

University Alliances as Learning Networks: Towards Responsible European Engineering Universities?

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Abstract— This Research to Practice Full Paper focuses on the European Universities initiative, which has launched the creation of European University networks to develop the European education sector and to enhance institutional capabilities for tackling grand societal challenges. We critically discuss the rationale and goals for establishing such alliances, focusing on the example of the EuroTeQ Engineering University. How can the formation of university alliances create learning networks and, in this way, increase moral reflexivity? For this purpose, we will consider the role of universities of technology in the 21st Century and the role that university alliances as learning networks can play to fulfil this role.

Keywords—university alliances, universities of technology, responsibility, reflexivity

I. INTRODUCTION

The European Universities initiative has launched the creation of European University alliances to develop the European education sector and to enhance institutional capabilities for tackling grand societal challenges, such as climate change [1]. One of these — the EuroTeQ Engineering University — emerges from six leading European universities of technology. These are: Technical University of Denmark (DTU), Eindhoven University of Technology (TU/e), École Polytechnique (l’X), Technical University of Munich (TUM), Czech Technical University (CTU) and Tallinn University of Technology (TalTech). These universities aim to establish a shared European campus, increase cooperation in the areas of research and innovation and set standards for educating the engineers of the future.

The academic literature has discussed “university alliances” mostly in the form of interest groups for member universities (such as, for example, the European University Alliance (EUA)). For example, scholars have analysed university alliances acting as political representatives [2] and discussed their role in shaping university technology transfer

policy [3]. While the European university alliances are also expected to do some of this interest group work, their focus lies in the collaboration to improve their own activities in education, research and innovation. Another novelty of these new alliances is that they are restricted to universities in EU member states. Other university alliances may be global and may comprise a much greater number of member universities. The creation of such university alliances, with roughly half a dozen members, aimed at setting educational standards, has few precedents.

This paper therefore aims to be a first exploration of how to best understand the benefits and opportunities such alliances create for their members. We critically discuss the rationale and goals for establishing such a European Engineering University. What advantage can universities gain from being part of such an alliance? How can the formation of university alliances create learning networks and help universities be reflective about their own role in society? Addressing these questions also requires us to consider the societal responsibility that universities of technology and their ecosystems can exercise, especially in educating future engineers [4].

Today many universities of technology are entangled with an “ecosystem” of companies and other societal stakeholders [5]. How can the formation of university alliances strengthen the connection between universities and their ecosystems, for instance in the field of student entrepreneurship? We distinguish three ways in which alliances provide platforms for universities to learn and mutually reflect on their activities.

First, universities can share know-how about course design and curricula change to co-creative education (*know-how*). Second, university alliances may have significant influence on the internal discussion and developments of universities about their future strategic plans. Resource pooling and economies of scale might enable universities to tackle projects they would individually be unable to do

(*strategy*). On a third level, university alliances might help universities reflect on their role and responsibility in their local environment and in their society (*reflexivity*) and hold each other accountable to these commitments. We follow the definition moral reflexivity provided in [6] as “holding a mirror up to one’s own activities, commitments and assumptions, being aware of the limits of knowledge and being mindful that a particular framing of an issue may not be universally held”.

The next section will sketch the new demands and responsibility at European universities and Engineering universities in particular. Later, we look at alliances and how they provide learning networks for know-how, strategy and moral reflexivity. Finally, the paper will explore an example, namely the EuroTeQ alliance and how it aims to increase learning and reflexivity among its partner universities.

II. RESPONSIBILITY AT ENGINEERING UNIVERSITIES

In addressing the responsibility of engineering universities, we enter a broader debate about the role of universities in society in the 21st Century. In order to understand the ways in which alliance formation may aid universities in fulfilling their role, we must first consider the expansion of functions and requirements that universities have come to be measured against. In this context, [7] has written of universities as ‘multiverses’ given the great variety of societal purposes they are meant to fulfil.

This trend is particularly strong at universities of technology. In addition to the traditional roles of education and research, these universities are increasingly expected to engage in innovation, which includes technology transfer, creating spin-off companies, and providing technical advice to policy makers and the broader community. Engineering universities are expected to develop technological solutions to societal problems and to cooperate with other actors who will be able to disseminate these solutions to society. All this takes place against the background of substantial changes in tertiary education. Reference [4] suggests this is a threefold process of “massification”, universities provide education to broad segments of society; “corporatization”, transforming universities into market-driven organisations [8], [9]; and, a process of “bureaucratization”, with the adoption of top-down management practices and performance indicators. Reference [4] points out that the purpose of the university in our society — especially with a view to sorting out tensions between its functions — is still unresolved. Such a conception “would doubtless embrace the pursuit of knowledge for its own sake as well as the realization of wider social and economic goals” [4].

