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Article

Managing Inter-University Digital Collaboration from a Bottom-Up Approach: Lessons from Organizational, Pedagogical, and Technological Dimensions

Alvaro Pina Stranger ^{1,*} , German Varas ² and Gaëlle Mobuchon ²¹ CREM-UMR 6211, University Rennes, 35000 Rennes, France² ISTIC, University Rennes, 35000 Rennes, France; german.varas@univ-rennes.fr (G.V.)

* Correspondence: alvaro.pina-stranger@univ-rennes.fr

Abstract: Driven by education policies, digitally enhanced partnerships between higher education institutions (HEIs) have become increasingly important in the pursuit of sustainability in European education. This article emphasizes the necessity of evidence-based policy implementation to prevent tensions between the decision-making layer (the upper level) and the institutional layer adopting the new norms (the bottom level) in the context of digital inter-university collaboration. To address this need, we conducted a comprehensive three-year (2020–2022) research project within the framework of Erasmus+. Our consortium comprises seven renowned European universities. The project's primary objective was to investigate how digitalization impacts HEI cooperation and joint learning activities both at the intra- and inter-institutional levels. We conducted experiments that accounted for specific challenges or lessons emerging from three perspectives: organization, pedagogy, and technology. In the organizational domain, we identified challenges related to HEI alliance aspects, such as trust, teacher incentives, legal frameworks, operational requirements, external policies, and mobility needs; and information flow, specifically in terms of disseminating local projects, and clarifying local institutional jargon. The pedagogical perspective revealed challenges in pedagogical support, especially in developing teachers' digital skills; learning assessment, involving agreement among teachers and external participants; and course design, including a wide variety of aspects, such as course flexibility, different calendars, async/sync balance, mandatory and optional regimes, content creation, and learning validation. Lastly, in the technology dimension, we found challenges related to the relevance of software choices, and centralized digital structures. This research aims to highlight the importance of evidence-based data in shaping education policies. By drawing on real-world experiences from a consortium of universities, we shed light on the intricate dynamics of digital inter-university collaboration.

Keywords: inter-university collaboration; pedagogical innovation; European higher education institutions; higher education policies; bottom-up approach



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1. Introduction

The rapid advancement of information and communication technologies (ICTs) has been greatly accelerated by recent pandemics, leading to a significant transformation commonly known as the 'digitalization of education'. This shift has had a profound impact on how higher education institutions (HEIs) and their stakeholders collaborate and execute their activities. Recognizing that digitalization plays a crucial role in the sustainability of the educational landscape, European policies emphasize the importance of a 'networked' education system. For example, the European Commission has promoted the creation of joint programs between European universities, through 'virtual journeys' [1], or by supporting the development of international blended learning models [2]. Moreover, the renewal of the European Union's action plan for digital education (2021–2027) highlights a

clear interest in designing educational policies that foster and endorse online and distance learning among universities [3].

Digitalization and cooperation, e.g., through online, blended, distributed, or hybrid learning, implies unique challenges, not only at the intra-institutional perimeter, i.e., between units, departments, faculties, campuses, and hierarchies, but also on the inter-institutional scale, i.e., among different types of organizations. We argue that, regardless of the scope of cooperation, both are often overlooked at the policy level (the upstream design). To help address this issue, we advocate for evidence-based policy implementation, which may mitigate the tensions between the decision-making layer (the upper level) and the institutional layer adopting the new norms (the bottom level). In this context, we (the authors of this manuscript) have managed and coordinated an Erasmus+ KA3 research project, including seven European universities that conducted a series of educational experiments, both intra- and inter-institutionally, to test inter-connected education. Through this bottom-up approach, including local experimentations, we aimed to capture the voice of stakeholders.

Capturing the voice of stakeholders implied following an abductive reasoning. This has allowed us to identify different types of challenges belonging to three dimensions: organizational, pedagogical, and technological. The organizational dimension corresponds to logistical as well as normative issues in relation to cooperation. The pedagogical dimension relates to didactic and learning aspects, such as the advantages or disadvantages of certain teaching modalities. The technological dimension concerns all elements related to digital technologies used for cooperation, including tangible and intangible support infrastructures.

2. Theoretical Framework

2.1. Collaboration and European Policies

In Europe, the digitalization of higher education is gaining prominence, as reflected in the growing body of literature on ‘external-typed collaboration’, i.e., among different types of institutions. ‘Internal-typed collaboration’, which refers to intra-organizational collaboration, e.g., among units or departments, is less developed from the perspective of education. The literature often refers to a ‘networked education’, which is constantly promoted by European policies [4]. Such policies prioritize inter-university collaboration, exemplified by the European Commission’s launch of Erasmus+ projects, and initiatives such as European Universities and European Universities Alliances [5].

‘European Universities’ corresponds to networks of universities across the EU, enabling students to obtain training and degrees powered by HEIs from different countries [6,7]. Such collaborative initiatives are supposed to benefit universities, through founding new and more risky projects, fostering creativity, improving efficiency, promoting transdisciplinary learning, accessing markets and knowledge, and reducing conflicts [8]. Thus, innovation, teaching, research, student mobility, and employability can be enhanced through new inter-organizational models [5].

The implementation of collaboration-related policies is not free from tensions, especially between the decision-making authorities and the institutions adopting the new norms [9]. For this reason, the EU has implemented the European Strategy for Universities, and has proposed a Council Recommendation to promote effective European cooperation in higher education [10]. These policies aim to provide universities with the resources and strategies needed to succeed in digital transformation, facilitate closer collaboration between institutions, and offer joint transnational educational programs and degrees [10].

In this article, we claim that tensions between the decision-making layer (the upper level) and the institutional layer adopting the new norms (the bottom level) in the context of digital inter-university collaboration can be diminished, for example, through the creation of evidence-based data provided by the main education stakeholders.

