communicate via a micro-service library in interconnection. This decentralised system allows the metamodelling of curricula (by data ingestion) and thus offers great technical flexibility allowing strong support for diversity and pedagogical evolutions. In this way, information systems will be able to interoperate in a fluid manner with connector networks that ensure redundancy of information in real time.

Proposal title: **Aesthetics and Ecology in Technological Education**
Acronym: AesThiCo
Call: KA220-HED - Cooperation partnerships in higher education
Programme: Erasmus+
Date submitted: May 2021
Status: Approved
Lead partner: TU Dublin
EUt+ participants:

UTT	H-DA	RTU	TU Dublin	TUS	CUT	UPCT	UTCN
√	√	√	√	√	√	√	√

Table 2: EUt+ participants in the AesThiCo grant proposal

Description: AesThiCo brings aesthetics together with an ethics of care that understands the self as constituted by relations with others, human and non-human and with our planet. From this, hermeneutics of care that considers the role of interpretation as restorative, reparative and creative, are proposed. Interpretation thus is an aesthetic act that opens up the potential for new forms of reasoning in relation to justice and democracy in society. This proposes an aesthetic-technological education that focuses on a curriculum design where education is seen as more than an 'economic act' of agency. Care, reparation and restoration are modes of ethical 'reception' and aesthetic 'beholding' that invoke and entail new ways of thinking technology beyond economic extraction. in relation to justice and democracy in society.

Proposal title: **Ethics and Ecology in Technological Education**
Acronym: ETHICO
Call: KA203: Strategic Partnership
Programme: Erasmus+
Date submitted: May 2020
Status: Approved
Lead partner: TU Dublin
EUt+ participants:

UTT	H-DA	RTU	TU Dublin	TUS	CUT	UPCT	UTCN
√	√	√	√	√	√	√	√

Table 3: EUt+ participants in the ETHICO grant proposal

Description: ETHICO aims at broadening cooperation among all EUt+ partners by developing new approaches to ethics and ecology in technology education. Special emphasis is given to the creation of materials and tools to teach teachers to integrate ethics into their course delivery.

Proposal title: **Innovative European University of Technology**

Acronym: Inno-EUt+

Call: EIT HEI Initiative

Programme: Horizon Europe

Date submitted: March 2021

Status: Approved

Lead partner: CUT

EUt+ participants:

UTT	H-DA	RTU	TU Dublin	TUS	CUT	UPCT	UTCN
√	√	√	√	√	√	√	√

Table 4: EUt+ participants in the Inno-EUt+ grant proposal

Description: Inno-EUt+ is a project aiming to enhance the innovation and entrepreneurial capacity of a new European university alliance, the European

University of Technology (EUt+). The partners of the alliance are already committed to gradually integrating educational and research activities, co-creating opportunities for their staff and student bodies across all campuses of the alliance.

Proposal title: **European University of Technology - Experimentation to Transform Research Activities and Steering**

Acronym: EUt-EXTRAS

Call: H2020-IBA-SwafS-Support-2-2020

Programme: Horizon 2020

Date submitted: November 2020

Status: Approved

Lead partner: UTT

EUt+ participants:

UTT	H-DA	RTU	TU Dublin	TUS	CUT	UPCT	UTCN
√	√	√	√	√	√	√	√

Table 5: EUt+ participants in the EUt-EXTRAS grant proposal

Description: The aim of EUT-EXTRAS is to support the emergence of intercampus knowledge-creating teams across our institutions, across disciplines, and across types of activities, towards a new approach of the environment and of steering and execution of research. It will be a test bed to establish a common roadmap for research and innovation at the EUt+ level by 2030 to validate a solid methodology of institutional transformation fully integrating the challenges of European technology development. EUT-EXTRAS aims to co-construct a pilot experimentation to achieve a critical mass in research that is flexible, decentralised and

collaborative, to support the institutional transformation necessary for Europe's industrial renewal. This entails opening up new career opportunities for the fluidity of ideas and knowledge (both within the university and with the private sector, and the other way around), and avoiding the brain drain often associated with such endeavours.

