ORIGINAL ARTICLE

The role of higher education institutions in transnational networks for teaching and learning innovation: The case of the Erasmus+ programme

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Abstract

Within the scholarship on internationalisation in higher education, transnational networks are seldom mentioned and even less studied. However, recent EU policy initiatives have attempted to enhance this form of internationalisation in order to tackle issues of employability, skills and competences and innovative curriculum development. Within European transnational networks, higher education institutions are posited to play a central role, as they are considered engines of socio-economic development in the so-called Knowledge Economy. To explore empirically the significance of higher education institutions in such networks, this article presents an analysis of 991 European networks promoting educational innovation within the Erasmus+ programme between 2014 and 2018. We analyse the role of higher education institutions by network size, governance, membership, and associated types of innovation. Our findings confirm expectations about the pivotal role of higher education institutions. However, expectations should be significantly nuanced, as higher education institutions tend to lead comparatively small networks. Also, higher education institutions tend to favour general innovative themes rather than specialised topics. Our contribution is threefold. First, it increases our understanding of higher education

institutions' capacity to engage with multi-level, multi-actor, multi-country innovation networks. Second, it sheds light on how higher education institutions have engaged with different priorities in EU's modernisation agenda. Finally, our paper extends the scholarship on internationalisation in higher education by looking at transnational networks in teaching and learning as an emerging phenomenon.

1 | INTRODUCTION

Research on internationalisation in higher education has evolved over the last decades following the introduction of policies, practices and strategies, such as student and staff mobility, double degrees and offshore campuses, as well as research collaborations and co-authorships (Fumasoli, 2019; de Wit & Altbach, 2020). Against this backdrop, transnational networks of innovation in teaching and learning are a relatively recent and understudied phenomenon (Knight, 2013). However, the rise of the idea of a *knowledge society* (Dagen & Fink-Hafner, 2019) and the *knowledge economy* (Chou & Gornitzka, 2014) has driven policy agendas nationally and internationally towards issues of employability, skills and competences. While this has happened in Europe since the adoption of the Lisbon Agenda in 2000, global trends can be identified in the discourse on the Grand Challenges and on the UN Sustainable Development Goals (de Wit & Altbach, 2020). This has also meant a renewed interest in teaching and learning, in order to better prepare graduates for labour markets that require, for instance, transferable skills, problem solving, skills in the use of information and communications technologies and cross-disciplinary expertise.

Against this backdrop, regional initiatives have led to the establishment of transnational networks, which, pooling different resources, are deemed instrumental in promoting innovation (Cabanda et al., 2019; Chou & Ravinet, 2015), even though some scholars have pointed to rising inequality between partners (Altbach & Knight, 2007). In Europe, the Erasmus+ programme of the European Union has funded several types of innovation networks to strengthen European capacity for innovation in teaching and learning and to address the current challenges related to preparing graduates for ever-changing labour markets.

In the last Erasmus+ programme (2014–2020) two particular types of transnational networks—(1) *strategic partnerships* and (2) *knowledge alliances*—were designed to involve higher education institutions as leading organisations. The intention of the European Commission was to use these two types of networks for scaling up processes of institutional innovation in teaching. Specifically, *Key Action 2* of the Erasmus+ programme addresses

> [...] increasingly global challenges—such as aligning graduates' skills to labour market requirements, integrating higher education systems, incorporating technological advances into programme design, offering interdisciplinary and multidisciplinary curricula, building expertise to tackle contemporary global issues, as well as establishing flexible accreditation systems for alternative learning paths. (Erasmus+, 2019)

Between 2014 and 2018, a total of 991 *strategic partnerships* and *knowledge alliances* were funded with the double objective to generate and diffuse innovation in higher education, as well as upgrade competences across the European national systems.

This paper analyses the role of higher education institutions in *strategic partnerships* and *knowledge alliances* in order to understand how higher education institutions engage in and contribute to innovation for teaching and learning within transnational networks. Hence our aim is twofold; (1) we map the landscape of transnational networks of higher education, (2) we examine how higher education institutions position themselves within the

framework of Erasmus+. In particular, we investigate whether there is a relationship between the role of higher education institutions and network size, network governance, as well as type of teaching innovation.

The starting point for our research was the assumption that higher education institutions play a central role within transnational networks. To corroborate our assumption, we investigated (1) What are the characteristics of transnational networks promoting innovation in teaching and learning, particularly in terms of size and membership? (2) What roles do higher education institutions play within transnational networks; particularly, in the governance of the network (leader or partner), in relation to the type of innovation pursued (online teaching and learning, multi-disciplinarity, etc.), and the challenge addressed by the network (employability, digital skills, etc.)?

This article is structured as follows. Following a review of literature, we present our analytical framework. We describe characteristics of *strategic partnerships* and *knowledge alliances* in the Erasmus+ programme and the positioning of higher education institutions in the programme. Next, in section three, we discuss our methodology, data and coding. Findings are presented in the fourth section by means of descriptive statistics and cluster analysis. Finally, we reflect on the significance of our findings with respect to higher education institutions as specific organisations and in relation to internationalisation in higher education.

2 | INTERNATIONALISATION STUDIES AND TRANSNATIONAL NETWORKS FOR TEACHING AND LEARNING

2.1 | Literature review

Our review of the literature has revealed a preponderance of policy reports (e.g., CHEGG & CHEPS, 2020; Karvounaraki et al, 2018) and case studies (Culver & Kniola, 2013; Montgomery, 2016; Ottewil et al., 2005; Sliwka, 2003). We have thus decided to outline the most significant papers that have, to some extent, elaborated conceptually on transnational networks of innovation in teaching and learning.