2.2. Collaboration in the Digital Context: Organizational, Pedagogical, and Technological Dimensions

Based on a literature review, we establish that efficient policy implementation requires understanding collaboration, and identifying its main challenges in the digital context, especially from at least three domains, i.e., organizational, pedagogical, and technological.

2.2.1. Organizational Dimension

From an organizational perspective, digital collaboration and cooperation between transnational universities involve different actors, purposes, and benefits. In terms of actors, collaboration, in its different forms, refers to the exchange of resources among interdependent actors who share the same standards, values, and beliefs. Consequently, a networked education can be thought of as a structure made up of several organizations and stakeholders, a trustworthy ‘alliance’ of individuals, artifacts, and institutions that produce and maintain the resources necessary for humans [11].

When thinking of this alliance, it is possible to identify how digitalization has turned universities and their related partners—especially new and non-state entities, such as NGOs and private companies [12,13]—into ‘technological hubs’ ([14], p. 716), where ‘power is not confined to the state or to the market but to exercises through a plethora of networks, partnerships, and policy communities’ ([15], p. 5). The structure of HEIs, which is favored by digital education solutions, does not only serve as a connecting mechanism between the different stakeholders, but also (re)constitutes spaces of governance where actors become key players influencing educational practice [12,13].

In terms of purpose, organizations may decide to collaborate, for example, to exchange knowledge, create joint research, and design new innovative educational programs [10,16]; to develop ‘conjoint course development’, such as master’s programs [17], which may be the most common case of cooperation efforts; to promote so-called ‘internationalization’; and to consolidate scientific and logistic expertise in one location, contribute to the employment market, and improve their reputation through the creation of trusted institutional and scientific connections [18].

In terms of collaboration benefits, the literature has highlighted an increase in the global and local flow of people, ideas, and capital in HEIs belonging to richer nations [18]; and the optimization of financial and human capital, a reduction in the time needed to achieve objectives, the enrichment of creativity, the improvement of process efficiency, and the promotion of transdisciplinary learning [19,20].

In terms of organizational challenges, the literature has accounted for the role played, for example, by top-level support, leadership, commitment, trust, and open communication [21–26]. Special emphasis has been placed on ‘trust’ as a trigger for success in virtual collaboration and joint projects [10,16,27]. In addition, the literature has identified the importance both of maintaining an open communication with partners, and of creating partnership links with mutually reliable organizations, as two building blocks of inter-institutional ‘trust’ [28,29]. Open communication implies opening up or sharing information, for instance, about current agreements, projects, or activities that might boost the potential of the alliance. In this sense, opening up information, such as current inter-institutional legal frameworks and agreements, could ensure a solid support for virtual collaborations [30]. In terms of potential barriers to collaboration [31], differing cultural, educational, and ethical expectations have been identified.

Most of these challenges may also affect the intra-organizational type of cooperation, as actors belonging to different units from the same educational institution may decide to collaborate for different reasons, for example, to leverage interdisciplinary knowledge.

2.2.2. Pedagogical Dimension

From a pedagogical perspective, networked education fostered by digital technologies has favored so-called digital pedagogies, which have gained popularity in recent years among higher education institutions. Hybrid and blended learning appear to have risen

to the top among these methods. Such cutting-edge digital pedagogies have led to a 'redefinition of jobs' [32], which implies the transformation of daily tasks performed by employees (e.g., teachers), in which new skills, duties, and obligations are needed [14].

Overlapping with the technological dimension, pedagogical practices have been impacted, for example, by the adoption of learning management systems (LMSs). As LMS services provide students with access to lecture notes, virtual classrooms, homework, and results, teachers and instructors must be able to adapt, for instance, to new forms of teaching (e.g., including different modalities, such as synch or async instruction), follow-up (e.g., distributed group work, and class engagement), and evaluation (e.g., involving non-academic actors, or recognizing different assessment criteria from partners). Thus, the different stakeholders, not only teachers but also students, must upgrade their knowledge, to succeed in the digitally collaborative domain.

Challenges related to the pedagogical dimension also include students' credit allocation, student group formation, scheduling, learning methods, the distribution of activities and technical support [33], the coordination of academic calendars, student enrolment processes, workload distribution, student engagement, screen fatigue, class size, and feedback collection [34]. The synchronization of activities between participating institutions is crucial, taking into account factors such as holidays, exams, student travel, and time differences [30]. When collaborating on the development and delivery of accredited online courses, challenges such as the translation of content into different languages, and differences in inter-institutional administration and accreditation processes, can arise [35]. The implementation of distance education and e-learning poses challenges related to teaching systems, student learning styles, technological support, and paradigm shifts [36].

2.2.3. Technological Dimension

As observed in the pedagogical dimension, digital tools, typically in the form of management platforms, play an important role in the inter-university education scheme. Digital technologies allow institutions to exchange data and resources, for example, through common repositories that can be accessed by multiple institutions. Usually with the help of LMSs, partners can monitor different operations, for example, in relation to salaries, online registrations, surveys, marketing, and planning [14].

Crucially, the use of digital tools may imply an ethical dimension, as HEI management 'is increasingly data-driven, underpinned by the need to both produce and use indicators, data analytics and other forms of objective evidence' ([37], p. 177). In networked education, crucial decisions can be made after collecting, measuring, evaluating, and assessing HEIs' KPIs, for example, to improving the sustainability of a joint program.

Challenges related to the technological dimension may include technical constraints related to server compatibility, interoperability, access to institutional infrastructure, and technical support [35,38]. It is essential that partner universities have the necessary technological infrastructure to support their teaching practices [39]. While the choice of the right technology, such as LMSs, can play an important role in facilitating course management and communication in inter-university collaborations [40], the choice of the right software for use by teachers can improve the quality of the learning materials.

