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Barriers to University–Industry Collaboration and the Role of
Trust: A Qualitative Study of Horizon Europe Projects

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Abstract in English

Research and innovation are key elements of EU competitiveness and economic growth and are promoted through the Horizon Europe (HE) program. Some of the projects funded through this program involve university-industry collaboration (UIC), which is the topic of this thesis. Extant literature identifies barriers and enabling factors in UIC; however this phenomenon has received little attention in the context of Horizon Europe. Therefore, this study investigates which barriers UIC actors encounter within the HE program and how they navigate them. Particular attention is given to the nature and role of trust in overcoming these barriers.

Using a qualitative research design, data were collected through 12 semi-structured interviews with individuals involved in UIC projects within the HE program. The data were analyzed using thematic analysis. The results reveal dominant barriers in UIC projects funded through HE while also highlighting approaches for addressing them. Trust emerges as an important factor in preventing or overcoming UIC barriers, particularly through the dimension of open communication; however, it must be complemented by additional instruments. Furthermore, the results highlight distinct roles of cognition-based trust and affect-based trust. Finally, the study provides recommendations for improving university-industry collaboration in HE projects.

Keywords: university–industry collaboration; Horizon Europe; barriers; trust; qualitative research.

Abstract in German

Für die Wettbewerbsfähigkeit und das Wirtschaftswachstum der EU sind Forschung und Innovation Schlüsselemente, welche mittels des Programms Horizon Europe (HE) gefördert werden. Unter anderem wird durch dieses Programm die Zusammenarbeit zwischen Hochschulen und Industrie (university-industry collaboration, UIC) unterstützt, was in dieser Arbeit untersucht wird. In der Forschungsliteratur gibt es bereits Studien, welche die Hindernisse und Förderfaktoren bei der Zusammenarbeit zwischen Hochschulen und der Industrie aufzeigen und Lösungsstrategien thematisieren. Für UIC-Projekte, die durch das HE-Programm gefördert werden, existiert diesbezüglich eine Forschungslücke. Deshalb wird untersucht, welche Barrieren den UIC-Akteuren im HE-Programm widerfahren und welche Lösungsansätze, zur Überwindung dieser, angewendet werden. Besonderes Augenmerk wird hierbei auf die Natur und Rolle von Vertrauen bei der Überwindung dieser Hindernisse gelegt.

Mittels eines qualitativen Forschungsdesigns wurden im Rahmen von 12 halbstrukturierten Interviews Daten von Personen gesammelt, die im Rahmen des HE-Programms in UIC-Projekte involviert sind. Diese wurden mit Hilfe der thematischen Analyse methode ausgewertet. Die Ergebnisse bringen dominante Hindernisse in einem HE-UIC-Umfeld zum Vorschein und weisen gleichzeitig Lösungsansätze auf, wie diese bekämpft werden können. Vertrauen erweist sich dabei als wichtiger Faktor, um sowohl UIC-Barrieren vorzubeugen oder als auch zu überwinden, insbesondere durch seine Dimension der offenen Kommunikation, muss jedoch durch zusätzliche Instrumente ergänzt werden. Darüber hinaus heben die Ergebnisse unterschiedliche Rollen von kognitionsbasiertem Vertrauen und affektbasiertem Vertrauen hervor. Abschließend gibt die Studie Empfehlungen zur Verbesserung der Zusammenarbeit zwischen Hochschulen und Industrie in HE-Projekten.

Schlüsselwörter: Hochschul-Industrie-Zusammenarbeit; Horizon Europe; Barrieren; Vertrauen; qualitative Forschung.

Table of Contents

Acknowledgements	2
Abstract in English	3
Abstract in German.....	4
Table of Contents.....	5
List of tables	7
Abbreviations.....	8
1. Introduction	9
2. Theoretical Background	12
2.1 University-industry collaboration.....	12
2.2 Horizon Europe.....	15
2.2.1 Horizon Europe Background	15
2.2.2 Horizon Europe in Publications.....	17
2.3 Barriers and Facilitators to UIC.....	19
2.3.1 Barriers	19
2.3.1.1 Five Dimensions of Proximity.....	19
2.3.1.2 Cognitive barriers	19
2.3.1.3 Organizational barriers	21
2.3.1.4 Social barriers	21
2.3.1.5 Institutional barriers.....	22
2.3.1.6 Geographical barriers	24
2.3.2 Facilitators to UIC	25
2.4 Theoretical perspectives on trust	29
3. Methodology.....	34
3.1 Research Method	34
3.2 Data Collection	34
3.3 The Interview Guide	36
3.4 Data Analysis.....	37
3.5 Limitations of the methodology	39
4. Findings and discussion.....	39

4.1 Identified themes.....	39
4.2 Institutional barriers and overcoming them	40
4.3 Cognitive barriers and overcoming them.....	45
4.4. Social Barriers and overcoming them.....	48
4.5 Other barriers and overcoming them	50
4.6 Absence of UIC barriers and preventing barriers	53
4.7 Trusting behaviors and their role in mitigating barriers to collaboration	57
4.8 Interplay of cognition-based trust and affect-based trust.....	65
4.9 Trust building.....	69
5. Conclusion	73
6. Literature.....	79
Annex A. Interview guide.....	88
Annex B. Codes and Themes.....	92

List of tables

Table 1. Demographics of interviewees.

P. 37

Abbreviations

ABT – Affect-based trust

CBT – Cognition-based trust

EC – European Commission

EU – European Union

HE – Horizon Europe

IPR – Intellectual property rights

SME – Small medium enterprise

UIC – University industry collaboration

1. Introduction

1. Introduction

Rapid advancements in AI and technological development have made research and innovation an integral part of international, state, and organizational strategies. Furthermore, global challenges, such as climate change, and shared sustainability goals, like those outlined in the UN's Sustainable Development Goals, require concerted action where each actor can contribute their unique competitive advantages to further a common goal. Additionally, the priority of improving the quality of life is as high as never before, stimulating unprecedented innovations in healthcare and life sciences, for example in the development of personalized medicine and discovery of new drugs to make progress in treating cancer, dementia, cardiovascular disease, obesity, and preventing communicable disease.