Reviewing 13,300 resources Kosmützky and Putty (2016) identified six themes in the literature: "(a) Overview and trends, (b) Quality assurance and regulation, (c) Teaching and learning, (d) Institutional and management perspectives, (e) Governance and policy, and (f) Student choice and student mobility". (Kosmützky & Putty, 2016, pp. 16–17) The European dimension and transnational networks (education hubs) are included within these themes. The selection of themes shows that higher education networks do not correspond to a dominant theme in the literature, yet related terms, such as education hubs, are included. Within the six themes, specific aspects linked to international networks and their impact on innovation are discussed. For example, in teaching and learning on a micro-level, "teachers undertaking transnational programs have to be equipped with skill-sets marked by high levels of intercultural understanding" (Kosmützky & Putty, 2016, p. 18).

Knight (2013) proposed that *international education hubs* build on the "connectedness or a network of interactions among engaged local and international actors undertaking cross-border education activities to achieve their individual objectives as well as the collective goals" (p. 380). Knight's conceptual framework of international educational hubs distinguishes three models with different rationales focusing on *students*, *talent* and *knowledge or innovation*. Student hubs are the most popular and seek "to increase the capacity of the higher education system both quantitatively and qualitatively" (Knight, 2013, p. 381). The talent hub orients to expand the skilled workforce, while the knowledge or innovation hub intends to generate and apply knowledge, fostering an innovation-based economy. The author applies the framework to six educational hubs in Asia, Africa and the Middle East.

Despite not having a central position in the narrative on internationalisation, the concept of international networks is present also in Knight's previous work (2008), as she refers to multiple characteristics of the form and function of networks. Specifically, international networks are discussed as an internationalisation strategy coupled with institutional agreements. Further, Knight discusses networks as forms of regionalisation framed in globalisation processes, including South-South networks and as public-private collaborations within the *knowledge*

society. Finally, the author notes that transnational networks are instrumental to processes of internationalisation and are used by higher education institutions to gain competitive advantage, notably for reputation and accreditation purposes and to step up their internationalisation activities (see also Kehm & Teichler, 2007).

Knight (2013) observed that the information on education hubs is mostly available in grey literature. This seems to continue being the case, as networks of institutions are discussed as a type of new provider in higher education primarily allowing for the accreditation of their own members. Nonetheless, the literature also identifies other types of transnational networks in higher education (Fumasoli et al., 2018; Vukasovic & Stensaker, 2018).

Finally, we note the European University Initiative in 2017, which aims at establishing networks of universities across the EU and enabling students to obtain a degree by combining studies in several EU countries. The EUI has generated grey literature (e.g., Karvounaraki et al, 2018) and one might expect that, as the initiative consolidates, further studies will be published.

2.2 | The EU modernisation agenda for higher education and cooperation in education and training

The Erasmus+ programme developed two distinctive types of transnational projects to further the *modernisation agenda of higher education* (European Commission, 2017) and the strategy for cooperation in education and teaching *ET 2020* (European Commission, 2015). In this respect, the strategic partnerships and the knowledge alliances represent an organisational innovation and are meant to contribute to the European governance of higher education, to its harmonisation and to the further construction of stable and efficient linkages across borders and institutions. The networks were designed to support the EU objectives to: strengthen higher education by increasing attainment levels, improve quality and relevance, foster mobility and cross-border cooperation, the knowledge triangle, governance and funding. Operating since 2014, strategic partnerships and knowledge alliances have partly anticipated the 2017 updated modernisation agenda objectives, which have increasingly highlighted the social dimension of higher education in a number of ways. The agenda has addressed skills mismatches, fostered inclusive and connected higher education systems and induced higher education institutions to contribute to innovation. The agenda has made higher education systems increasingly effective and efficient. Structured around a minimum of three partners, strategic partnerships and knowledge alliances should design, deliver and disseminate teaching and learning innovation, including technologies such as MOOCs or open access learning e-platforms. They tackle new models of educational delivery and a broader variety of study modes, as well various types of mobility (blended, virtual). Fundamentally, the variety of partners with which higher education institutions need to relate within strategic partnerships and knowledge alliances, is meant to enhance creativity and diffuse best practices at European, national and local levels, as well as to broaden the scope for impact by integrating such activities within higher education institutions and other organisations.

The database consisting of 898 strategic partnerships and 93 knowledge alliances between 2014 and 2018 points to a variety of geographical, thematic, organisational types, activities and objectives. Although it is beyond the scope of our dataset, we note that from 2019, "European Universities" was added besides strategic partnerships and knowledge alliances, with the objective to establish inter-university campuses where students and staff would move supported by new joint and flexible curricula in the three cycles. This new type of project reflects the European University Initiative, which aims to encourage the emergence by 2024 of around 20 bottom-up networks of universities in the EU.

Focusing on the period considered in our analysis (2014–2018) the two types of Erasmus+ transnational networks were characterised as follows.

Strategic Partnerships were aimed at skills development, social inclusion, open and innovative practices of teaching and learning, training educators, transparency, recognition of skills and qualification, sustainable investment, performance and efficiency. Strategic partnerships were transnational projects designed to develop and

share innovative practices and promote cooperation, peer learning, and exchanges of experiences in the fields of education, training, and youth. They were of different sizes and conducted different activities depending on the objective of the project, the organisations involved, the expected impact, and other elements. They could last between 24 and 36 months for a maximum of €150,000 a year. Applications were handled at a national level, through national agencies in countries where the applicant organisation was established.

Knowledge Alliances sought to boost innovation in higher education, business and in the broader socio-economic environment; develop and implement new learning and teaching methods (new multidisciplinary curricula, learner-centred and problem-based teaching and learning); organise continuing educational programmes and activities with and within companies; develop solutions for challenging issues, product and process innovation (students, professors and practitioners together); develop entrepreneurial mind-set and skills. Each knowledge alliance needed a minimum of six independent organisations, of which least two had to be higher education institutions, and of which at least two must be enterprises or businesses. Projects could last two to three years. The maximum funding for a two-year project was €700,000, and the maximum funding for a three-year project was €1,000,000. Applications were submitted to the Education, Audiovisual and Culture Executive Agency.