After identifying these three dimensions, it should be noted that some challenges can be multidimensional. For example, ECTS allocation, on the one hand, may refer to the problem of how many ECTSs may be assigned to a student after the completion of a certain elective course (i.e., the pedagogical dimension) or, on the other hand, may refer to the problem of how institutions can draw on existing agreements to activate ECTS inter-institutional recognition (i.e., the organizational dimension).

2.3. Moving from a Top-Down to a Bottom-Up Approach

Education policies are generally designed using two approaches: top-down or bottom-up [41]. The top-down approach, mainly established in the late 1960s, focuses on policy implementation from the perspective of policy designers and decision-makers. It implies

centralized regulation, and policies where the government or central authority makes policy decisions, conducts research, and implements policies in the education field [42–44]. Although this approach gives the government power to implement policies, it has its limitations. It is criticized for failing to consider the views of other stakeholders, such as teachers and local cultures and institutions, which are key to interpreting, facilitating, modifying, or obstructing policies. Critics argue that privileging decision-makers' perspectives neglects the roles of other actors, and the complexity of educational reform [45–49]. To address these limitations, a balanced approach, combining top-down and bottom-up elements, is needed.

The bottom-up approach is an alternative to the top-down model, focusing on implementing decisions starting from the perspective of the target group and service providers, such as teachers. It aims to empower these individuals at the grassroots level, recognizing their active roles and influence in shaping policy changes [50]. By studying teachers' practice, and considering interpretations of policies and interactions among various stakeholder groups, the bottom-up approach aims to propose suitable educational strategies [50]. Unlike top-down strategies, bottom-up approaches prioritize enhancing everyday teaching practice, through participatory research and development. These approaches are characterized by dynamic, iterative-cyclical, and open-ended processes [51]. They emphasize active teacher participation and co-ownership in initiating, developing, and implementing innovations [51].

In this approach, experiments play a pivotal role. The experimentation methodology is normally followed by researchers, to test policies from both approaches. Experiments with a bottom-up strategy are used to spark innovations and transitions, whereas experiments with a top-down approach are used to assess specific institutional arrangements, and promote social and political learning; for example, they are used as the 'starting points' or 'seeds' for desirable societal transformations [52].

Experimentations formulated and conducted with a bottom-up approach present significant advantages, offering valuable insights into the benefits and challenges of networked education. Experimentations produce key information regarding the worlds and experiences of the stakeholders involved in the network, either at an intra-institutional level, or at an inter-institutional level [32]. If an experiment's findings are in line with their preferences, policymakers may be able to justify current regulations, or suggest new ones that encourage collaboration amongst HEIs.

So far, we have described the importance of networked education, and how cooperation has been encouraged by European policies. We have also described the importance of a bottom-up approach for eventually feeding education policies through evidence-based information from local experimentation, involving intra- and inter-institutional stakeholders. In the next section, we describe how we explored inter-university cooperation from a bottom-up approach, in the context of a research Erasmus+ KA3 project including seven European partners whose purpose was to explore how cooperation, as well as joint learning initiatives, between higher education organizations, could be strengthened using digitalization.

3. Methodology

3.1. Engaging Participants

To research collaboration from the bottom-up perspective, organizers from University of Rennes 1 (France) and Paris 1 Pantheon Sorbonne (France) coordinated a network of seven institutions: Aalto University (Finland), Università di Bologna (Italy), Freie Universität Berlin (Germany), KU Leuven (Belgium), Paris 1, Universidad Complutense de Madrid (Spain), and Universidad Politécnica de Madrid (Spain). Local coordinator partners from the consortium were tasked with finding researchers interested in testing pedagogical innovations, either at an intra- or inter-institutional level, in two six-month experimentation phases: (a) the first phase from 1 June 2021 to 15 January 2022; and (b) the second phase from 15 January 2022 to 31 July 2022. The experimentations were to be in line with Erasmus+ K13 OpenU project priority Actions (PAs), through which the three dimensions

under scrutiny—organization, pedagogy, and technology—could be targeted by researchers (List S1).

Researchers interested in participating were attracted by means of a Pre-call and an Open Call.

3.2. Design of Pre-Call and Open Call

To set up both experimentation phases, the leading coordinators designed a Pre-call and an Open Call. Regardless of the phase, templates were designed, iterated, and edited by all Consortium partners, to clearly meet their purposes. In the case of the Pre-call, this document aimed to target internal experimenters from partner universities, either academics or staff already participating in international projects in the field of education (e.g., UNAEUROPA or EIT Digital, among others). Through the Pre-Call, open from 1 December 2020 to 19 February 2021, interested experimenters were prompted to describe their experimentation activity, including an introduction, justification, objectives, and possible methodology; and to identify both the leader and involved contribution partners. With this information, coordinators could then determine potential synergies among existing cooperation alliances.

In the case of the Open Call, which was open from 15 March 2021 to 14 May 2021, the template aimed to promote the research activity at a wide level (i.e., inter-institutionally), as well as at a local level, including researchers from different departments and units. The document aimed to collect information regarding:

- The main partner (in case of intra-institutional experimentations)
- Leading and contributor partners (in case of inter-institutional experimentation)
- PAs
- Possible international project engagement and the value of the network
- Content to be produced/methodology to implement
- The use of digital tools
- Evaluation metrics (quantitative/qualitative)
- Policy involvement
- Target (students, teachers, others)
- Levels of educational application (session, module, program)
- Schedule
- Working days (researchers, technicians, administrative staff)

3.3. Coordination Results

The coordination through the Pre-Call and Open Call attracted partner leaders from seven universities, who conducted 12 experimentations, each of which was iterated or expended in the second phase (Table S1). The different project coordination activities are listed in List S2. As presented in Table 1, eight projects were inter-institutional, involving contributors both from and outside the consortium (marked with * in Table 1), while four experimentations were intra-institutional (Table 2), and aimed to test internal cooperation, for example, across courses, masters, departments, or faculties.