Both universities and industry engage in research and innovation. The role of universities has been traditionally to educate and to further basic research. However, a third mission of contributing to economic development has been emerging (Etzkowitz & Leydesdorff, 2000). Businesses, on the other hand, are increasingly propelled to engage in research and development efforts to keep up with technological advancements and remain competitive. Therefore, as universities seek to contribute to industrial development, and as industry increasingly engages in an activity which has traditionally been one of the missions of universities, it is only natural that university-industry collaboration (UIC) will continue to evolve, grow in importance, and attract interest as a research subject itself.

Research and innovation, including those conducted by universities and private enterprises, are of particular importance in the EU to strengthen its scientific and technological bases for enabling the green and digital transitions (DG Research and Innovation, 2020). Furthermore, global competition makes research and innovation vitally important for retaining competitiveness in the EU. Horizon Europe (HE) is the EU's funding program established to promote research and innovation with a budget of over 93 bn euro for 2021-2027, succeeding Horizon 2020. Horizon Europe provides support through 3 pillars. Pillar 2 is of particular interest for university-industry collaboration as it earmarks over 50 bn euro for clusters of "cross-disciplinary, cross-sectoral, cross-policy and cross-border collaboration" for research and innovation to promote industrial competitiveness of the EU and to achieve the SDGs involving both private enterprises and higher

1. Introduction

education institutions (European Commission. Directorate General for Research and Innovation., 2021).

Existing research has examined multiple facets of university-industry collaboration, such as collaboration types, motivations, barriers and enablers to collaboration, identifying trust as one of such enablers. With respect to studies on Horizon Europe and its predecessors, it has been mainly focused on such topics as responsible research, the implications of Brexit, the unique challenges and contributions of specific projects, as well as general challenges and drivers of successful HE projects. At the same time, research at the interface of UIC and HE remains scarce. Given the strategic importance of HE projects for the EU and the high number of stakeholders in these projects, understanding the barriers to university-industry collaboration in a HE setting and the respective mitigation strategies warrants attention. Furthermore, with trust identified as a key enabler both for HE and UIC (Bruneel et al., 2010; De Wit-De Vries et al., 2018; Rossoni et al., 2024; Tenhunen-Lunkka & Honkanen, 2024; Uhløi et al., 2012), it is both of practical and theoretical interest to identify its role in barrier mitigation, as well as its nature and foundations in this setting. Therefore, the present study calls to address the following research questions:

1. How do university and industry partners in Horizon Europe projects navigate and overcome barriers to collaboration?
2. How does trust manifest and relate to the ways collaboration barriers are addressed in Horizon Europe projects?
3. How do participants in Horizon Europe projects establish and maintain trust between university and industry partners over the course of collaboration?

To address the above research questions, this thesis adopts a qualitative research design. Semi-structured interviews are conducted with individuals affiliated with universities, firms, or intermediary organizations with experience participating in UIC projects funded through the HE framework and analyzed using the thematic analysis approach. The resulting analysis draws on the proximity dimension framework proposed by Boschma (2005) for barrier analysis, and the managerial interpersonal trust and boundary role person's trust frameworks proposed by McAllister (1995) and Currall and Judge (1995), respectively, for the analysis of the nature, antecedents, and role of trust in university-industry collaborations in a HE setting.

1. Introduction

The aim of this research is to analyze how barriers to UIC are mitigated in practice and how trust shapes university–industry collaboration in Horizon Europe funded projects. Furthermore, it aims to provide practical insights into how trust can be established and maintained. This research will provide a deeper understanding of the role and nature of trust in international university–industry collaboration, particularly within the unique setting of Horizon Europe. It will generate insights into practical strategies that enable academic and industry partners to manage collaboration barriers more effectively. In doing so, the study will also contribute to policy and management discussions on how to design and support research programs that foster stronger and more sustainable partnerships that yield successful outcomes.

2. Theoretical Background

2. Theoretical Background

2.1 University-industry collaboration

University-industry collaboration (UIC) involves the interaction of any element of a higher education institution with private commercial organizations aimed at promoting the exchange of knowledge and technology (Ankrah & Al-Tabbaa, 2015). An alternative term for cooperation between universities and business is academic engagement, which refers to the participation of universities in knowledge-related collaboration with non-academic institutions. This term takes a university-centric view and considers academic engagement as a method for universities to contribute to economy and society by generating knowledge in a joint project that is aimed at producing research and providing the non-academic partner with utility (Perkmann et al., 2013). Furthermore, cooperation between universities and industry can also be described as technology transfer (De Falani Bezerra & Torkomian, 2024). These terms are closely linked to commercialization, that is the process of gaining financial rewards from using academic knowledge. Commercialization initiatives do not necessarily have to be collaborative ones and may trigger other mechanisms, such as academic entrepreneurship, which refers to the establishment of new firms to draw financial gain from an academic invention. At the same time, commercialization can be the result of UIC or one of the reasons to engage in UIC (Perkmann et al., 2013).

Various theoretical frameworks have been applied to delineate this type of collaboration. The relationship between universities and industry can be conceptualized from the point of view of their role in innovation. In this regard, universities, industry, and government are the key actors propelling innovation in society. As Etzkowitz and Leydesdorff (2000) describe, the perception of their relationship has evolved, where, for example, the national systems of innovation approach saw industry playing the principal role in this process and Sabato's Triangle model considered the government to be the forerunner. Universities were not additionally perceived as direct participants of commercial innovation, as their primary goals were to teach and, starting in the 19th century, to conduct basic research. However, a third mission of contributing to economic development has emerged in the 20th century. The Triple Helix of Innovation model describes the relationships between universities, industry, and government. Currently, the three are seen as overlapping institutional spheres with flexible and shifting role distribution resulting in the emergence of hybrid organizations, such as academic spin-offs, trilateral initiatives, or research groups. The role of the government is to encourage initiatives through creating appropriate frameworks or financing. This

2. Theoretical Background

system is in a constant state of transition and development (Etzkowitz & Leydesdorff, 2000). A fourth helix was suggested by Carayannis and Campbell (2009). They proposed that the media and culture-based public can influence the innovation process by shaping discourse around it and defining public innovation priorities. Finally, the quintuple helix model proposed by Carayannis and Campbell (2010) places innovation in the context of the natural environment, setting the framework for linkages between innovation and sustainable development and contemplating the role of eco-innovation and eco-entrepreneurship in future innovation practices.