Participating countries were 28 EU member states, EEA countries (Iceland, Liechtenstein, Norway), Turkey, the Republic of North Macedonia and Serbia (the latter since 2019).

2.3 | Higher education institutions as central players in strategic partnerships and knowledge alliances

Higher education institutions are conceptualised as fundamental institutions in contemporary societies (Frank & Meyer, 2020; Zapp & Ramirez, 2019), and they have been discussed as such in the framework of European integration (Corbett, 2005; Fligstein, 2008; Maassen & Olsen, 2007), and in multi-level governance (Fumasoli, 2015). Traditionally considered as organisations where experimentation can be conducted and knowledge created (Kerr, 1994), higher education institutions provide legitimacy to new practices of teaching and learning (Frank & Meyer, 2020). Higher education institutions are understood to hold the necessary expertise and resources for inter-organisational innovation to flourish and become institutionalised (Jensen et al, 2020).

The specific nature of higher education institutions as organisations has been articulated around their ability to handle an increasing variety of academic disciplines, to accommodate diverse academic staff and educate a diverse body of students. Higher education institutions are considered resilient organisations able to adapt to external pressures—including economic, political and social pressures. Importantly, higher education institutions need to manage several sets of stakeholders and prove they can successfully educate, train as well as carry out research and come up with impactful innovation.

This characterisation of higher education institutions might appear idealised and not reflecting the pressures, complexities and tensions that higher education institutions experience. Nonetheless, it can be contended that, as knowledge intensive organisations with a public mission, they appear to be well positioned to contribute significantly to innovation networks in teaching and learning. Meanwhile, the ideal of the higher education institution as a pivotal organisation in tackling societal issues through transnational networks would benefit from further empirical testing. The strategic partnerships and knowledge alliances of the Erasmus+ programme offer the opportunity to investigate the scale and scope for higher education institutions to play a role in transnational networks of higher education when substantial resources are made available.

Most of our current knowledge about higher education institutions' role in transnational networks comes from studies of networks primarily aimed at scientific research in varied fields, not focusing on teaching and learning innovation. Such studies show that higher education institutions play a key role within scientific research networks. In the context of the European Framework Programmes, higher education institutions have been found to

coordinate many projects, in different fields from information technology (Protogerou et al, 2010) to nanotechnology (Pandza et al, 2011); moreover, such core participants have come to occupy increasingly central positions (Breschi & Cusmano, 2004). Higher education institutions, at least in some fields, coordinate larger and more diverse networks compared to firms (Pandza et al, 2011). Drawing on findings from this literature, and given the nature of strategic partnerships and knowledge alliances as transnational innovation networks in teaching and learning, we propose the following. In terms of the relationship between *role of* the *higher education institution* and *network size*, we expect that (a) the larger the network, the more important higher education institutions are, in terms of (1) a greater likelihood to play a coordinating role and (2) the number of (other) higher education institutions they collaborate with. Network size is here measured by the number of network participants and grant amount.

In terms of the relationship between *role of the higher education institution* and network *membership diversity*; we expect that (b) the more countries participate in the network, the more important higher education institutions are. Also, we expect that (c) the greater variety of types of participants in the network, the more important higher education institutions are.

In terms of the relationship between role of the higher education institution and network *topic diversity*, we expect that (d) the more topics are addressed by the network, the more important higher education institutions are.

3 | DATA AND METHODOLOGY

Our dataset includes information about 991 transnational networks funded by the Erasmus+ programme between 2014 and 2018. Out of 991 networks, 898 were funded under the strategic partnership calls and 93 networks were funded under the knowledge alliance calls. The dataset was cleaned and partially re-coded, particularly in order to (dis-) aggregate innovation topics and types of organisations involved. First, we performed a thorough cleaning of the names of the higher education institutions and other organisations, which were often reported under different names and in different languages. Second, we partially re-coded the types of organisations participating in the programme. Participants initially indicated 88 different organisation types; these were aggregated into a smaller number (19) of macro-categories. Third, we partially re-coded the topics reported (from an initial list of 54 different topics, we re-coded those topics that appeared only once, leaving us with 50 different topics, each reported by at least ten different networks—networks reported up to three topics each).

To ensure inter-coding reliability we have met several times over a period of six months to discuss preliminary coding, specific issues during the coding process and the final outcome of the coding process. The overall coding, according to these three stages, has been carried out by a research assistant, who has worked closely with one of the authors. Various descriptive statistics and a cluster analysis were carried out.

The number of *participants* involved in the 991 transnational networks was 6,572. However, the number of *different organisations* involved was lower since organisations could participate in more than one network: there were 3,050 different higher education organisations that participated. Each network was led by a project coordinator and comprised on average from three to eighteen participants (including the co-ordinator) from on average 4.9 different countries (programme specifications require the participation of minimum three and maximum fourteen countries). The 93 *knowledge alliance* networks were on average larger (10.9 participants, 5.8 countries) and received comparatively larger grants (on average 911,373 euro) than the 898 *strategic partnership* networks (6.2 participants, 4.8 countries, on average 275,156 euro). Overall, there were 131 networks granted a total of 37.9 million euro in 2014; 170 networks in 2015 were granted a total of 50.6 million euro; in 2016 a total of 62.7 million euro were accorded to 182 networks; 223 networks were granted in 2017 a total of 77.5 million euro; in 2018 the programme provided 103.1 million euro for 285 networks. The total of all grants awarded over this 5-year period amounted to 331.8 million euro.