Table 1. Inter-institutional projects according to leaders and external (*) contributors.

ID	Inter-Institutional Projects	Leader	Contributor
1.	Educating the Trainers—Blended Content Production Catalyst	Aalto	UCM FUB
2.	Scientific posters across boundaries: design of distributed group research activity	UCM	Rennes Trento
3.	Joint digital, interactional teaching formats—How to implement collaborative online and blended courses	UCM	FUB

Table 1. *Cont.*

ID	Inter-Institutional Projects	Leader	Contributor
5.	eTandem—Online Language Partnerships	FUB	Bologna * Edinburgh
6.	Designing and supporting Virtual Mobility activities	KULeuven	* Others
7.	Definition of users' needs in the digitalization of EU HEIs	Paris1	JUKrakow
11.	Preparation and delivery of an international collaborative MOOC: an analysis on the pedagogical and technical implementation	Bologna	KULeuven * Wurzburg * diParma * Hamburg
12.	One Health in Bloom	Bologna	FUB * Edinburgh * Helsingin yliopisto JUKrakow KULeuven UCM Paris1

The four intra-institutional projects participating in the project are listed in Table 2.

Table 2. Intra-institutional experimentations.

ID	Intra-Institutional Projects	Leader
4.	Gamification tools in Higher Education: implementation of the Escape Room in the Pharmacy Degree	UCM
8.	Students as main actors of European HEIs: general survey of student population in the aim of establish needs, aspirations, fears and hopes in the digital turn of EU HEIs	Paris1
9.	Distributed training of students for the quality improvement of their bachelor's and master's theses	UPM
10.	Technology Watch to find Solutions to Social Challenges of our Society	UPM

A description of projects according to their target priority actions can be found in Table S2.

3.4. Data and Data Analysis

The data corresponded to experimentation coordination meetings and experimentation reports.

In terms of coordination meetings (Table S3), we, as project coordinators, used the project Peer-to-Peer Learning Meetings to track the most important topics, for example, the difficulties of working in distributed settings, and management challenges, among many others. These real-time online discussion sessions allowed us to ask questions, and understand the experimentations in more depth, when needed. These discussions would also allow us to better understand and interpret our results.

In terms of experimentation reports, all partners had to account for the contribution of the network (i.e., the added value of collaboration), the role of pedagogic innovation (i.e.,

the added value of digital tools), and the potential contribution to education policies. The data were analyzed via an abductive approach, which consisted of two steps:

- (a) identifying discursive regularities regarding the three domains of organization, pedagogy, and technology; these discursive regularities corresponded to different pragmatic values, for example, offering a recommendation, describing a result, interpreting experimentation results, or communicating a critical stance (all of them are included in the Results section by means of quotation marks).
- (b) identifying the challenge categories associated with each dimension; data were coded in thematic units, which accounted for the different types of challenges. This codification process was iterated twice, to solve possible categorization doubts. In these cases, doubts were discussed and resolved by the three authors.

The following descriptions were used as a guide:

- The organizational dimension corresponds to aspects related to the normative and logistic part of cooperation;
- The pedagogical dimension relates to didactic and learning aspects, such as the advantages or disadvantages of a certain type of teaching modality;
- The technological dimension concerns all elements related to the digital technologies used for cooperation, including tangible and intangible infrastructures.

4. Results and Discussion

In this section, we present the main results summarized in Table 3. We have organized our descriptions according to the three main dimensions: organization, pedagogy, and technology.

Table 3. Synthesis of HEI challenges, identified via a bottom-up approach.

Dimension	Topics	Challenges in HEI Cooperation
Organizational dimension	Alliances	Building trust among local participants
		Finding teachers and offering incentives
		Building the legal framework to teach through innovative pedagogies
		Setting operational aspects
		Innovative pedagogies drawing on international policies
		Need for mobility opportunities for students
Pedagogical dimension	Information flow	Institutional jargon across boundaries
	Pedagogical support	Disseminating local running projects across consortia
		Developing teachers' digital skills
	Learning assessment	Agreement among teachers
		External stakeholders' involvement in student evaluation
	Technological dimension	Course design
Time and calendars		
Balance between asynchronous and synchronous sessions		
Regime: mandatory versus optional modules		
Content creation		
Learning validation		
Technological dimension	Relevant software	Lack of knowledge about software use
		Tendency to use free solutions with limited functionalities
	Centralized digital structure	Common (but open!) repository for all partners
		Platform interoperability
		Ethical issues around education technologization

4.1. Organizational Dimension

4.1.1. Alliances

1. Building trust among local participants

One key aspect of HEI collaboration is certainly building trust at all institutional levels. Trust among partners is worth exploring, not only to try to explain or interpret the performance of different partnership activities, but to understand the relationship and possible tensions among key actors, such as authorities, staff, and students, when facing pedagogical change. In the experimentation conducted at Paris 1 (ID8), researchers prepared a focus group, in which students, teachers, and supporting staff could feel comfortable discussing critical points concerning the digitalization process taking place at their institution (for example, in terms of the information flow, discussed below, in point 7). By creating an 'atmosphere of trust' (e.g., ensuring voluntary participation), researchers elicited participants' attitudes and concerns towards their organizational practices, despite their different hierarchies and power statuses (e.g., teachers versus students). Thus, in the context of (digital) collaboration, especially when activities are locally impacted using technologies, the importance of creating trusted and secure spaces, in which people can exchange their opinions and feelings across different hierarchical layers, is revealed. The literature confirms the importance of building trust between the different stakeholders participating in university partnerships [10,16,27].