Further models that explain university-industry collaborations are the network model and the evolutionary model, whereby the former refers to the importance of relationships and networks for UIC and the latter sees UIC as successive evolutionary phases (Hailu, 2024). Furthermore, research in UIC can be grounded in relational social capital approaches, where trust is contended to contribute to the accumulation of human capital and transfer of knowledge (Rossoni et al., 2024).

The types of collaboration can be grouped into 6 categories, depending on the extent of university resource involvement, length, and degree of formalization (Bonaccorsi and Piccaluga, 1994). Thus, collaboration can take the form of personal informal relationships, which develop directly between individuals inside firms and universities (Bonaccorsi and Piccaluga, 1994) and include collective lectures, academic spin-offs or individual consultancies (Ankrah & Al-Tabbaa, 2015). Personal formal relationships also involve direct relationships between individuals, but in these cases, they are formalized through agreements between university and industry (Bonaccorsi & Piccaluga, 1994). These types of collaboration include student internships, joint supervision of theses, or scholarships (Ankrah & Al-Tabbaa, 2015). Collaboration mechanisms can also involve third parties, such as technology transfer organizations, government agencies, or technology brokerage companies. Collaborative arrangements involving formal agreements can be divided into two groups: targeted and non-targeted agreements. With targeted agreements, objectives are defined from the very outset of collaboration (Bonaccorsi & Piccaluga, 1994). Examples of targeted agreements are license agreements, joint research programs, and joint curriculum development (Ankrah & Al-Tabbaa, 2015). Non-targeted agreements have a broader application and can involve research grants, funding of university posts or advisory boards. The final group, focused structures, involves the creating of dedicated joint, often permanent, university-industry structures to carry out specific research activities. These can be science parks, incubation centers, or university-industry

2. Theoretical Background

consortia (Ankrah & Al-Tabbaa, 2015). Alternatively, the shape that collaborations take can be grouped into thematic areas: collaboration in education, collaboration in research, and collaboration in management, the latter including sharing resources, funding of mutual activities by businesses, and creation of intellectual property (Tereshchenko et al., 2024).

Universities and industry engage in UIC for a number of reasons. One of the incentives that drives firms to engage with higher education institutions is to gain broad access to the latest developments in their field. Research and development requires extensive financial and time investments, therefore firms typically focus on just a few narrow subjects internally. Collaborating with universities allows firms to be aware and make use of developments outside of their narrow field of expertise. In doing so, firms can access knowledge from around the world and stay close to the frontier of scientific thought. Industry can also rely on academic partner for performing specific development activities, such as testing of prototypes at university facilities, to reduce costs and share risks. Finally, companies can also engage in collaboration with universities because they lack internal resources to conduct research and development (Bonaccorsi & Piccaluga, 1994).

Universities engage in UIC to commercialize their activities through receiving personal income or benefitting from intellectual property revenue, to learn from industry, to obtain access to in-kind resources, such as materials, equipment, or expertise, and to secure access to industry and government funding (D'Este & Perkmann, 2011). Indeed, an empirical assessment of academic researchers has demonstrated that economic motivations are a primary motivation of universities. They see UIC as a way to commercialize their activities and to receive funding for their research (Mascarenhas et al., 2024). However, a broader analysis shows that this is only one of the perspectives and that motivations can differ across various types of UIC, where researchers interested in pecuniary benefits prefer to engage in spin-offs, consulting, or patenting, while those motivated by learning and getting access to funding collaborate in joint research, contract research, as well as in consulting. Industry contact can also have indirect effect on academic research, where participation in joint research and consulting may direct researchers to take on new research avenues and derive benefit from them (D'Este & Perkmann, 2011).

2. Theoretical Background

2.2 Horizon Europe

2.2.1 Horizon Europe Background

Horizon Europe is the EU's funding program to promote research and innovation in the period from 2021 to 2027, which was formally adopted through Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe on May 12, 2021 (*Regulation - 2021/695 - EN - EUR-LEX*, n.d.). Horizon Europe succeeds the Horizon 2020 program and is aimed at advancing scientific excellence, supporting the creation of new fundamental knowledge, growing research and innovation talent, at generating knowledge needed to implement EU policies, at driving innovation use in industry, fostering participation from all Member States, and strengthening the European Research Area (European Commission: Directorate-General for Research and Innovation, 2021).

The total budget of the 2021 – 2027 Horizon Europe is 95.5 bn euro (European Commission, 2025c). Additional funding is also available through European Partnerships, an instrument established in 2002 to bring together the EU and private or public partners, including industry, universities, research organizations, civil society, and NGOs, to jointly support research and innovation activities (*Regulation - 2021/695 - EN - EUR-LEX*, n.d.). There are three types of partnerships currently established: institutionalized partnerships for long-term collaborations established under Art 185 and 187 TFEU, co-programmed partnerships based on Memorandums of Understanding, with partners' contributions implemented under their responsibility, and co-funded partnerships based on grant agreements providing for 30 to 50% co-funding to Horizon Europe. There are currently 50 European Partnerships providing about 38 bn euro in contributions (European Commission: Directorate-General for Research and Innovation, 2024b).

The Horizon Europe program is structured in four parts. The first part, Pillar I “Excellent Science,” ensures financing to individual research groups, supports mobility of researchers, and funds research facilities to promote research excellence and advances in fundamental science through the Marie Skłodowska-Curie Actions and the European Research Council. Pillar II “Global Challenges and European Industrial Competitiveness” establishes six clusters for research and innovation to promote industrial competitiveness of the EU and to achieve the SDGs. Pillar III 'Innovative Europe' establishes the European Innovation Council, European Innovation Ecosystems, and European Institute of Innovation and Technology aimed at funding strategic research and scaling

2. Theoretical Background

up of operations, as well as nurturing entrepreneurial talent. The last part, “Widening participation and strengthening the European Research Area,” is aimed at increasing participation in the program and at reforming the European R&I system (European Commission, 2025b).