One way to approximate the question of universities’ responsibility is to ask: *Who do they have responsibility towards?* In answering this question, we can

first point out that in some sense, all universities have a public mandate. Their funding (at least for research-led universities in Europe) is to a large extent provided by public funds. Thus, universities are — perhaps more than private businesses — to be held accountable by the public. To which extent do universities serve public interests, as opposed to their own interests? Second, universities are situated in a local city, or community, and for their education, research and innovation purpose they must somehow interact with this environment. Universities play a role in these local ecosystems and the question of responsibility also applies here. Finally, students often spend some of their most formative years in universities. What responsibility do universities have to their own students?

The narrative of grand challenges for society and engineers serves as the focus point for the recent changes in thinking about responsibility at engineering universities [10]. These challenges are now closely linked to an understanding of the future role of the (responsible) engineer. The main impact of linking the education of responsible engineers to challenges has been to identify a broad set of skills that are required. The Dutch technical universities make an interesting example because they were among the first to adopt the sustainable development goals and to rethink their education programmes accordingly. For example, the strategy for 2030 of the Eindhoven University of Technology states that: “Engineers of the future need a broad, open and cooperative mindset to meet the UN sustainable development goals, contribute to the technological revolution and create impact for society in a responsible and sustainable way. This implies reflection, analysis and participation in academic and public debates about technology and its impact” [11].

Linking education with societal challenges led to the identification of a broader set of skills needed for future engineers. This has often been done by giving students more choice and to let them tailor their programme according to their interests and ambitions. In a vision statement about the “Engineer of the Future”, philosopher Anthonie Meijers wrote that “[m]uch innovation takes place at the interface between disciplines and students must learn to seek and embrace the creative tension arising from multidisciplinary contacts” [12]. Besides interdisciplinarity, lifelong learning is another element on the agenda of engineering universities. While university degrees used to indicate the end of a learning process, this shifted to a model where the degree indicates that graduates are able to continue learning throughout their lifetime. As a result, learning how to learn became more central.

“Co-creation” is an umbrella notion of innovation practices in which diverse actors gather in an innovation process to achieve mutual benefits [13]. Co-creation can take different forms and take place in different situations. As co-creation is embedded, improving the innovation process is not an abstract endeavor, but requires interactions and

collaborations with innovation practitioners to touch on the specific situated aspects of co-creation. Universities are increasingly expected to engage in co-creative processes to contribute their particular expertise and resources to societal efforts. Understanding universities' role in co-creation is a key step to defining their responsibilities towards societal actors, like the public sector and industry.

In discussions about engineering ethics, the concept of responsibility has played a core role [14]. Here it has been understood as the "exercise of judgment and care to achieve or maintain a desirable state of affairs" [15]; see also [16].

Philosophers discussing the concept of 'responsibility' often distinguish between two different notions. First, "backward-looking" responsibility (blameworthiness) denotes the idea that some agents can be blamed for harms that came about or goods that did not come about. Second, "forward-looking" responsibility is the idea that some agents have a responsibility to act, whether or not it is possible to (individually) blame them for their (in)action. Ascribing the "backward-looking" type of responsibility to universities is very difficult. First, universities operate in a wider university 'system' — along with other universities, policy, and other educational and research institutes. It is virtually impossible to point at individual university players and blame them for undesirable results in the education of engineers or the production of research and innovation necessary for overcoming grand challenges.

However, the forward-looking sense of responsibility is very relevant in the context of grand challenges. Focusing on the forward-looking sense of responsibility lets us ask which institutions and protocols can help universities exercise this kind of responsibility. How can universities launch a process that makes it more likely that they will transform and act in a way that corresponds to the societal expectations placed on them? In other words, how can university alliances aid partners in tackling these new challenges and provide a platform for moral reflection? The next section turns to these questions.

III. UNIVERSITY ALLIANCES AS LEARNING NETWORKS

Despite increasing analytical interest in university alliances and networks at the turn of the century ([17]-[19]), recent studies observe that transnational networks are rarely mentioned or studied [20]. There are quite a few case studies on specific regions or countries, such as Scotland or Canada [19], [21]. Moreover, in the few occasions when they are, the advantages that universities receive from being a member of such an alliance has not been linked to explicit discussion of the broader role of universities in society and their role in grand societal challenges.