Proposal title: Solutions for Unified Communication Competences for Engineering Students and Specialists

Acronym: SUCCESS

Call: KA220-HED

Programme: Erasmus+

Date submitted: May 2021

Status: Approved

Lead partner: RTU

EUt+ participants:

UTT	H-DA	RTU	TU Dublin	TUS	CUT	UPCT	UTCN
√	√	√				√	

Table 6: EUt+ participants in the SUCCESS grant proposal

Description: SUCCESS project encourages the use of creative learning and teaching methods by providing student-centered curricula. It aims to develop and implement new, innovative ideas in already existing study practices and to help students and specialists develop a skill set that will enhance their confidence and abilities to deliver the knowledge they have in an engaging and interactive way.

1.2 Networking Activities

For easy reference and to keep the relevance with Task 4.5 the research networking activities summarized next are classified per thematic network.

1.2.1 European University of Technology Institute of Nanomaterials and Nanotechnologies (EUTINN)

The aim of the European University of Technology Institute of Nanomaterials and Nanotechnologies (EUTINN) is to bring together the eight EUt+ partners focusing on nanomaterials and nanotechnologies. This thematic network serves as a hub for consolidating the collective knowledge and capabilities of the EUt+ alliance, as well as fostering diverse perspectives and methodologies in addressing challenges and advancements within the realm of nanosciences and nanotechnologies.

In the framework of EUTINN the following research networking activities took place:

Title: 1st EUt+ Workshop on Nanomaterials and Nanotechnologies

Event type: Workshop

URL: https://www.univ-tech.eu/first-eut-workshop-on-nanomaterials-and-nanotechnologies

Dates: 28-29/4/2021

Delivery mode: Online

Book of abstracts:

https://www.calameo.com/read/0063571165313d22a92d6?authid=OHwSCWz4qwqo

Description: This was an event organized only for EUTINN faculty members. The purpose was to get to know each other and start working together on the different subjects and identify and discuss the identity of EUTINN. During the Workshop participants also identified and discussed the themes of research, the organization of work within EUTIN, the question of funding and topics of collaboration.

Title: **EUTINN Meetings**

Event type: Meetings

URL: Via the Whaller platform

Dates: Monthly meetings and a physical meeting at Darmstadt in October 2021

Delivery mode: Mostly online

Description: The aim of those meetings was to allow the EUTINN researchers to know each other and explore collaboration possibilities in terms of (a) grant proposal submission, (b) exchange visits at the EUTINN related research labs, (c) examine the possibilities of PhD co-supervision, and (d) develop new ideas that could lead to common publications.

1.2.2 European Sustainability Laboratory (ESL)

In order to bring together expertise from all partner universities and enable joint working field of sustainability, the idea of an EUt+ Sustainability Lab has arisen. It envisions to offer a space for discussion and research in EUt+ in bringing together all colleagues interested in topics of sustainable development. It will for sure be a wide variety of topics, probably even similar as it can also been seen for example in the Sustainable Development Goals, the SGDs. To address individual problems from separate disciplinary perspectives, the sustainability sciences integrate several branches of science and research in order to gain insights into societal, socio-economic, engineering (or technical) and natural science challenges. The aim is to clarify the various effects and interactions on the one hand, but also the influences of involved and interested actors. This includes the complex interplay of environment and society as a whole. This common background is the starting point

for predominantly applied and practice-oriented research on and for sustainable development.

In the framework of ESL the following research networking activities took place:

Title: 1st workshop of the EUt+ Sustainability Lab

Event type: Workshop

URL: https://www.univ-tech.eu/first-workshop-of-the-eut-sustainability-lab

Dates: 14-15/6/2021

Delivery mode: Online

Program & presentation titles:

https://www.lu.lv/fileadmin/user_upload/lu_portal/projekti/wcomb/RTU_EUt_SustainabilityLab_programma.pdf

Description: The 1st EUt+ Workshop on Sustainability was organized on the 14-15/6. Authors from universities and research institutes of the EUt+ partner universities were invited to submit their contributions in the field of holistic views of effects of technologies on the various topics. Each participant was given 10 minutes of participation. The presentations were split in two tracks. The thematic areas covered were Sustainable Transition (6 presentations); Renewable energies (12 presentations); Land use, agriculture, food (13 presentations); Energy and resources efficiency (9 presentations); Water and water management (9 presentations); Circular economy, material recycling, economy (16 presentations); Smart cities, urban planning, mobility, buildings (17 presentations); Decision makers, risk, crisis management (15 presentations); Monitoring, IT, telecommunication, sensors (15 presentations). In

addition, a round table discussion on the opportunities and cooperation possibilities within the ESL took place.