University-industry consortia collaborate in Pillar II projects. Research and innovation activities falling under this pillar are implemented across six clusters: Health; Culture, Creativity and Inclusive Society; Civil Security for Society; Digital, Industry, and Space; Climate, Energy, and Mobility; and Food, Bioeconomy, Natural Resources, Agriculture and Environment. Furthermore, in order to better link EU’s research and innovation to society needs, the Horizon Europe introduced the concept of missions, that is, research and innovation action portfolios designed to achieve a measurable goal within a defined timeframe that impacts a significant part of the European population. Missions are intended to be programmed under Pillar II but may also be carried out under other programs (Regulation on Horizon). In practice, about 80% of the budget allocated to missions pertains to Pillar II projects (European Commission, 2025b). The Regulation establishes five possible mission areas: Adaptation to Climate Change; Cancer; Healthy Oceans, Seas, Coastal and Inland Waters; Climate-Neutral and Smart; and Soil Health and Food, with specific implementation plans and measurable goals defined for each mission by the corresponding mission board.

The Horizon Europe program is implemented through Strategic Plans and Work Programs. Strategic plans are developed for a period of three or four years and define key strategic orientations, expected outcomes, guiding cross-cutting principles for implementation, and updated information on European Partnerships (European Commission, 2025b). Thus, The Strategic plan for 2025-2027 defines three strategic orientations (the Green Transition, The Digital Transition, and A More Resilient, Competitive, Inclusive, and Democratic Europe) and 32 expected impacts, each of which is attributed to a cluster (European Commission: Directorate-General for Research and Innovation, 2024a). These orientations and expected impacts are then used to develop specific Work Programs for each part of the program and for each cluster in Pillar II for a narrower period. Work Programs include detailed information on specific calls for proposals. Each call includes a number of topics grouped into destinations, with destinations mirroring the expected outcomes outlined in the strategic plan. The Work Programme also defines the type of action, budget, EU contribution, the number of funded projects for each topic. The Work Programme also provides

2. Theoretical Background

details on eligibility, award criteria, scope, and objectives of each topic. Work Programmes are generally developed by the European Commission for each Cluster and Horizon Europe part, but European Partnerships can also prepare their own Work Programmes outlining calls for proposals (European Commission, 2025c).

As for participation in Horizon Europe-funded initiatives under Pillar II, it is open for entities from Member States, associated third countries, and other countries, as specified in the Work Programme. There are currently 22 countries with association agreements in force (European Commission: Directorate-General for Research and Innovation, 2025b). Composition of consortia participating in actions under the Horizon Europe program are outlined in Article 22 of the Regulation, which requires at least one entity of the consortium to be registered in the Member State and at least two additional legal entities registered in different Member States or associated countries (*Regulation - 2021/695 - EN - EUR-LEX*, n.d.). Potential partners can search for collaborators for joint applications using the partner search function of the EU Funding and Tenders Portal.

2.2.2 Horizon Europe in Publications

Horizon Europe as the subject of academic literature has been addressed through a number of lenses. One stream of literature concerns itself with ethics and responsible research and innovation (RRI) in Horizon Europe Projects (Gerber et al., 2020; Ikonen, 2024; Mazzonetto & Simone, 2018; Robinson et al., 2020). RRI is a concept that developed in a European Commission workshop in 2011 and claimed that research and innovation are deemed responsible if they protected the environment, served social needs, shared European values, and are beneficial to a wide range of actors (Owen et al., 2021). Ethics management in Horizon Europe projects starts with self-assessment to identify potential issues, follows with description of applicable legislation, planning of mitigation measures and resource allocation, then continues with incorporating an ethics dimension in work packages and assignment of responsible persons or units, and results in the creation of handbooks or guidelines and is supplemented with continuous workshops, trainings and etc. Extant literature suggests that ethics management is best implemented from the beginning of the project through ethics by design and responsible research and innovation approaches. The latter can be based on responsibility by design consisting of five components: enlightenment, ethics, engagement & empowerment, evaluation, and endorsement & exploitation (Ikonen, 2024). Gerber

2. Theoretical Background

et al. (2020) propose measures to fortify RRI in Horizon Europe research by requiring applicants to describe specific RRI tasks, deliverables, and budgets, by applying a holistic approach to RRI implementation, and by establishing an RRI hub. Mazzonetto and Simone (2018) wrote in anticipation of the new Horizon Europe program before its commencement to underscore a growing emphasis on innovation without due attention to RRI inherent to the new proposal, highlighting the importance of preserving and fostering this approach in Horizon Europe as it has played a significant role in mainstreaming RRI across industries, sparking innovation, and combatting inequalities.

Another important area in Horizon Europe research is dedicated to the implications of Brexit for UK's participation in Horizon Europe and for research in UK, including consequences of withdrawal from Horizon Europe, UK's plan B, and the UK's renewed membership in Horizon Europe in 2024 as an associated country (Allen, 2023; Burki, 2023; Owens, 2023; Sanderson & Naddaf, 2023; “UK’s Rupture With Horizon Europe Is Totally Unnecessary,” 2022; “UK Scientists Are Right to Say No to ‘Plan B’ for post-Brexit Research,” 2023). In 2023, the UK announced its return to Horizon Europe as an associate member making 2.6 billion euro in yearly contributions. Surveys have shown that this was a long-awaited decision in the scientific community. Furthermore, it will allow British organizations to bid for EU funding and to lead projects, making the UK much more attractive for international researchers (Burki, 2023).

A third group of publications concerns itself with specific projects and challenges. Benissa and Patil (2024) focused on clustering of projects in Horizon Europe in an empirical study of the Solid4B cluster, identifying technical synergies, networking, and visibility as prime drivers to collaborate in clusters and issues around confidentiality, commitment, and communication as they key challenges to clustering. Lages et al. (2023) addressed the tensions emerging in collaboration and commercialization in the Horizon2020 NextLand project for e-commerce in earth observations in agriculture and forestry and described how they were addressed in workshops using the value-creation wheel. Ferrer-Serrano, Fuentelsaz and Gil-Lamata (2025) covered digitalization and technology transfer in their research, situating their research in Horizon Europe and finding that countries with intermediate level of digitalization engage in technology transfer the most actively.