To illustrate this absence of considerations of university responsibility, a recent paper on university

alliances is instructive [20]. The authors examine the role of higher education institutions in 991 strategic partnerships and network alliances supported by the ERASMUS programme between 2014 and 2018. In their study, they create different categories of topics and of importance given to them within the networks. They differentiate between core, transversal, specialist, and marginal topics. The marginal topics include:

"cooperation between educational institutions and business; access for the disadvantaged; energy and resources; gender equality and equal opportunities; migrant issues; social and environmental responsibility of educational institutions; early school leaving and combining failure in education... civic engagement and responsible citizenship; cultural heritage; human rights; ethics, religion and philosophy; post-disaster rehabilitation; rural development and urbanization; transport and mobility; Roma and other minorities" [20].

The fact that these authors include extremely important university activities, such as "cooperation between educational institutions and business" in the category of "marginal topics" illustrates the diminished role that such topics of responsibility have received in the literature on alliance formation.

Recent studies on the European Universities Initiative suggest it promises to assign a more prominent role to topics of sustainability, focusing on societal challenges, and searching for strategies for civic participation [22]. The authors also observe that the alliances formed by the initiative could test different ways of inter-institutional cooperation and best practices sharing, ideally aiming to form a "network of networks". However, they observe that a weakness of the initiative is the "hyper-concentration" of universities from Germany, France, Italy and Spain. It is still too early to have results of how the alliances supported by the European Universities Initiative share resources to become more responsible towards their ecosystems. Given that the European Universities Initiative has only been launched in 2020, it is too early to analyse their empirical success. In the rest of this section we will put forward a conceptual scheme for how to study the success of university alliances as learning networks.

The guiding idea here is that university alliances are learning networks in which universities help themselves and others to exercise different types of responsibility. Reference [23] argues that "[t]he best possible outcome of any global university alliance is creation of opportunities for mutual advance, mutual learning, and positive organisational transformations" and "we refer to these positive outcomes as the creation of 'collaborative advantage'". In the following we will distinguish three types of advantages that universities may derive from alliances.

Know-how. The first level on which universities can learn from each other is basic know-how on how to improve education. Here, universities can learn from those who were early-adopters of educational innovation and thus already have experience with experimenting with new formats. Technical universities adapt their curricula to specific pedagogical approaches to address societal challenges, such as project based [24] or challenge based ([25]-[27]) learning. In the attempt to answer the global challenges of the 21st century, technical universities incorporate complex, sociotechnical innovation challenges [28] including human sciences [29] or ethics [30] in their courses. Pedagogical sciences focus on a wealth of topics to improve this education, such as how to motivate students [31], how to increase competences [32] and how to upscale this education [33]. Universities can exchange syllabi, reading lists, challenges and problems to work on and, more generally, advice on how to implement education that tries to encompass such societal considerations.

Strategy. Next to this restricted focus to the know-how of education, universities can exchange ideas and collaborate to pursue a common university strategy. On this level, which concerns the university as a whole as opposed to individual courses or modules, universities may share ideas about how best to collaborate with other societal actors, such as political actors, NGOs or industry. Here, the universities may exchange experience in setting up, maintaining and cultivating a university “ecosystem”, other societal actors who are (spatially) close to universities and who closely interact with it for the delivery of their services to society. University alliances may also be a way for formulating and implementing strategies for linking these ecosystems with each other. The resulting sharing of resources and knowledge may give a decisive advantage to these individual ecosystems [23].

Moral Reflexivity. On a third level, universities are required to rethink their own role and responsibility in society given the need to adapt to grand societal challenges. The last section sketched some of the issues of responsibilities for universities of technology. However, deliberating these issues, including them in the day-to-day practices of education, research and innovation requires a platform where universities can mutually reflect on their practices. University alliances may also be a good way to “hold themselves accountable” to implement considerations of responsibility. By adopting a similar framework, comparing and benchmarking their activities, universities can make themselves accountable to the other members of the alliance. Such a platform to reflect on one’s own activities and values necessarily requires a culture of open conversation and transparency to function well. Such a platform must be beyond merely showcasing success stories at universities. They must also allow in-depth discussions of failures and

obstacles encountered in implementing considerations of responsibility.

IV. THE EUROTEQ ENGINEERING UNIVERSITY

As was shown in the previous sections, the focus on responsibility is very recent and the empirical evidence of its enactment at technical universities and their alliances is still missing. In this section, we will sketch the ongoing research into the formation of the EuroTeQ Engineering University. As the EuroTeQ alliance states:

“we share the conviction that for effectively shaping value creation processes in technology, we need an approach that involves all of society as an active partner, including all relevant stakeholders in the process (developers, producers, and utilisers) alongside civil society and policy-makers. Yet, each of us lives in different societal structures and traditions. Therefore, value creation processes are shaped and perceived differently across different countries, requiring a situated approach to understanding and utilizing the science-society interface. We share the conviction that Europe with its European values in general bears successful societies, but we are interested in understanding the differences, unique features and best practices across the continent” [34].