2. Finding teachers and offering incentives

Another important aspect that should be considered in the frame of HEI cooperation is the potential difficulty in finding interesting incentives that motivate professors to take part in collaboration settings (e.g., in distributed environments). According to UPM/FUB (ID3), if teachers have the possibility to work with colleagues with whom they already have a cooperation relation (e.g., research), incentives may be already 'given'. But if this is not the case, incentives are necessary, for example, in terms of (a) supporting the planning and implementation of the course; (b) supporting the organization of the physical short-term mobilities; and (c) crediting the extra effort and teaching load, as reported by UPM/FUB (ID3). On the same topic, the development of a support structure for teachers at KU Leuven has been documented and discussed within the context of this research [1].

3. Building the legal framework to teach through innovative pedagogies

Although it may sound evident, it is worth noting that HEI cooperation in the digital domain should be ensured via legal frameworks. Normally, teachers are interested in participating in collaborative activities, but they are not supported by internal regulations. In this sense, 'it is advisable to adapt the development of regulations accordingly, i.e., to include blended teaching as a valid learning format and include the blended mobility format in the 'study abroad regulations', as reported by UPM/FUB (ID3). The literature supports this view, demonstrating that the establishment of legal frameworks is essential to ensuring solid support for virtual collaboration [30].

4. Setting operational aspects

There are varied operational aspects to consider when collaborating digitally. From a bottom-up experience, UPM/FUB (ID3) identified at least five critical points that should be considered in collaboration partnerships: (a) 'financial framework': the identification, and calculation of available funds and funds to be raised, and application for funding; (b) 'available time frame': the identification of the start and end dates of the project, the consideration of possible constraints related to fixed dates, and the construction of a milestone plan, with buffer zones and deadlines; (c) 'personnel capacities': the clarification of responsibilities and division of tasks with the teaching partner and, if applicable, the inclusion of student assistants or research assistants; (d) 'support from services for teaching and learning': this question should be posed right from the outset of the planning phase, and reiterated at critical junctures throughout the project; and (e) 'technical aspects': the clarification of the technical and e-learning infrastructure at one's own and partner university, and an

early decision on which systems will be used. In this sense, the literature identifies similar operational aspects as challenges to virtual collaboration, including the coordination of academic calendars, student enrolment processes, workload distribution, credit recognition, student engagement, or screen fatigue [10,16,29]. Furthermore, the synchronization of activities between participating institutions is a crucial operational aspect, in which factors such as holidays, exams, student travel, and time differences should be considered [30].

5. Innovative pedagogies drawing on international policies

HEI collaboration may draw not only on internal institutional policies, establishing inter-university cooperation as a strategic development priority, but on much broader initiatives. Such is the case of KU Leuven, which has aimed to reach a 100% mobility of students in the frame of an initiative raised at a European level, called Una Europa Alliances (more details about the KU Leuven case can be consulted in [1]).

6. Need for mobility opportunities for students

UPM experimentation (ID2) revealed that there is a necessity to strengthen cooperation alliances among HEIs, to provide students with the opportunity to study abroad and acquire new experiences. Researchers found that (a) most students have not studied abroad (70%) but they would like to (90% out of the 70%), or they would like to do so again (78% out of the 30%); (b) most students (90%) would prefer to go physically to the foreign university than take their courses online from their home university; (c) most students (73%) have not cooperated with international students for academic purposes, but they would like to (90%); and (d) almost all the students (92%) think that working with international students for their assignments increases their interest in internationalization. European policies are moving in this direction, as virtual mobility for students is one of the major areas of work of the European Commission [5], in trying to encourage the development of joint transnational educational programs and degrees [10].

4.1.2. Information Flow

7. Institutional jargon across boundaries

Organizations tend to develop their own language to refer to certain institutional social practices. As reported by Paris 1 (ID8), 'academic jargon and administrative-related language is not always understood', blocking not only collaboration, but also international students' engagement with local formal activities. The literature corroborates this finding, as collaboration and cooperation between European universities are perceived as running up against various obstacles, such as technical communication, and cultural and linguistic differences [53–55].

8. Disseminating local running projects across consortia

Another point related to the flow of information across consortia relates to the promotion and description of local projects. According to Paris 1, 'teachers and students are unaware of collaborative projects', and '70% of respondents said they had no idea what other members of the university thought regarding digital university' (ID7).

4.2. Pedagogical Dimension

4.2.1. Pedagogical Support

9. Developing teachers' digital skills

In the context of collaboration among universities, one essential aspect is providing teachers with all the necessary support to conduct innovative learning. In the case of blended learning, researchers at Aalto (ID1) have put emphasis on the fact that teachers are supposed to have high 'video production skills'. Unfortunately, 'when organizations (i.e., teachers) start producing their first blended learning or online content units, they usually lack understanding of the process ahead of them and of the key elements at each stage needed to succeed' (ID1). This is problematic if production skills are nowadays considered

a necessity among teachers. Indeed, survey results suggest a crucial demand for training in the field of video production, and a potential need for its further development (ID1). Indeed, for many teachers, the challenge of virtual mobility or online transnational courses lies in the pedagogical use of digital platforms and tools [56].

Experimentations have revealed the necessity of offering ‘established support’ (ID5), e.g., via group meetings, feedback, and advice. According to researchers from Bologna, ‘international communities of practice (...) will look for support’; thus, ‘it is thus important to keep this link and build motivation by offering training’ (ID11). As reported, ‘our experiment builds on the assumption that it is necessary to support teachers and academics by providing simple, easily accessible and reusable teaching and learning material, information about past training events and future training events they can participate in’ (ID11). The lack of support from teachers is also seen in the literature as an obstacle to successful collaboration [34].

Additionally, a support instrument is needed to help teachers in designing the back-end of virtual mobility, for example, considering the curriculum, workload/ECTS credits. Understanding the complexity of this type of learning, teachers can address potential difficulties and obstacles, in discussion with partners (ID5). The literature points out that inter-university collaborations from different countries require an extra effort for educational teams, as they challenge them to step out of their comfort zone, and work against the barriers that hinder this collaboration [57]. These barriers include political, logistical, and cultural factors, such as restrictions on sharing materials and data, differences in academic standards, language differences, academic calendars, and time zone differences [57].