2. Theoretical Background

A smaller set of publications reflects on the experiences of participating in HE consortia. Shortall and Meredith (2025) discuss the challenges they have faced in leading HE projects and suggest some improvements. They underscore the bureaucratic burden that individuals not familiar with HE procedures have to bear, as well as the prescriptive nature of the calls which limits flexibility. Furthermore, they suggest that academics are forced to compete with specialized consultancies for calls and the academic quality of resulting research may be jeopardized due to the nature of the calls. They call for improved helplines, expert review of calls, and extended coordination groups. Tenhunen-Lunkka and Honkanen (2024), on the other hand, outline the success factors of HE projects, among which they have identified communication, trust, effective collaboration and leadership.

2.3 Barriers and Facilitators to UIC

2.3.1 Barriers

2.3.1.1 Five Dimensions of Proximity

There are several approaches to grouping barriers to university-industry collaboration. They can be grouped into orientation-related barriers and transaction related-barriers, where orientation-related barriers reflect differences in attitudes to incentives, time, or organizational culture, and transaction-related barriers refer to contrasts in the regulations and handling of intellectual property that are characteristic of universities and industry (Bruneel et al., 2010). The classification of UIC barriers in this study will be based on the five proximity dimensions approach proposed by Boschma (2005). In collaborative innovation, the proximity of the collaborating organizations may be described along five dimensions, which are cognitive proximity, organizational proximity, social proximity, institutional proximity, and geographical proximity. Both excessive and insufficient proximity along these dimensions can hinder collaboration. (Boschma, 2005) Therefore, five categories of barriers to UIC can be identified: cognitive, organizational, social, institutional, and geographical barriers. The sections below will group the findings in extant literature around specific barriers to UIC into these five groups of barriers.

2.3.1.2 Cognitive barriers

Cognitive proximity refers to the closeness of the cognitive base of the actors involved in knowledge sharing. A certain minimum level of cognitive proximity between organizations is required in order for them to be able to communicate, understand, and use new knowledge from

2. Theoretical Background

the other firm or from the shared activities. If the new knowledge is too distant from an organization's cognitive base, it will simply lack the capacity to absorb the new information. However, too little distance can also pose problems, as too much overlap in the actors' knowledge base will mean there is little novelty they can gain from their partner (Boschma, 2005). Therefore, barriers may emerge both from insufficient and excessive cognitive proximity.

Multiple studies demonstrate that cognitive distance affects the conceptualization stage of collaborative initiatives. Thus, a lack of industry awareness in the latest developments in the academic domain may result in little interest on their part to engage in collaborative research (Mirza et al., 2020). Therefore, the failure of academia to attract interest to their research domain, build awareness about their research among potential partners, and to close knowledge gaps with industry can hinder the development of collaborative initiatives. Furthermore, cognitive barriers can affect the selection of the research thematic area and study methodology, where some researchers find it difficult to select potential areas for joint research due to cognitive distance with partners (Muscio & Pozzali, 2013). This means that some collaborative initiatives might not go beyond initial prospecting as the partners cannot find sufficient overlap in research interests to commence a project. Other perspectives suggest that cognitive differences do not adversely affect motivation to collaborate but do limit interaction during the collaboration, which is required for the transfer of tacit knowledge (De Wit-De Vries et al., 2018).

Another potential hindrance related to cognitive distance is linked to ease of communication in ongoing projects. A study of 15 UIC projects in Norway demonstrated that firms that experienced difficulties in finding a common understanding with their partners due to varying knowledge bases ended up participating in university collaborations less frequently. The varying knowledge bases take the form of different accents on knowledge depth and breadth, where university partners tended to be much more specialized and operated on far more complex terminology (Steinmo & Rasmussen, 2018). Thus, the inability or unwillingness to translate specialized knowledge by university partners for collaborators can obfuscate communication and create difficulties in collaboration.

2. Theoretical Background

2.3.1.3 Organizational barriers

Organizational proximity refers to the rate of autonomy and degree of control actors will have in a collaborative organizational arrangement. Low organizational proximity implies the ties between actors are weak, whereas high proximity implies strong ties with hierarchical organization of relationships. This continuum can be applied both to intra-organizational ties between different units of an entity, as well as to inter-organization ties between distinct organizations (Boschma, 2005). Barriers to UIC can emerge if ties between organizations are too weak to offer stable routes for exchange of information and reliable feedback loops.

Weak inter-organizational ties can mean that there is a lack of links between academia and industry which can be used to learn about opportunities and develop partnerships. A study featuring academics in the psychiatry field in the UK demonstrated that a key barrier to UIC in the field comes from the fact that researchers often do not know how to find industry partners and commence a collaborative relationship (Mirza et al., 2020). This tendency is also indicative of weak intra-organizational ties, as universities do usually have a TTO or a business liaison that can help establish contacts, however this evidence shows that these units do not have strong ties to academic departments.

Inter-organizational ties can be strengthened through taking conscious initiative to establish pathways for communication and dedicate time for collaboration. However, as noted in a study of two alliances in Norway, the lack of such initiative and involvement can be detrimental to achieving positive outcomes (Steinmo, 2015). Showing unwillingness to forge organizational ties can therefore create dissatisfaction and lead to missed opportunities in establishing common goals.

2.3.1.4 Social barriers

Social proximity involves relations between actors on a micro-level based on trust developed through friendship, kinship, or experience. Social barriers can emerge if the actors do not trust each other enough to share tacit knowledge, or conversely, when their social ties are so strong, that they lock them into established ways and prevent them from innovation and seeking novel input (Boschma, 2005).