4 | FINDINGS

4.1 | Features of the Erasmus+ programme

Coordinators and partners from 34 different countries participated in the Erasmus+ programme. The largest shares of network coordinators came from Spain (9.28%) followed by Germany (8.48%), the UK (7.97%), Poland (6.66%) and Italy (6.36%). The largest shares of non-coordinating partners came from Spain (9.49%), Italy (9.29%), Germany (7.58%), the UK (6.84%) and Belgium (4.96%). Some countries appeared more often as coordinators than as partners, while for some countries the opposite occurred. It is remarkable that Non-EU Programme countries (except Serbia) participated more as network coordinators than partners.

In terms of the objectives that networks aimed to achieve, each network could report up to three topics; in total 50 different topics are identified. Information about topics is not available for all networks; in particular, for *knowledge alliance* networks launched between 2015 and 2018. Hence, we only have information about topics for 918 out of 991 networks.

The distribution of topics among networks was skewed with a small number of topics being chosen by most networks. Considering the first topic listed (which we assume being the most important one for the networks) the first eight most frequently chosen topics accounted for 67% of the networks.

Furthermore, certain topics appeared more frequently as first topics while others appeared more frequently in second or third position. It is notable that a very frequent topic like "ICT—new technologies—digital competences" (the second most frequently occurring topic overall) tends to appear most frequently in third position; this seems to be a transversal objective which is present in a number of networks without being the core focus of the initiative. In fact, many of the most frequently occurring topics appear, more often in second or third position, being secondary objectives ancillary to a different main network focus.

We have classified topics according to their prominence in the programme, based on two dimensions: *frequency* and *importance* (whether they constituted the focus of the project, being more often in first position, or not). In particular, we classify topics as "high frequency" if they are in the top third of the frequency distribution (and "low frequency" otherwise), and "high focus" if they appear most often as first topics (and "low focus" otherwise). This way we can classify topics into four possible categories according to their prominence in the programme: *core topics* (high frequency and high focus topics that play a central role in the programme, appear frequently and are often the first topic of the network); *marginal topics* (low frequency and low focus topics that play a marginal role in the programme and rarely appear as first topics); *transversal topics* (high frequency and low focus topics that provide the backdrop to many networks without being the main focus); and *specific topics* (low frequency and high focus topics are quite rare but when they appear they tend to be the main focus of the project).

Core topics comprised new innovative curricula and educational methods and the development of training courses (24.14%); open and distance learning (6.65%); quality and relevance of higher education in partner countries (4.69%); enterprise, industry, small medium enterprises, entrepreneurship (2.57%); creativity and culture (2.04%); and quality improvement institutions and methods, school development (1.88%).

Transversal topics were ICT, new technologies and digital competences; international cooperation, international relations and development cooperation; entrepreneurial learning and entrepreneurship education; research and innovation; inclusion and equity; health and wellbeing; labour market issues including career guidance and youth unemployment; pedagogy and didactics; intercultural and intergenerational education and (lifelong)learning; overcoming skills mismatches (basic and transversal); teaching and learning of foreign languages; environment and climate change; recognition, transparency and certification; quality assurance.

Specific topics comprised disabilities and special needs; EU citizenship, EU awareness and democracy; key competences (including mathematics and literacy) and basic skills; integration of refugees; regional dimensions and cooperation; agriculture, forestry and fisheries; reaching the policy level and dialogue with decision makers; social dialogue; social entrepreneurship and social innovation.

Marginal topics were cooperation between educational institutions and business; access for disadvantaged; energy and resources; gender equality and equal opportunities; migrant issues; social and environmental responsibility of educational institutions; recognition (non-formal and informal learning and credits); early school leaving and combating failure in education; natural sciences; youth (participation, youth work, youth policy); civic engagement and responsible citizenship; cultural heritage and the European year of cultural heritage; economic and financial affairs (including funding issues); home and justice affairs (human rights and rule of law); ethics, religion and philosophy (including inter-religious dialogue); post-conflict and post-disaster rehabilitation; rural development and urbanisation; transport and mobility; Roma and other minorities.

4.2 | The role of higher education institutions

A total of 3,033 individual participants were involved at 6,572 instances in the networks. Higher education institutions play a key role in the Erasmus+ programme, 1,280 higher education institutions participated 4,428 times (67.38% of total participations), including 856 as coordinators (86,38% of total coordinators). After higher education institutions, the most active participants were non-governmental organisations, associations and social enterprises (584 participations, including 50 as coordinators) and small and medium sized enterprises (553 total participations, including ten as coordinators). Universities coordinated 783 strategic partnerships (87.3%) and 73 knowledge alliances (78.49%). Table 2 lists some key network characteristics according to the type of coordinating organisations. Of the nineteen organisation types present in the programme, only fifteen played the role of coordinators at least once (listed in Table 1). The remaining four types (national public bodies, schools at pre-primary, primary and secondary levels) did not feature as coordinators at all.

Higher education institutions appeared relatively more often as coordinators than as network partners (the coordinator to network partner ratio was 1.28). Other organisations that similarly had a more prominent role as coordinators than as partners (although comparatively fewer) were vocational training centres. The coordinator to partner ratio was 1.97 for tertiary level vocational training centres, and 1.28 for secondary level ones.

The higher education institutions that coordinated most projects (20 and more) were: University of Ljubljana and KU Leuven (33), University of Bologna (25), Oporto Polytechnic Institute (23) and University of Tartu (20). There were 43 higher education institutions that each coordinated between ten and nineteen projects. The top five of these were University of Vilnius, University of Vienna and University of Porto (18), University of Malta and Politecnico Milano (17).