As this vision document shows, the universities themselves view the alliance formation as the creation of a learning network where the university partners become responsible by learning from each other. The three levels of engagement described in the previous section may be studied as part of this process. How can the attainment of these learning goals be operationalized with the example of EuroTeQ?

Know-how. In the case of EuroTeQ, the exchange of engineering learning formats is likely to be the main objective on a practical level. Some universities within the alliance have experimented significantly with novel educational formats. The “EuroTeQ Collider” is one project within the EuroTeQ alliance formation and is an especially valuable project to study the dissemination of this kind of knowledge. The same instructions were given to all partner universities in the alliance. “During the EuroTeQ Collider project weeks, interdisciplinary and international teams composed of students, vocational trainees, young professionals and lifelong learners collaborate on challenges developed with the support of industry partners, start-ups, teachers and students at each institution” [34]. Universities are free how to implement the course and significant divergences are thus to be expected in the way that universities carry it out. For

example, there has been less experience so far with including external stakeholders in the education process at L’X or CTU. Here co-creation activities and closer cooperation with industrial partners were not traditionally part of the curriculum and were mostly optional for students. The existence of the university alliance and possibility of discussion and comparison with the other more experienced partners in this area facilitates the implementation of this format into the student’s curricula. In addition, the availability of courses, study programmes and academic units that aim at bringing ethics, responsibility, and social aspects of science and technology in these universities are ways in which the sharing of know-how may be studied.

Strategy. The partner universities within the EuroTeQ alliances have launched *maker spaces* in recent years, such as “Mektory” at TalTech; “Innovation Space” at TU/e; “UnternehmerTUM” at TUM; and “SkyLab” at DTU. Some of these serve as hubs of co-creative education and play a crucial role in re-orienting the university strategically, especially with a view to their ecosystem and external stakeholders. Inviting these maker spaces to engage with each other may likely be the most fruitful way to understand the creation and sharing of university strategy in the context of alliance formation. Next to the maker spaces in general, we will also analyse other co-creation institutes and instruments that support co-creative education to increase the moral reflexivity. Examples include the Intelligent Lighting Institute (ILI) at TU/e and Venture Labs in TUM.

Moral Reflexivity. Studying how universities define their societal role and hold each other accountable may be the most difficult aspect of studying alliances as learning networks. The creation of a common narrative is a central element in this. Partner universities, as well as similar European university alliances, have different discourses. These different conceptual narratives may each point to slightly different directions as to what should be done at universities. On the one hand, the idea of “responsibility” at universities suggests that there are obligations to society that universities must be sensitive towards. On the other, for some universities (and alliances) there is a strong link with entrepreneurship (a responsibility to make students entrepreneurial). The partner universities enter the alliance with different expectations and with a different conceptual framework. One crucial aspect of studying moral reflexivity will be to consider whether these narratives converge over time and how they interact with one another.

A crucial aspect of this is the regional aspect that comes along with such a European project. By combining universities from different geographical regions from Europe, universities with contrasting histories, societal embeddedness and resources are made to engage and learn from each other. In this context it is critical to study different universities’ needs, as well as some of the legacies and barriers that may prohibit them from more actively engaging or from changing

as a result of alliance formation. One consequence of such an imbalance may be observed in student behavior as they look for resources or teaching in other universities unavailable at their own, with possible asymmetric flows as a consequence. For example, after the first year of making courses open to students from other alliance universities, we see greater numbers from the Eastern European universities (CTU and Taltech) to TUM than the other way around.

Considering these historical and geographical aspects raises an important issue for the propensity of universities to engage in moral reflexivity. One important risk is the pursuit of an imperial style of sharing resources. This links to more traditional challenges in collaboration and those present in the European context. The alliance has old Western-European members and new East-European members. There are differences in world ranking that are seen as a strength by some participants, but as a challenge by others. And there are administrative burdens of semesters starting at different moments and having different lengths that do not form fundamental challenges, but nevertheless are very intensive to overcome. Alliances in general and specifically those addressing moral reflexivity may be fragile. Yet they may also be a golden opportunity for universities to reflect on themselves, transform and actively engage with questions of societal responsibility.

V. CONCLUSION

Forming university alliances may be a decisive step for engineering universities to transform themselves into responsible education facilities, geared for the challenges of the 21st century. The necessary changes in the curricula go beyond tinkering and require forming learning networks, engaging with external stakeholders and reflecting on the broader role of engineering universities in society. We described three ways in which alliances — such as the European university alliances — may facilitate this process: sharing know-how, aligning strategies and moral reflexivity. Against this background, we sketched how these benefits may materialize in the context of the EuroTeQ alliance.

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