Experience can play a particularly significant role in establishing successful collaborations. For instance, as demonstrated in a survey in Italy, universities that have already partnered with industry

2. Theoretical Background

are more likely to do so again in the future (Muscio & Pozzali, 2013). Negative experience on the other hand, can disincentivize organizations from collaborating. A qualitative analysis of academia perceptions of UIC in psychiatry in the UK demonstrated that prior negative experience in working with industry can hinder further collaborative efforts. For example, a situation where inclusion criteria were altered during the study and conflicts of interest were not openly declared prompted one researcher to describe his experience working with an industry partner as "horrific". In general, researchers expressed a belief that commercial research is biased and therefore not credible. These types of experiences encourage university researchers to make additional steps when considering working with the industry again, like building a framework to ensure full control or carefully selecting the right partner (Mirza et al., 2020). Thus, this demonstrates that negative experience can build distrust in specific partners and industry as a whole, as well as create additional obstacles in the form of developing new safeguards.

Furthermore, opportunistic behavior can also negatively affect collaboration. This refers to taking advantage of partners and situations to serve one own's interests, often in violation of agreements and norms. Empirical evidence shows that power asymmetries and imbalances of benefits fostered resentments and resulted in perceived or actual losses (Tootell et al., 2021). This can create distrust and jeopardize further collaboration.

2.3.1.5 Institutional barriers

Institutional proximity refers to the extent actors share rules, procedures, customs, and values (Boschma, 2005). Barriers emerge if the rules or values of the collaborating organizations are too distant to agree on the rules and values governing the collaboration.

One area where the attitudes, customs, and values of universities and industry vary is time and planning. Universities and industry have a different time-horizon perception, where universities approach research as a long-term initiative, and businesses have a short-term orientation to conduct research and implement its results (Rossoni et al., 2024). One other possible manifestation of attitudes to time norms is the decision to participate in sequential UIC projects or in parallel ones. It has been demonstrated that universities tend to focus on one project at a time, thereby extending the time they have available to work on it to gain in-depth knowledge. Businesses, on the other hand, prefer to compress the time they dedicate to a single project by participating in multiple

2. Theoretical Background

collaborations in parallel to gain a broad knowledge base to attain synergies or more opportunities to scale up or become a first mover (Mannak et al., 2019). Thus, attitudes to timing may create tension between university and industry partners, where industry may push for faster turn-around times than higher education institutions are comfortable working with. Conversely, industry partners may also feel dissatisfaction from this collaboration if they feel that it is progressing too slowly to achieve the expected results. Additionally, opposite trends are observed in attitudes to dissemination, where academia strive to publish data quickly and industry prefers to keep knowledge secret or delay publication (Bruneel et al., 2010). Therefore, timing is a source of multidirectional tensions that may result in conflict.

Another misalignment in terms of institutional values pertains to attitudes around knowledge dissemination. Performance in academia is measured outside of traditional market terms and depends on researchers' publications, institutional affiliations, and awards. Moreover, university researchers operate in a setting where communalism, universalism, and social objectives take precedent over monetary concerns. Industry, on the other hand, is incentivized to keep knowledge private in order to be able to draw economic value from it and gain a competitive advantage. Knowledge-sharing for industry is a further tool of competing for partners and economic resources. A further misalignment stemming from this is the selection of research topics, where university researchers are motivated to choose topics interesting for their peers, and industry prefers those that have potential for commercialization (Bruneel et al., 2010). This mismatch in treatment of knowledge resulting from potential collaborations may then lead to conflict around research objectives.

A third area where the institutional framework may create obstacles is related to legal arrangements. For example, finding a compromise between the legal requirements of both partners takes time and may result in dissatisfaction with delays (Canhoto et al., 2016). One specific subject of legal contention is intellectual property (IP), where universities may have very rigid rules around protecting IP resulting from collaborative research. This can be accentuated by the fact that in some cases universities might have unrealistic expectations of how much their output is worth, leading to conflicts around the value of IP (Bruneel et al., 2010). Furthermore, university IP regulations and interests can create an "environment of suspicion" which serves as a further obstacle to collaboration (Canhoto et al., 2016). Furthermore, industry and university opinions can diverge in

2. Theoretical Background

terms of attitudes to IP, where industry seeks to secure IP rights on the results of their work as this is the basis for future revenue, while academia seeks to publish new knowledge and might not desire the same level of protection (O'Dwyer et al., 2022). These discrepancies can even result in absence of an IP arrangement, which will make partners hesitant to share sensitive information (O'Dwyer et al., 2022). Thus, a lack of compromise and transparency around the legal environment can delay cooperation or harm the relationships due to a seemingly unpleasant atmosphere of suspicion.

A final institutional gap lies in the level of commitment to collaboration. Misalignment between leadership operational market-driven expectations and long-term commitments required for UIC research can be detrimental to participant motivation, (Sa'A & Gunnarsson, 2025) meaning that both industry leaders and collaborators express and insufficient level of commitment to UIC. A lack of leadership commitment can also translate into firms not providing enough support to UIC. If this occurs in companies with little UIC experience, they often lack structures dedicated to the collaborative projects and delegate them to single employees without providing adequate support, setting relevant objectives, and company commitment. Furthermore, insufficient commitment can be linked to a lack of procedures for sharing knowledge and utilizing UIC outcomes (Sa'A & Gunnarsson, 2025).

2.3.1.6 Geographical barriers

Geographic proximity refers to the physical closeness between actors. If actors are physically close to each other, they are more likely to interact, share, and create knowledge. At the same time, excessive geographical proximity might limit geographic openness, where actors begin to rely on spatial proximity for knowledge sharing and creation and exclude potential partners based on their geographic distance, losing the opportunity to gain novel insights from them (Boschma, 2005). Thus, physical closeness can ease exposure of partners to one another, but also hinder collaboration with more distant ones.

Early proximity studies have shown that some of the ways that geographical proximity can aid collaboration is by supporting face-to-face collaborations, the establishment of trust, and enabling informal communication. Location near to universities can also result in knowledge spillovers to firms, which may also aid innovation initiatives. However, geographical closeness can be

2. Theoretical Background

outweighed by other factors, such as the quality of the university, where location to third-tier universities can disincentivize high R&D-intensive firms from collaborating with universities at all (Laursen et al., 2010). Therefore, physical closeness may not be a sufficient reason to collaborate, and closeness to an unsuitable partner can even be demotivating for demanding partners.

One setting where geographical barriers to UIC are by definition removed are science parks. In this environment, physical proximity improves and facilitates informal ties. At the same time, even before accessible communication tools made it easy to reach any partner worldwide in the 21st century, geographical proximity did not contribute to the establishment of formal ties (Vedovello, 1997). Therefore, geographical proximity and the associated barriers play a less significant role than those mentioned above.