If we look at France, Germany and the United Kingdom, we find that German higher education institutions coordinated 83 projects, and no individual institution coordinated more than three times. In the UK, 52 universities coordinated 79 projects, with Manchester Metropolitan University, University of Exeter and University of Gloucestershire being coordinators seven times. Finally, 34 French higher education institutions coordinated 43 projects, with University of Bordeaux coordinating four projects. We note that eight knowledge alliances were coordinated by German institutions, five by UK institutions and none by French institutions. Italy (15) and Spain (14) coordinated 31,1% of all knowledge alliances.

The other twelve types of organisations were more often partners than coordinators. However, higher education institutions, on average, did not coordinate the largest networks in terms of number of participants, countries, or grant value. The largest networks in terms of number of participants were coordinated by cultural organisations, while the largest ones in terms of number of countries and grant values were coordinated by large enterprises.

The rest of our analysis focuses on the role of the higher education institutions in the governance of the networks, considering in particular whether they played a coordinating role in the network and what share of the network membership was composed of higher education institutions. The role of higher education institutions is differentiated by network characteristics, in particular network size and membership (Section 4.2.1) and by the type of teaching innovation that the networks were designed to deliver (Section 4.2.2).

TABLE 1 Network coordinators by organisation type

Coordinator type	% Coordinated projects	Average number of participants	Average number of countries	Average grant value (euro)
Accreditation, certification or qualification body	0.50	5.00	8.00	306,825
Consultancy organisation	0.20	4.50	5.50	191,820
Cultural Organisation	0.40	7.00	8.75	308,777
Higher education institution (tertiary level)	86.38	4.93	6.54	330,601
Large enterprise	0.20	5.00	10.50	708,937
Local Public body	0.30	4.33	7.00	322,547
Media organisation	0.10	6.00	8.00	268,520
Non-governmental organisation/ association/social enterprise	5.05	5.22	7.56	366,738
Regional public body	0.10	4.00	6.00	345,704
Research institute/Centre	1.61	4.88	7.63	483,224
School/Institute/Educational centre—Adult education	0.81	5.50	7.50	466,851
School/Institute/Educational centre—Vocational Training (secondary level)	0.50	3.40	4.00	140,651
School/Institute/Educational centre—Vocational Training (tertiary level)	1.92	4.58	5.79	243,277
Small and medium sized enterprise	1.01	4.60	6.00	302,323
Social partner or other representative of working life (chambers of commerce, trade union, trade association)	0.91	4.33	8.89	505,407

Source: Authors.

4.2.1 | Involvement of higher education institutions by network characteristics

Table 2 illustrates different network characteristics according to the role of higher education institutions, considering four possibilities in which higher education institutions are: (1) neither a partner nor a coordinator; (2) only a partner; (3) only a coordinator; (4) both partner and coordinator.[1]

Networks where the higher education institution is only a partner but not a coordinator are on average larger (in terms of number of number of partners, funding, and number of participating higher education institutions) and they include a greater variety of participating countries. Instead, when the higher education institution plays the role of coordinator (particularly when only a coordinator, not also a partner), the networks are on average smaller in terms of size and have less variety in participating countries. On the other hand, networks coordinated by higher education institutions (without any other higher education institutions involved) have a greater variety of partners (greater number of different types of partners) and of topics. However, networks where higher education institutions do not appear at all are even smaller, such networks are coordinated by NGOs and adult and vocational training institutions.

We can derive some additional insights from correlation analysis. Coordination by higher education institutions is significantly and positively correlated with the number of higher education institutions involved, and

TABLE 2 Network characteristics by role of higher education institution

Role of higher education institution	Network size			Diversity of network members		Diversity of topics	Network governance	
	Average number of partners	Average grant value	Average number of higher education institutions (excluding coordinators)	Variety of partners	Average number of participating countries	Average number of topics	Experience of the coordinator	Share of higher education institution partners (excluding coordinators)
Neither partner nor coordinator	5.00	165,027	0.00	2.80	3.60	3.00	1.00	0.00%
Only partner	6.95	299,414	3.70	3.14	4.97	2.73	2.00	54.29%
Only coordinator	4.92	210,751	0.00	3.67	4.00	2.83	5.92	0.00%
Both partner and coordinator	6.24	288,425	3.71	2.10	4.88	2.85	6.07	60.22%
Total	6.30	288,114	3.64	2.26	4.87	2.83	5.53	58.36%
p-value	.002***	.01**	.00***	.00***	.07*	.01**	.00***	.00***

Source: Authors.

*significant, **very significant, ***extremely significant.

with the experience of the coordinator (since higher education institutions tend to coordinate many projects). Coordination by higher education institutions was also significantly correlated with smaller size networks (in terms of number of partners, funding and numbers of higher education institutions) and with the number of participating countries. Networks led by a higher education institution tend to be smaller and involve a greater number of other higher education institutions.

If we consider the share of partners that are higher education institutions (excluding the coordinator), we find that the share of higher education institutions involved is significantly positively correlated with the number of participating countries and number of topics, but significantly negatively correlated with the number of partners and the variety of partner types. Networks with a greater relative presence of higher education institutions tend to be less varied in terms of types of partners, but more varied in terms of participating countries and topics.

Finally, we found that the grant amount is significantly positively correlated with the network size (measured in terms of the number of institutions and participants involved), the experience of the coordinator (average number of networks coordinated) and the variety of partners (number of different types of partners, number of participating countries). In contrast, the grant amount is significantly negatively correlated with coordination by a higher education institution, the share of higher education institution partners involved, and the number of topics. Hence, larger and more varied networks, and networks led by a more experienced coordinator, received on average more funds, but networks with greater involvement of higher education institutions and a greater variety of topics received less funds.