Finally, an often-overlooked dimension has to do with training teachers on the use of digital tools (i.e., platforms, and software). Teachers should understand that there is a social impact created by technology. As reported, ‘Digital technology is never a default solution: it must be complementary to face-to-face courses’, and ‘The digital university must be concerned with the well-being of its community by finding alternatives to the destruction of the social link that digital tools can generate’. Thus, through training, teachers should advocate ‘a reasoned and optimized use of technology’ (ID7). The digital divide, previously focused solely on gaps in internet access, is now increasingly linked to differences in how individuals (in this case, teachers) use digital devices and the internet [58].

4.2.2. Learning Assessment

10. Agreement among teachers

The Centre National d’Etude des Systèmes Scolaires [59] in France has already highlighted the existence of different evaluation standards among the different countries in the European Union. This situation, i.e., the problem of inter-assessment, is a critical aspect of innovative pedagogies [60]. In distributed contexts, for example, different teachers participating in a module may be asked to evaluate students, which may become a real challenge, as assessment criteria might not always be the same among teachers. During their experimentation, researchers at UCM found that ‘The evaluation has shown a high degree of disagreement in the instructors’ criteria’. In an activity in which teachers had to evaluate the quality of students’ scientific posters, ‘researchers found that instructors did not meet in a unified rating (which was only observed 4 times), but they usually provided two different ratings (18 times) and even three different ratings (8 times). Therefore, partial agreement is the most common result’ (ID2). In this sense, further research on inter-rater reliability in distributed settings is needed.

11. External stakeholders’ involvement in student evaluation

Collaboration among HEIs and innovative pedagogies often involve the participation of external stakeholders, especially in evaluation activities, where they act as juries or judges. When measuring student satisfaction, researchers at UPM found that the participation of the invited experts in the evaluation process was assessed by 64.7% favorable opinions, 17.6% negative opinions, and a 17.6% neutral stance. In this context, external evaluators

may be a good option to valorize as a motivating element for the development of subjects. However, it should be noted that, although partners agreed to work as evaluators, 'they preferred to participate in a more transversal way, not only in purely academic activities, such as evaluation', as reported by UPM (ID10).

4.2.3. Course Design

12. Curriculum flexibility

When speaking about digital education, flexibility is a recurrent topic. Indeed, it is a well-appreciated feature of online learning. However, flexible formats, such as MOOCs, have shown that over 90% of enrollees never finish the course [61–63]. As reported by UPM, 'finding the motivation for the students is a fundamental aspect to obtain the maximum results in education' (ID10).

One possible reason for students dropping out may be related to online adaptation. As reported by Paris 1, 'some lectures and tutorials impose a classical format that cannot be modified (e.g., art activities, fieldwork), while others rely on digitization (e.g., virtual reality in archaeology) to perfect the pedagogical arsenal, without ever replacing face-to-face exchange'. (ID7) Therefore, it is important to carefully design pedagogical activities, without literally transposing the physical design to the online context. The literature also corroborates these findings, especially in terms of workload, as content cannot simply be copied from a face-to-face to an online environment [64].

Granting students flexibility to access pedagogical activities from international institutions may raise problems related to language proficiency. In distributed learning settings, for example, which attract students from different cultures, a key challenge mentioned by participants of the experimentation conducted by FUB is related to 'speaking the target language, in an authentic communication situation', 'especially when the students had little or no previous experience' (ID5). Thus, distributed experiences should be flexible enough to adequately host international students. Indeed, language difference has been extensively seen as an obstacle to distributed learning success in the literature [57].

Despite the challenges mentioned above, it is worth noting that flexibility includes a democratic dimension that is not often reached onsite. According to UCM, the 'flexibility' delivered by blended learning formats is 'more inclusive, since it offers international experiences especially to those who are limited in their ability to participate in longer physical mobility due to family, financial or other reasons' (ID3). This type of format, distributed learning, allows students to benefit from an international experience without having to travel abroad, thus enabling those who would not want to, or could not, travel for physical, social, or financial reasons to be mobile [29].

13. Time and calendars

A critical operational point in collaborative education is definitively related to time and calendars. Indeed, during their experimentation, researchers at FUB experienced a 'slight overlap in lecture times between the FUB and other Una Europa universities, especially in the summer semester, (which) also made it difficult to hold joint courses' (ID3). The literature points out that inter-university collaborations from different countries require an extra effort for educational teams, as they challenge them to step out of their comfort zone, and work against the barriers that hinder this collaboration [57].

14. Balance between asynchronous and synchronous sessions

Digital collaboration activities often include recorded material and live sessions. These two pedagogical resources should be carefully planned. As reported by UCM, 'The overall sequence of the course and the sequence of the learning units must be determined, as well as the alternation of asynchronous and synchronous learning phases: successful digital learning requires asynchronous collaboration on assignments as well as synchronous communication for exchange with teachers and peers' (ID3). This is particularly important when two or more teachers from different organizations are involved: 'Ideally, the extra coordination and communication effort required for the joint planning of an international

blended course should be balanced by less synchronous teaching/lecturing time and/or moderation time due to the second teacher' (ID3).

15. Regime: mandatory versus optional modules

Collaboration among HEIs may materialize, for example, in a shared module, subject or program delivered by two or more institutions. In this configuration, it is important to note that, for some students, the module may be optional, while, for others, it may be mandatory. This heterogeneity concerning regime may raise certain performance challenges within the classroom. Researchers at UCM and FUB, when exploring satisfaction on cooperation during online learning, found that this aspect was perceived as rather negative: 'the majority of students stated that student participation in discussions varied greatly and that only a few students, especially from UCM, participated in joint discussions during the online sessions'. (ID3). According to UCM and FUB researchers, the reasons would be related to a lack of motivation: students from FUB did not have a strong incentive, as the course had an elective status, and no mobility towards Madrid was considered. As reported: 'Commitment and participation would usually be lower in elective courses than in the compulsory study program' (ID3). Research on these motivation factors [65] found that students reported higher levels of motivation in compulsory language courses than in optional language courses.