2.3.2 Facilitators to UIC

Barriers to UIC can be overcome through a range of measures. They include conducting courses and workshops on UIC both for university and industry employees, using effective communication tools, providing background information on partners, reducing geographical distance, obtaining government funding, and gaining an understanding of partner values (Rossoni et al., 2024). With respect to geographical distance, physical proximity between partners has been demonstrated to reduce cognitive gaps between partners and enabled learning and the implementation of knowledge-transfer routines (O'Dwyer et al., 2022). As far as government funding is concerned, new funding opportunities drive initial contacts and joint applications, while sustained funding motivates more creative and innovative collaboration. Furthermore, the way funding is used can also serve as a facilitator. Thus, grants that were distributed evenly among the partners fostered a sense of equality, partnership, and ownership over the results among grant participants, which in turn bolstered their commitment (O'Dwyer et al., 2022). Additionally, governments and policies can help by offering tax credits, supporting information networks, and providing advisory assistance (Ankrah & Al-Tabbaa, 2015).

University-industry collaborations can also be supported through engaging intermediaries. These are organizations which aid in the exchange of knowledge between universities and organizations and can take the form of independent organizations or specialized entities in universities or industry partners. Intermediaries carry out four types of functions, which largely align with those performed

2. Theoretical Background

by intermediaries in the innovation process in general, not just in UIC, namely connection, collaboration, services, (Lopez-Vega & Vanhaverbeke, 2009) and commercialization (Santos et al., 2023). Connection entails brokering of contacts for flow of knowledge and building networks and innovation spaces, as well as facilitating relationship-building and providing access to graduates and researchers. Collaboration functions involve knowledge processing, combination, and generation, as well as technology foresight through mapping technology transfer and reception, scoping and filtering of potential partners, and formulation of requirements. Service functions include support services such as training, IPR maintenance, protection and consulting, administrative, legal, financial services, provision of physical resources, technology assessment, and testing (Howells, 2006, Lopez-Vega & Vanhaverbeke, 2009, Santos et al., 2023). Finally, intermediaries involved in commercialization support with exploitation of outcomes, marketing and sales, fundraising, and licensing or selling IPR (Santos et al., 2023). The roles predominantly expressed and covered by extant literature are IPR protection and licensing, networking, outcome exploitation, and marketing (Santos et al., 2023).

Multiple types of intermediaries are engaged in supporting UIC. Technology transfer offices (TTO) are organizations within universities that facilitate the transfer of technology developed by university researchers by establishing links between creators and recipients of technologies, disseminating information, and providing administrative support (De Falani Bezerra & Torkomian, 2024). Their main functions are protection and direct commercialization of IP (Santos et al., 2023). Collective research centers (CRC) are public or non-profit research centers that specialize in a specific domain, generally include university members and produce more specialized knowledge that position them well to bridge the gap between academia and applied research initiatives of industry. Financial intermediaries aid in marketing, commercialization and management. Science and technology parks are organizations that bring together science-based companies to one location that is typically close to universities and are intended to support start-ups, but also provide opportunities for contract research (Santos et al., 2023). Furthermore, they promote knowledge spillovers through face-to-face interactions on clustered entities and reduce transaction costs of UIC for small firms (Kang et al., 2025). University incubators are designed to foster academic entrepreneurship and provide new technology firms and university spin-offs with access to reduced rent, access to capital, faculty consultants, technology transfer services, and infrastructure such as laboratories (Barbero et al., 2014). Further types of intermediaries include industrial associations,

2. Theoretical Background

technology brokers, proof-of-concept centers, public agencies, external patent agents, and technology scouts (Santos et al., 2023). Consortia can benefit from engaging multiple intermediaries depending on the purpose, as they can serve as valuable resources with unique specializations and contributions within one project (Sa'A & Gunnarsson, 2025).

Beyond intermediaries, the individuals involved in the collaboration can also positively affect progress. Thus, boundary-spanning collaborators with both industry and university experience help close gaps, as they can explain the specifics of academic research to industry and business considerations to academia (De Wit-De Vries et al., 2018; Sa'A & Gunnarsson, 2025). Another significant component driving successful UIC is a project manager that resolves daily operational issues and balances different and sometimes conflicting needs, perspectives, and ways of working (O'Dwyer et al., 2022). Thus, individuals can aid collaboration either by helping organizations bridge differences or by managing these differences with competence.

With respect to project management, planning is a key activity that is crucial for preventing misunderstanding, such as that stemming from cognitive or institutional differences, as well as for aligning objectives to prevent institutional barriers related to commitment levels (Morandi, 2011). Therefore, planning is a key skill for project managers in UIC environments.

Inter- and intraorganizational networks can also be conducive to collaboration. For example, creating matrix organizations and other structural arrangements that foster interdisciplinary exchange contribute to knowledge-sharing in UIC arrangements (Sa'a & Asplund, 2024). Furthermore, firms with little UIC experience can also benefit from participation in interorganizational networks bridging multiple projects, allowing them to obtain feedback and learn best practices (Sa'A & Gunnarsson, 2025).

Additionally, previous experience is also an important factor in overcoming organizational, cognitive, and institutional barriers. In terms of organizational barriers linked to weak ties, previous research collaboration can help by allowing organizations to use their previous experience to develop standard procedures, agreements, and mutual understanding that are needed for successful collaboration. Having prior experience is also helpful in setting common expectations and aligning approaches, which is also useful in overcoming institutional barriers related to goal misalignment (Bruneel et al., 2010; De Wit-De Vries et al., 2018). Previous experience allows collaborators to

2. Theoretical Background

learn from prior challenges and acquire the necessary skills and knowledge for more successful collaborations. This experience can also be diversified through using multiple various channels of interaction to build up the common knowledge base through being exposed to different configurations. However, this has the downside of increasing administrative complexity and transactions costs, which can adversely affect collaboration (Bruneel et al., 2010; De Wit-De Vries et al., 2018). Previous experience has also been suggested to be an important factor in overcoming cognitive barriers, though opposite findings establishing no link between previous experience and cognitive barriers also exist (De Wit-De Vries et al., 2018).