Word cloud of the presentations: In Figure 1 we see the wordcloud of the presentation titles of the 1st EUt+ Workshop on Sustainability [2] while in Figure 2 we present the main keywords of those presentations [3].

Figure 1: Word cloud of the presentation titles of the 1st annual workshop of the European Sustainability Lab (ESL)

Figure 2: The main keywords of the 1st workshop of the European Sustainability Lab

Title: **EUt+: Boosting European Research, Innovation and Entrepreneurship**

Event type: Roundtable discussion

URL:

Date: 23/9/2021

Delivery mode: Physical during the Limassol week on September 2021 (also broadcasted online)

Description: In this roundtable, EUt+ researchers had the opportunity to exchange ideas with successful startup founders (SignalGeneriX, RSL Revolutionary Labs, LearnWorlds), and Cypriot policy makers, (Vice-minister of Innovation, Principal Investigator of Research) on how to boost European Research, Innovation and Entrepreneurship in the framework of European Universities in General and EUt+ in particular.

Title: ESL Meetings

Event type: Meetings

URL: Via the Whaller platform

Dates: Monthly meetings and a physical meeting at Darmstadt in October 2021

Delivery mode: Mostly online

Description: The aim of those meetings was to allow the ESL researchers to know each other and explore collaboration possibilities in terms of (a) grant proposal submission (a specific call of the LIFE programme, namely "Facing the increase in cooling demand of buildings in the coming years" TOPIC ID: LIFE-2021-CET-COOLING, was examined), (b) exchange ideas on how to keep up with the broad nature and scope of ESL, (c) define the main research topics or ESL, and (d) preparation of a white paper with the aim "to identify what are the main stakes around the transformation of research for sustainability purposes"

1.2.3 The European Culture and Technology Network (ECTN)

ECTN operates as a collaborative entity to conduct advanced research into technology's essence and function. Its core goal is to define and promote a distinct European model around technology while aiding the evolution of appropriate legal and regulatory frameworks.

Research Missions:

- Promote a transdisciplinary perspective on technology through the articulation of Philosophy, Social Sciences, Art & Humanities, and Engineering Sciences

- Integrate research on the humanities and social sciences into the overall research of the European University
- Create a critical mass in research in the arts, humanities and social sciences within the European university.

In the framework of ECTN the following research networking activities took place:

Title: **ECTN Meetings**

Event type: Meetings

URL: Via the Whaller platform

Dates: Weekly / bi-weekly meetings and a physical meeting at Darmstadt on October 2021

Delivery mode: Mostly online

Description: The aim of those meetings was to allow the ECTN researchers to explore collaboration possibilities in terms of (a) grant proposal submission (see ETHICO and AesThiCo project proposals), (b) exchange ideas about the combination of technology and ethics, (c) develop the support the "Human Think First" think tank, and (d) organize the activities of the network so as to become an ERI as soon as possible

Title: **Think Human First**

Event type: Seminar Series

URL: Via the Webex platform

Dates: 29/4/2021 (TU Dublin), 27/5/2021 (TUS), 23/6/2021 (UPCT)

Delivery mode: Online (and physically at TU Dublin, TUS and UPCT respectively)

Description: These roundtable discussions focused on the question of 'Thinking' in the statement 'Think Human First'. The question of what does it mean to think (human first) has become urgent with the growth of AI and social networking platforms and the immanent nature of climate change. There is an inherent tension within the statement to "think human first", which on the one hand implies recentring technological development on human(ity), such as ethical and societal implications of technology, on the other it implies that a privileging the human (anthropocentrism) has led to the climate disaster (Anthropocene). The panel will set out to pose the question of 'thinking' in the 21st Century.

Title: **Think Human First (Creative Machines)**

Event type: Seminar Series

URL: Via the Zoom platform

Dates: 30/9/2021 (CUT)

Delivery mode: Online (and physically at CUT)

Description: A roundtable discussion on critical philosophical questions about computational creativity, creative software agents and their artistic values.

1.2.4 Data Science Institute (DSI)

Data Science is a rapidly expanding research field that spans various scientific disciplines, focusing on leveraging data to advance state-of-the-art technologies in

academic, industrial, and societal contexts. Sharing diverse expertise among European research teams promises to create an exceptional ambitious project within the competitive European landscape.