16. Content creation

A critical challenge arises when creating content. Given the high probability of dropout, online content should be innovative and appealing. As reported by UPM (ID9, ID10), 'Students highly value activities where they can see their contribution to social aspects, which helps improve their motivation and performance'. To create innovative content, researchers at UPM recommend leveraging partners' networks to find 'the best professionals'.

17. Learning validation

Related to the former point, the creation of innovative and appealing collaborative modules or sessions sometimes faces the problem of 'institutional recognition'. Such is the case the eTandem project at FUB, which is 'institutional-non-integrated' ([66], p. 187), which means that, although it is organized and run by an institution, and the matching of tandem partners, and the support and technical resources, materials, and the advice service are provided, the eTandem project is not integrated into a formal course (a language course, in this case). As reported by FUB, 'They are open to any interested student of each institution, the prerequisite being that they are native speakers (or very competent speakers) and that they have at least some knowledge of the target language'. As a solution, FUB researchers explain that some frameworks are recommended, for example, 'students wishing to obtain a certificate for their tandem are required to meet at least 6–8 times, keep a learning diary and make an appointment with a language learning advisor for a final evaluation' (ID7).

4.3. Technological Dimension

4.3.1. Relevant Software

Collaboration across HEIs usually involves innovative pedagogies that require technical software solutions with specific functions. Researchers at Aalto (ID1) identified the following requirements from teachers working in an online learning modality: (a) the possibility of recording video from two sources (screen and camera) simultaneously; (b) basic video editing tools with at least two timelines; (c) a built-in background remover plugin and green screen option; (d) a countdown before starting the video recording; (e) hot keys for starting/ending the recording; (f) a teleprompter (the position of which on the screen can be changed); and pop-up hints on how to use the software in the most efficient way (e.g., hotkeys). Unfortunately, as reported by Aalto (ID1), the biggest challenges faced by partners are the lack of information on video production, and the lack of available software.

In this sense, 'ICT services should support course and curriculum developers and teachers in selecting and using ICT tools' ([67], p. 53).

18. Lack of knowledge about software use

A common problem in blended learning is the poor quality of the recorded material. According to Aalto's report (ID1), the quality problem may be due to the fact that teachers normally know neither what solutions are on the market, nor what their functionalities are. As reported by Aalto researchers (ID1), 'one of our main discoveries is the lack of the availability of video creation solutions (tools). Our partners used different solutions but still faced shared challenges such as not knowing which software solution will meet their needs and worth their time investment, learning new software in a short amount of time and not knowing their possibilities and limitations'. In this sense, the Erasmus+ virtual exchange initiative [68] highlights the poor quality of the infrastructure, and the lack of knowledge on how to use it [69].

19. Tendency to use free solutions with limited functionalities

When not receiving institutional support, teachers must search for free solutions, to avoid expensive memberships. In the context of video editing specifically, there are several efficient and intuitive applications available on the market, but teachers often have no other option than to take free samples (usually full of advertisements). According to Aalto researchers, 'free solutions are usually hard to master and have limited functionality, leaving beginners in frustration' (ID1). As reported by Aalto (ID1): 'our participants had to research what kind of free solutions exist and which of them are applicable to be used. The free solution typically is not only limited in functionality, but it is usually not user-friendly too. Therefore, it requires a lot of time to learn how to use it. But the poor quality of the result might be not because of a lack of knowledge, but because of the features of the software'. The low availability of software and hardware to support the e-learning environment, and the quality or level of teaching, have been frequently identified as obstacles to the development of collaborative virtual projects [70].

4.3.2. Centralized Digital Structure

20. Common (but open!) repository for all partners

A crucial aspect found across HEI collaboration experiments was related to the need to have a common 'point of encounter' for all partners involved in a consortium, i.e., a 'shared repository'. At Aalto, it was found, for example, that a repository would be an interesting source to 'keep track of all the materials about ongoing projects in one single place', to 'share updated content related to every new online session', and 'to upload visuals/feedbacks and commenting' (ID1).

Similarly, at FUB, researchers found that a 'common repository' would be useful as a 'communicating medium' for the different actors involved (teachers, teaching planning, e-learning, etc.) (ID5). Thus, partners would be able to access and 'always find information in one central place'. As reported by FUB, this tool allowed students to 'find information about specific programs, events and workshops; learning resources; learning tips; tools for communicating with their partner and with other pairs, such as chats or online cafés; tools for communicating with organizers, tutors or advisors; learning journals' (ID5).

Interestingly, while the relevance of having a shared repository seems evident for most partners involved in cooperation projects, researchers at Bologna (ID12) reported on the limitations emerging when testing their collaboration activity. When trying to find the best platform solution as a learning device and as a storage repository, researchers initially considered the platforms of the University of Bologna and University of Leuven. According to the report, these two organizational platforms are 'conceived primarily for synchronous courses', which 'implies that (potential) MOOCs would have to be delivered at fixed times'. If a student wants to complement his or her learning by following an external MOOC, e.g., from YouTube, institutional recognition through badges and certificates then would not be possible. Another issue raised in the report has to do with the institutional 'fixed

framework for planning and implementing educational videos through shared platforms, which made it difficult to combine with a distributed responsibility among the international partners'. Then, the feasibility of a common repository is not that simple. Consequently, a free platform, such as Google Education, was adopted, to gain flexibility when working in a distributed setting.