4.2.2 | Higher education institution involvement according to the content and prominence of the challenges addressed

Five general challenges, twelve thematic clusters and four prominent types of topics
We have analysed whether higher education institution involvement differs according to the prominence and nature of the challenges addressed by the network. To reduce the topics to a more manageable number of categories referring to different types of challenges addressed by the network, we clustered the 918 networks for which we have information about topics, based on reported topics. We used 50 variables for 50 different topics. Each variable takes the value 3 if the topic was mentioned as the first topic, 2 if it was mentioned as a second topic, 1 if it was mentioned as third topic, and zero otherwise. We ran a hierarchical clustering algorithm since we did not want to impose a number of clusters in advance. In particular, we implemented a Wards' linkage algorithm with Canberra distance. The Wards' linkage method minimises within-group variance and at each step it optimises the partition obtained through the progressive aggregation of each element.

We identified twelve significant clusters, based on the analysis of the Duda-Hart and Calinski-Harabaz statistics. The Duda-Hart statistic has a local maximum with lowest T-squared for $n = 12$ clusters. The Calinski-Harabaz statistic is decreasing monotonically so it does not provide a maximum value which could be a guideline for the optimal choice of the number of clusters. However, after $n = 12$ the statistics drop substantially. The clusters were then analysed according to the frequency of occurrence of each topic in each cluster, considering only those topics that displayed significantly different means across clusters. We named the clusters based on the interpretation of these patterns.

Furthermore, we have aggregated the clusters into five macro-categories that capture the nature of the broader challenges that these networks were attempting to address: (1) broad economic development and social improvement objectives; (2) competences and skills development; (3) new educational methods; (4) promoting opportunities for students (widening access, employability, entrepreneurialism); (5) promoting quality and standards.

General Challenge I: Four clusters addressed broad economic development and social improvement

Cluster 1: Regional and sustainable development. Particular attention was given by 228 networks to the topics of agriculture, forestry and fisheries; cooperation between educational institutions and business; creativity and culture; energy and resources; environment and climate change; intercultural and intergenerational education, and (lifelong)learning; regional dimensions and cooperation; teaching and learning of foreign languages; new innovative curricula, educational methods and the development of training courses.

Cluster 2: Promoting EU cohesion. The focus of 68 networks addressed EU citizenship; EU awareness and democracy; quality and relevance of higher education in partner countries; social dialogue; new innovative curricula, educational methods and the development of training courses.

Cluster 3: Promoting societal wellbeing. The work of 54 networks addressed health and wellbeing; youth (participation, youth work, youth policy); new innovative curricula, educational methods and the development of training courses.

Cluster 4: Promoting scientific and business cooperation. The attention of 69 networks addressed international cooperation, international relations and development cooperation; the natural sciences; new innovative curricula, educational methods and the development of training courses.

General challenge II: Two clusters addressed competences and skills development

Cluster 5: Improving competences. The focus of 54 networks was on addressing key competences (including mathematics and literacy) and basic skills; pedagogy and didactics; economic and financial affairs (including funding issues).

Cluster 6: ICT and digital competences. The work of 81 networks addressed specifically ICT, new technologies and digital competences.

General challenge III: Two clusters addressed new education methods

Cluster 7: Innovative pedagogy. Particular attention was given by 50 networks to research and innovation; new innovative curricula, educational methods and the development of training courses.

Cluster 8: Open and distance learning: The focus of 86 networks addressed open and distance learning; new innovative curricula, educational methods and the development of training courses.

General challenge IV: Three clusters addressed efforts to promote opportunities for students

Cluster 9: Entrepreneurial learning. The attention of 57 networks addressed entrepreneurial learning and education for entrepreneurship; gender equality and equal opportunities.

Cluster 10: Access and inclusion. The work of 66 networks addressed access for disadvantaged; civic engagement and responsible citizenship; disabilities and special needs; inclusion and equity; integration of refugees; migrant issues; post-conflict and post-disaster rehabilitation.

Cluster 11: Promoting employability. The themes of 54 networks addressed enterprises, industry, small and middle size enterprises and entrepreneurship; labour market issues, career guidance and youth unemployment.

General challenge V: Promoting quality and standards

Cluster 12: Quality assurance and recognition of qualifications. The work of 51 networks addressed the topics of overcoming skills mismatches (basic and transversal); quality assurance; quality improvement institutions and methods (including school development); recognition (non-formal and informal learning and credits); recognition, transparency and certification.

Table 3 shows how the characteristics of the networks and the role of higher education institutions differed according to the challenges that they addressed (for the 918 networks for which topics are available). We found that higher education institutions tend to comparatively often coordinate networks that address broad economic development and social improvement challenges, as well as those that have the objectives to improve

TABLE 3 Network characteristics and the role of higher education institutions by general challenges and twelve thematic clusters

General challenges	Clusters	Network size			Diversity of network members		Diversity of topics	Network governance		
		Average number of partners	Average grant value	Average number of higher education institutions (excluding coordinators)	Variety of partners	Average number of participating countries	Average number of topics	Experience of the coordinator	Share of networks coordinated by a higher education institution	Share of higher education institution partners (excluding coordinators)
Broad economic development /social improvement objectives	Regional and sustainable development	6.26	285,762	3.58	2.26	4.81	2.82	5.37	91.23%	58.27%
	Promoting EU cohesion	6.28	262,524	3.88	2.16	5.18	2.84	4.06	85.29%	61.00%
	Promoting societal wellbeing	5.70	297,828	3.46	2.07	4.52	2.85	5.56	90.74%	60.59%
	Promoting scientific and business cooperation	5.97	270,597	4.09	1.74	5.01	2.75	6.19	88.41%	66.94%
Competences and skills development	Improving competences	6.11	294,896	3.87	2.13	4.83	2.81	7.20	87.04%	63.25%
	ICT and digital competences	6.58	282,244	3.75	2.19	4.90	2.85	6.28	88.89%	57.45%
New educational methods	Innovative pedagogy	6.58	308,745	3.60	2.58	5.18	2.86	6.04	86.00%	56.54%
	Open and distance learning	6.20	292,007	3.57	2.34	4.85	2.86	6.15	87.21%	56.76%
Promoting opportunities for students	Entrepreneurial learning	6.65	291,368	3.89	2.30	5.21	2.89	4.11	84.21%	58.99%
	Promoting employability	6.72	322,215	2.81	2.93	4.52	2.87	4.72	85.19%	45.39%
	Access and inclusion	5.94	288,927	3.17	2.17	4.39	2.86	5.95	83.33%	55.14%
Promoting quality and standards	Quality assurance and recognition of qualifications	6.88	280,724	4.10	2.41	5.20	2.76	4.73	70.59%	59.22%
	p-value	.222	.514	.02**	.00***	.052*	.825	.05**	.075*	.00***

Source: Authors.