In the framework of DSI the following research networking activities took place:

Title: **DSI Meetings**

Event type: Meetings

URL: Via the Whaller platform

Dates: Monthly meetings (started from March 2021) and a physical meeting at Darmstadt in October 2021

Delivery mode: Mostly online

Description: The aim of those meetings was to allow the DSI researchers to know each other and explore collaboration possibilities in terms of (a) grant proposal submission (a significant part of the EUt-EXTRAS grant proposal was written in the framework of those meetings), (b) exchange ideas on how to keep up with the broad nature and scope of DSI, (c) define the main research topics or DSI, (d) prepare the 1st EUt+ Data Science Workshop, and (e) develop a collaboration framework for co-supervising PhD theses or / and participating in PhD theses' examination committees.

1.2.5 European Laboratory for Pedagogical Action - Research And Student-Centered Learning (ELaRA)

ELaRA focuses its efforts on several key research themes:

- Enhancing student-centered pedagogies for lifelong learning in technology education, promoting intellectual development, creativity, problem-solving skills, and cultural awareness.
- Investigating transformations in higher education, including changes in epistemologies, teaching practices, teacher development, and methods to facilitate educational change.
- Educating students about the societal implications of technology, encompassing ethical considerations and professional development.
- Promoting inclusivity in technology education by increasing participation among females and reaching a more diverse segment of society, including refugees.

In the framework of DSI the following research networking activities took place:

Title: ELaRA Summer Workshop (Online)

Event type: Workshop
URL:
Dates: 30/6/2021
Delivery mode: Online
Description: This was an event organised for ELaRA members. The purpose of this first Workshop was to get to know each other and start working together on the different subjects and identify and discuss the identity of ELaRA. During the Workshop participants also identified and discussed the themes of research, the organization of work within ELaRA, the question of funding and topics of collaboration. The Workshop was also an opportunity for planning the Autumn Symposium and set future actions.

Title: **ELaRA Meetings**

Event type: Meetings

URL: Via the Whaller platform

Dates: Monthly meetings, and two physical meetings at Limassol (September 2021) and Darmstadt (October 2021)

Delivery mode: Mostly online

Description: The aim of those meetings was to allow the ELaRA researchers to know each other and explore collaboration possibilities in terms of (a) grant proposal submission (preparation of an *ERASMUS+ KA2: Cooperation among organisations and institutions* proposal to be submitted by RTU in March 2022), (b) exchange ideas on how to enhance student-centered pedagogies, (c) define the main research topics or ELaRA, and (d) prepare the ELaRA Autumn Symposium entitled "Post-pandemic pedagogies" which is to be held 1n November 2021.

Preparation of an *ERASMUS+ KA2: Cooperation among organisations and institutions* proposal. The proposal is currently being discussed and will be submitted by the 23rd of March 2022. Possible coordinator: Latvia. All 8 Universities have expressed interest in participating in this proposal.

2 Upgrading of the Convergence Plan

This part of the report refers to the upgrading of the convergence plan and includes structural actions (such as the MoA for the creation of ERIs and ERO) undertaken by the EUt+ alliance as well as adaptation of the already planned convergence activities.

As explained in Deliverable 4.5.1[2], the EUt+ alliance followed two main strategies to develop an effective convergence plan regarding the research in general and the development of research units in particular:

+ A top-down approach in which the priorities identified in the proposal and confirmed via the steering committee of the EUt+ will be adopted and actively promoted within the EUt+ community. S3 priorities could be another driving force which can guide the top-down approach.
+ A bottom-up approach in which the strengths of the EUt+ community will be identified on the basis of some measurable metrics, such as existing (and complimentarity of) research infrastructure and research expertise of the EUt+ community [1], as identified via PhD programs, scientific publications and research interests.

As far as the first strategy is concerned, the Memorandum of Agreement (MoA) for the creation of the European Research Institutes (ERIs) and the establishment and staffing of the European Research Office (both to be signed in the next few months) is an additional step towards effective convergence.