21. Platform Interoperability

In the context of HEI collaboration, the possibility of interconnecting several institutional platforms is crucial. As reported by Bologna (ID12), 'new institutional infrastructures and facilities should be as flexible as possible to interoperate and communicate with a multiplicity of initiatives developed within the different disciplines or within interdisciplinary research communities, since the wide movement towards open science has now reached a consensus on many common standards, as it can be observed in the European Open Science Cloud Portal and Marketplace'. Importantly, as raised by Paris 1, 'institutions must be concerned about the scrupulous and unconditional respect of the RGI ('Référentiel général d'interopérabilité')' (ID8), a set of recommendations related to the interoperability of IT systems. The equipment of the various providers of virtual collaboration platforms is not interoperable [71], thus posing a problem between the student users and the institution's equipment.

22. Ethical issues around education technologization

The ethics around the digitalization of education are usually overlooked in discussions on HEI collaboration, even though they may have an important impact on students' lives, their feelings, and expectations. As reported by Paris 1, 'digitalization is not only the switch to distance learning but a real readjustment of pedagogies (. . .), including tools and practices, distance learning courses, courses between European universities, interactive courses, international mobilities carried out online or in a hybrid way, among others' (ID8). The problem in this 'new context', according to researchers at Paris 1, is that students usually do not have a 'voice' in their own universities. Indeed, based on their survey, '60% of respondents had never gotten the opportunity to express their views' on digitalization. Through focus groups and interviews with students, researchers from Paris 1 have listed their main learnings: (a) digital tools must be strictly open source and free; it is necessary to enact a total end to the use of proprietary tools such as Zoom/Teams, etc.; we must pay attention to the scrupulous and unconditional respect of the RGI, at all levels of the university (administrative, students, teachers, etc.); the digital university must favor material accessibility, with equipment provided for all; and the financing of equipment must go hand-in-hand with the equality of means (work must absolutely never be conducted on personal equipment). The report issued by Paris 1 concludes with an ontological remark: 'digital university does not mean an online university; it means that each teacher should be free to agree with the students on the institutional tools and/or platforms they decide to use in addition to the course (exercises, course materials, media, etc.)' (ID8).

5. Conclusions

A successful policy on digital inter-university collaboration should be evidence-based, to help avoid tensions between the decision-making layer (the upper level) and the institutional layer adopting the new norms (the bottom level). In this article, we have introduced the result of a comprehensive three-year (2020–2022) research project within the framework of Erasmus+ KA3, in which we have managed a consortium of seven European universities that tested how HEI cooperation and joint learning activities are impacted by digitalization. Through an abductive approach, our analysis allowed us to recognize 22 lessons emerging from the organizational, pedagogical, and technological dimensions.

In terms of organization, we highlight the following key aspects that may be considered to improve collaboration in digital settings:

- creating an atmosphere of trust among university students and authorities, in which feelings towards the use of technology can be expressed confidently;

- providing teachers with the right incentives to participate in new collaboration activities;
- providing teachers with pedagogical support to create online learning activities;
- developing a legal framework that ensures that teachers have formal support while working in an online collaborative learning environment;
- defining the roles and responsibilities of professionals working in a digital setting;
- lowering the local bureaucratic jargon, so that international students become more familiar with the institution structure;
- disseminating current (and past) projects, so that organization stakeholders are aware of their potential contribution.

In terms of pedagogy, we highlight that:

- teachers and instructors need to be trained in creating online materials, and in selecting the right software;
- the evaluation of assignments may vary significantly among teachers from different universities, so careful guidelines should be created, to reach a certain level of inter-rater agreement;
- university external partners may want to be involved in students' activities other than grading;
- classic teaching formats and methodologies may not work in new online settings; in this case, the adaptation of teaching should be encouraged;
- evaluation schedules (grade delivery, ECTS recognition) work differently between institutions;
- mandatory and optional courses schemes may influence students' performance in an online setting;
- some optional online courses cannot be validated by students because they are not formally recognized in the curriculum.

Lastly, in terms of technology, we highlight the following learnings:

- teachers may have different technological demands according to their teaching needs; there is not a single tool that satisfy all their needs;
- most teachers have little knowledge about how to use specific software and digital tools; mastering the platform functionalities may take too much time;
- the lack of software and licenses at universities pushes teachers to spend considerable time searching for a free solution, resulting in bad-quality material;
- there is a strong need for a common and open repository across partners, containing all teaching material;
- complex digital collaborations require platform interoperability to gain efficiency;
- the use of technology should be critically discussed by all university stakeholders.

Unlike other research on online collaboration, our study is concretely based on the design, the execution, and the analysis of an inter-university research project on digital collaboration, which has allowed us, through bottom-up experimentation, to simultaneously explore a wide range of interactions. To name a few: between university authorities and foreign students, between teachers and students, between teachers and non-academic actors (e.g., from industries), between teachers belonging to different institutions (e.g., in distributed curricula), between students from different institutions (e.g., in conjoint courses), between teachers and technology (e.g., using software to create content), between students and technology (e.g., using LMS), and between foreign students and their host institutions (e.g., in relation to credit recognition). The possibility of capturing the voice of a wide variety of stakeholder is what makes this research unique.

In terms of limitations, we believe that our research only captured some of the collaboration challenges, given the nature of the collected data. In this respect, it is worth noting that the report genre, although it was not our only source of information, tends to constrain more personal insights and, consequently, hide deeper controversies between people and institutional hierarchies. Thus, further research may be required to trace challenges in more

depth, for instance, using interviews or surveys, and focusing on the values and norms supporting stakeholders' positions.

We expect our results to contribute to the discussion about the relevance of evidence-based data to feed education policies.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su151813470/s1>, List S1. List of Priority Actions (PA) covered in the project. List S2. List of different project tasks, including key deadlines. Table S1. Description of experimentations per partner Consortium. Table S2. Priority Actions covered by experimentations. Table S3. Key "Peer-to-Peer Learning Meetings".

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