*significant, **very significant, ***extremely significant.

TABLE 4 The role of higher education institutions in different general challenges

General challenges	Average number of higher education institutions (excluding coordinators)	Share of networks coordinated by a higher education institution	Share of higher education institution partners (excluding coordinators)	Neither	Only partner	Only coordinator	Both
Broad economic development and social improvement objectives	3.70	89.74%	60.44%	0.24%	10.02%	1.19%	88.54%
Competences and skills development	3.80	88.15%	59.77%	0.74%	11.11%	2.22%	85.93%
New educational methods	3.58	86.76%	56.68%	1.47%	11.76%	0.00%	86.76%
Promoting opportunities for students	3.29	84.18%	53.40%	0.56%	15.25%	1.13%	83.05%
Promoting quality and standards	4.10	70.59%	59.22%	0.00%	29.41%	3.92%	66.67%
p-value	.05*	.0***	.0***	.57	.00**	.23	.00**

Source: Authors.

*significant, **very significant, ***extremely significant.

competences and develop skills at a general level. These are not necessarily the largest and most funded projects. Equally, universities tend to appear relatively less often as coordinators in the area of *quality assurance and recognition of qualifications*, as well as in networks that aim to promote opportunities for students and to develop new educational methods. Interestingly, these networks tend to be on average larger and better funded.

What these patterns seem to suggest is that higher education institutions are more likely to coordinate networks that aim to address grand challenges in terms of social improvement or economic development or development of general competences in the population. They are less likely to coordinate networks with more specific, more applied objectives targeted at specific stakeholders (students, the higher education system).

On average, networks on the topic of *improving competences* had the most experienced coordinators (coordinating more than seven other projects) while the least experienced were found in the area of *promoting EU cohesion*.

No patterns emerge in relation to the number of participating countries and the different types of challenges addressed. The only significant patterns are that Germany has a particularly high share of partners in promoting scientific and business cooperation (and a low share in research and innovation); Austria has a particularly high share of partners in promoting societal wellbeing (and a low share in access and inclusion); Hungary has a particularly high share of partners in entrepreneurial learning (and a low share in quality assurance and the recognition of qualifications).

Table 4 presents a cross-tabulation of the role of higher education institutions and the content of the challenges addressed by the network. General challenges are listed in the first column (for the 918 networks for which topics were available). Higher education institutions play particularly prominent roles in networks that address broad economic development and social improvement challenges, as well as those that have the objectives to improve competences and develop skills at a very general level. For these general challenges, higher education institutions coordinate a larger share of networks, they constitute a larger share of partners (excluding the coordinator), and they are more likely to be both partners and coordinators. Higher education institutions play a comparatively small role for the remaining three general challenges, particularly promoting quality and standards.

There are only a couple of areas where networks did not include any higher education institutions; specifically, topics such as promoting EU cohesion; ICT and digital competences; access and inclusion, and open and distance learning. Networks that did not include higher education institutions were a very small share of the total (only five).

There are some areas in which higher education institutions do not appear as coordinators only (that is, they are always both coordinator and partner); such topics are promoting EU cohesion, promoting scientific and business cooperation, innovative pedagogy, promoting employability, as well as open and distance learning.

To analyse the involvement and role of higher education institutions in networks that deal with topics that have different degrees of prominence in the programme, we used a typology that distinguishes between *core topics* (high frequency, high focus), *marginal topics* (low frequency, low focus), *transversal topics* (high frequency, low focus), and *specific topics* (low frequency, high focus). We have categorised networks according to whether their first topic is *core*, *transversal*, *marginal* or *specific* and we have considered various measures of institution specific involvement.

Networks that have as their first topic a *marginal topic*, though quite rare, tend to get higher average funding. We also found that networks with *core* and *transversal* topics involve on average a greater number of higher education institutions and they are more likely to be coordinated by a higher education institution. Networks with *marginal* topics involve on average a lower share of partners that are higher education institutions.

5 | CONCLUSIONS

Our findings confirm our expectation that higher education institutions hold a central role in transnational networks for innovation in teaching and learning; however, this expectation needs to be nuanced. Higher education institutions constituted 67.5% of the total number of participants, but they led 86.58% of the networks. These

numbers confirm the important role of universities, even if we account for the fact that in our dataset universities are considered key players within the Erasmus+ programme. Indeed, a programme requirement for so-called *knowledge alliance* networks is that at least two universities participate in the network. There are very few networks where higher education institutions do not participate at all, neither as partners nor coordinators. We identified five such networks among the so-called strategic partnerships networks in the Erasmus+ programme.