As far as the bottom-up strategy is concerned, the activities reported in the previous section is a proof that interlinking between thematic networks and existing labs

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[2] D4.18: Convergence Plan towards common research units and institutes

within the EUt+ alliance can effectively lead to the establishment of ERIs (based on the agreed MoA), as shown in Figure 4 below.
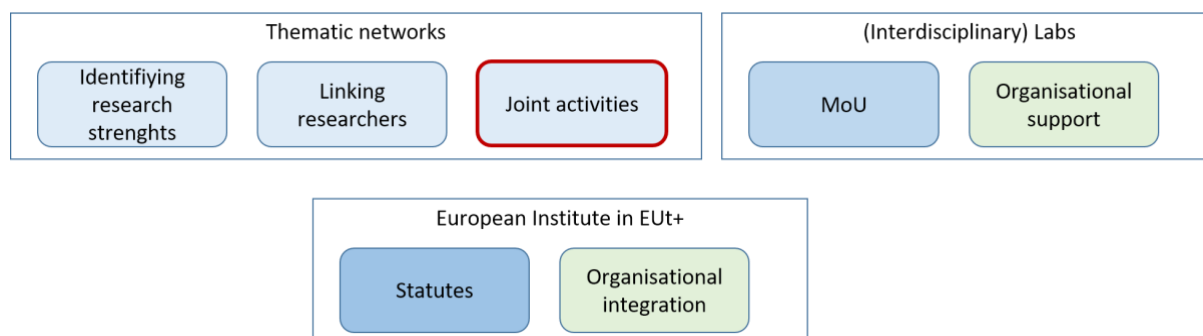

Figure 3: Interlinking between thematic networks, labs and Institutes and main activities within them

A main issue regarding the convergence plan, is the difficulty on getting a common meaning regarding the various research related structures across the EUt+ alliance and especially their legal status (if any). It seems that at least for the research institutes a clear definition must be adopted by the EUt+ alliance in order to facilitate the convergence plan that has been set in D.4.5.1.

2.1 The EUt+ research strengths

The initial convergence plan was developed around three different axes, namely:

+ Infrastructure
+ PhD programs
+ Research interests of the EUt+ researchers

The activities undertaken within the thematic networks help in getting additional information regarding the existing infrastructure and the research interests of the EUt+ researchers. A significant addition to the effective identification of the EUt+

research strengths could be facilitated upon successful completion of the work described in the EUt-EXTRAS project[3], and especially the tools provision in WPX4.

Thus, as far as the EUt+ research strengths are concerned , the updated convergence plan includes now the following axes:

+ Infrastructure
+ PhD programs
+ Research interests of the EUt+ researchers
+ Use of the EUt-EXTRAS tools and results

Conclusion

In this document an activity report regarding the main research results achieved during the first year of the EUt+ project (1/11/2020 – 31/10/2021) along with suggested modifications of the developed convergence plan (see Deliverable 4.5.1[4]) towards the creation of common research units was presented. The activities refer mostly to grant proposal preparation and submission (which led to securing six research grants) and research networking actions undertaken in the framework of bottom-up created thematic networks.

The Convergence Plan towards establishing common research units and institutes across EUt+ was updated considering top-down actions taken by the EUt+ alliance, such as the creation of the European Research Office (ERO) and the Memorandum

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[3] EUt-EXTRAS: European University of Technology - Experimentation to Transform Research Activities and Steering,

[4] D4.18: Convergence Plan towards common research units and institutes

of Agreement for the establishment of European Research Institutes (ERIs), as well the bottom-up activities like the ones undertaken in the framework of thematic networks. In addition, research steering tools like the ones foreseen in the EUt-EXTRAS project can be used as an additional axis for collecting information regarding the EUt+ research strengths.

References

[1] Giannoulakis, S. and Tsapatsoulis, N (2021): **Topic Identification via Human Interpretation of Word Clouds: The Case of Instagram Hashtags**, *IFIP International Conference on Artificial Intelligence Applications and Innovations*, pp. 283-294.

[2] Giannoulakis, S. and Tsapatsoulis, N (2019): **Filtering Instagram hashtags through crowdtagging and the HITS algorithm**, *IEEE Transactions on Computational Social Systems*, 6(3), pp. 592-603, DOI: 10.1109/TCSS.2019.2914080

[3] Tsapatsoulis, N and Djouvas, C (2019): **Opinion mining from social media short texts: Does collective intelligence beat deep learning?** *Frontiers in Robotics and AI*, vol. 5, article 138, DOI: 10.3389/frobt.2018.00138