5.1 | Size

We assumed that (a) the larger the network, the more important higher education institutions are, in terms of (1) a greater likelihood to play a coordinating role and (2) the number of higher education institutions they collaborate with. Higher education institutions, on average, do not coordinate the largest networks in terms of the number of participants or grant value. Our cluster analysis indicates that higher education institutions tend to appear relatively more often as coordinators in the areas of regional and sustainable development; ICT, digital competences, and promoting societal wellbeing. These projects are of average size in terms of number of participating countries, partners and funding. We also found that the number of participating higher education institutions correlated with comparatively smaller network size, by all of our measures. Our expectations are not supported by the data in that higher education institutions play a stronger role in the governance of comparatively smaller networks, in terms of number of partners and funding, when compared to networks coordinated by other types of organisations. As we noted, however, those networks where higher education institutions do not appear at all (coordinated by NGOs and adult and vocational training institutions) tend to be even smaller.

5.2 | Diversity of members

We assumed that (b) the more countries participate in the network, the more important higher education institutions are, in terms of (1) a greater likelihood to play a coordinating role and (2) the number of higher education institutions they collaborate with. Also, we assumed that (c) the greater variety of types of participants in the network, the more important higher education institutions are, in terms of (1) a greater likelihood to play a coordinating role and (2) the number of higher education institutions they collaborate with.

As we have seen, the more varied the network in terms of countries, the less it is likely that higher education institutions are coordinators. Meanwhile, networks involving proportionally more higher education institutions tend to be more geographically widespread. A possible explanation is that, while networks coordinated by higher education institutions tend on average to be smaller and less geographically widespread, when higher education institutions form a large share of partners (excluding the coordinator) these higher education institutions tend to be drawn from many different countries. Hence, our expectation about the variety of countries is only partially supported (in relation to the number of participating higher education institutions, but not the likelihood to have a higher education institution as a coordinator).

In terms of variety of partners (number of different types of organisations involved), we found that networks coordinated by higher education institutions tend to have a greater variety of partners, but networks with a greater participation of higher education institutions (excluding the coordinator) tend to have a lower variety of partners (they are homogeneous in that they include a large number of higher education institutions).

We can therefore say that higher education institutions coordinate networks that tend to be on average smaller, less well funded, and less geographically diverse than networks coordinated by other types of organisations, but more varied in terms of types of partners. Hence, our expectation about the variety of partners is only partially supported (in relation to the likelihood to have a higher education institution as a coordinator, but not the share of participating higher education institutions).

5.3 | Diversity of topics

We assumed that (d) the more topics are addressed by the network, the more important higher education institutions are, in terms of (1) a greater likelihood to play a coordinating role and (2) the number of higher education institutions they collaborate with.

In general, we found that networks coordinated by a higher education institution tend to address, on average, a greater number of topics. Networks where higher education institutions constitute a greater share of partners are also more varied in terms of topics. Hence, our expectations are supported by the data. However, we note that higher education institutions tend to appear relatively less often as coordinators in the areas of quality assurance and recognition of qualifications. Higher education institutions were absent as coordinators or partners in some networks in the areas of promoting EU cohesion, access, inclusion, open and distance learning. Higher education institutions appear to more often coordinate networks that have broad-ranging objectives, less so networks that have very specific objectives. Perhaps higher education institutions are better suited than other types of organisations to coordinate networks that respond to the *Grand Challenges* development efforts.

Moreover, higher education institutions coordinate more often networks that are highly prominent in the Erasmus+ programme, where they play *core* or *transversal* roles. Instead, higher education institutions appear less frequently in networks that are *marginal* in terms of prominence in the programme. This further confirms the suitability of higher education institutions in driving networks that deal with important, prominent and generally broadly defined themes rather than focus on marginal or very specific issues.

Our study contributes to our understanding of higher education institutions' capacity in engaging with multi-level, multi-actor, multi-country innovation networks. Drawing on the example of the Erasmus+ programme *strategic partnerships* and *knowledge alliances*, we have demonstrated that higher education institutions are more active in mid-sized networks tackling more general themes. This indicates that there are specific conditions in which higher education institutions tend to operate. Equally, this finding seems to point to the fact that other actors might be more suitable for larger projects in teaching and learning.

This research also shows that higher education institutions engage with the different priorities of the EU modernisation agenda in a distinct way and seem to favour certain themes over others. Further investigation is needed to understand whether this is related to the Erasmus+ programme and how it is designed, or if it indicates that certain types of expertise are more likely to be taken on by other actors.

Outlining the possibilities and limits for higher education institutions to engage in innovation in teaching and learning is helpful for understanding the division of labour needed to achieve EU's modernisation agenda and the harmonisation of the European Higher Education Area and the European Education Area. Further, our analysis indicates that higher education institutions do not (and cannot) lead on every sector of teaching and learning innovation. While the significance of this finding needs to be tested more broadly, it could signal a changing role for higher education institutions.

Finally, in relation to internationalisation in higher education—the study on which this article reports contributes with a systematic empirical analysis to research on the sustainability of internationalisation and globalisation. Our findings show that, on the one hand, provided the necessary funding and resources, higher education institutions are able to participate actively in such projects; on the other hand, there are both quantitative and qualitative limits in their capacity for doing so.

5.4 | Future research

Our study could be developed in three directions. First, by analysing the organisational characteristics of the involved universities by matching our data with available datasets on European higher education in order to shed light on the conditions under which universities are able to engage with such networks. Second, a qualitative

comparative case study could investigate the internal workings of selected networks according to size, member and topic diversity, in order to provide insights on their governance and sustainability. Third, our database could be used for a network analysis to explore the emergence of sustainable hubs of expertise in Europe.

ETHICAL STATEMENT

This research has received ethical approval by the Department of Management, Birkbeck University of London.

DATA AVAILABILITY STATEMENT

The data on which this research is based was publicly available on the Erasmus+ programme website. Our database and detailed analyses are available upon request.

ENDNOTE

[1] Since topics are not available for all knowledge alliances, this table is computed only considering the 918 networks for which topics are available. However, the results do not change (apart for the number of topics variable) if we consider the entire set of 991 networks.

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