Trust has been demonstrated to be one of the key factors in overcoming barriers to collaboration (Bruneel et al., 2010; De Wit-De Vries et al., 2018; Rossoni et al., 2024; Ulhøi et al., 2012). Trust plays an important role as it affects the flow of information, especially sensitive information that can potentially be used opportunistically. This is especially true for knowledge creation and sharing tacit knowledge that may be difficult to codify (Bruneel et al., 2010; Tootell et al., 2021). Trust is essential both for the formation and endurance of professional relationships required to create and share knowledge (Tootell et al., 2021).

One key factor linked to trust is communication. Perspectives on this link differ, as it can be both seen as an antecedent to trust (De Wit-De Vries et al., 2018) and a dimension of trusting behavior (Currall & Judge, 1995). It has been demonstrated that communication alleviates institutional barriers linked to misaligned goals through allowing partners to gather insights on mutual perspectives and expectations. Furthermore, communication is also a facilitator in overcoming cognitive barriers by allowing collaborators to develop a deeper understanding of methods and knowledge available to their counterparts (De Wit-De Vries et al., 2018).

Further dimensions of trusting behavior proposed by Currall and Judge (1995) are also relevant for UIC. With informal agreements being another dimension of trusting behavior, UIC collaborators that share trust are expected to rely on less formal agreements, such as memoranda of understanding or standard documents in lieu of contracts, especially as far as collaborations absent of IP outcomes are concerned (De Wit-De Vries et al., 2018). As institutional barriers can be linked to difficulties around legal arrangements (Bruneel et al., 2010; Canhoto et al., 2016; O'Dwyer et al., 2022), trust may facilitate overcoming these hurdles or prevent them. Particularly, reliance on informal

2. Theoretical Background

agreements reduced the time for establishing administrative frameworks for the collaboration and prevented conflicts around information use (Ulhøi et al., 2012). Furthermore, this dimension of trusting behavior influences the extent to which other communications, such as the project plans, are formalized, where initial plans might not be updated. Absence of updated documentation in this case can actually create hurdles in project implementation (De Wit-De Vries et al., 2018). Finally, another component of trust, lack of supervision has also been observed in UIC environments, where formal control mechanisms might be absent, and reporting and coordination may go through less formal mechanisms (De Wit-De Vries et al., 2018).

In conclusion, UIC partners have a wide range of interconnected instruments that can be utilized when addressing varying barriers to collaboration.

2.4 Theoretical perspectives on trust

Numerous studies point to the key role of trust in overcoming barriers to UIC. Trust can be defined as a willingness to be vulnerable to the actions of another with respect to something one finds important in a situation where there is no way to exert control over the actions of the trustee in that regard, where vulnerability is defined as preparedness to take risk (Mayer et al., 1995). Different approaches to measuring exist, considering trust to be either a unidimensional measure that is not further broken down into components, or a multidimensional phenomenon (Legood et al., 2022).

Though multiple approaches to defining multidimensional measures of trust have been identified, McEvily and Tortoriello (2011) advocate for the use of one of the following five measures of trust as their authors have defined the procedure for developing the measure of trust and provided details on construct validity: the Managerial Interpersonal Trust proposed by McAllister (1995), Boundary Role Person's Trust proposed by Currall and Judge (1995), Organizational Trust Inventory proposed by Cummings and Bromiley (1996), Organizational Trust proposed by Mayer and Davis (1999) and Behavioral Trust Inventory proposed by Gillespie (2003). The measure developed by McAllister (1995) is bidimensional and suggests that either affect and cognition serve as foundations of trust. Currall and Judge (1995) address trust between boundary role persons, that is individuals who engage in interorganizational contact and identify four dimensions of trusting behavior: open and honest communication, entering into informal agreement, task coordination, and low surveillance over the counterpart (Currall & Judge, 1995). Cummings and Bromiley (1996)

2. Theoretical Background

define trust as a belief that another individual or organization makes good-faith efforts to honor commitments, is honest, and does not show opportunistic behavior, that is does not take advantage of the other party when given the opportunity. Developing on their earlier work (Mayer et al., 1995), Mayer and Davis (1999) link trust to trustworthiness stemming from ability, benevolence, and integrity of the counterparty. Finally, Gillespie (2003) identifies two dimensions of trusting behavior inside an organization: reliance on the other party and disclosure of sensitive information to the other party.

McEvily and Tortoriello (2011) recommend using McAllister's Managerial Interpersonal Trust (1995), Cummings and Bromiley's Organizational Trust Inventory (1996), and Mayer and Davis's Organizational Trust (1999) when researching trustworthiness, that is the perception of how trustworthy a trustee is, and Gillespie's Behavioral Trust Inventory (2003) and Currall and Judge's Boundary Role Person's Trust (1995) when researching trusting behaviors, that is, the decision to trust another party.

In defining trust, extant literature has also differentiated trust from other concepts, such as cooperation, confidence, and predictability. Though trust can be an important precedent to cooperation, it is not equivalent to it, as cooperation can occur even without trust, for example if parties are coerced. As for confidence and trust, though they are linked to a belief in another's positive behavior, confidence also occurs in situations where trustors do not perceive a risk in this belief. Finally, trust and predictability are both associated with a consistency in behavior, however predictable behavior may not always ease the trustor into feeling vulnerable towards a trustee, as their predictable behavior may be averse to the trustor's interest (Mayer et al., 1995).

Trust has also been studied with respect to the parties involved: the trustor and trustee. Trustors exhibit differences in their inherent propensity to trust, that is, the likeliness they will trust someone without having sufficient data on that party. The propensity to trust varies amongst trustors. It also depends on the trustee, or the party they place their trust in. The extent to which a party can be trusted is defined by their trustworthiness. As mentioned above, it consists of three components: ability, benevolence, and integrity. Ability encompasses expertise in a specific domain, competence, and skills. Benevolence is the degree to which the trustee wants to do good to the trustor without any ulterior motive. Finally, integrity involves the adherence of the trustee to

2. Theoretical Background

principles that the trustor finds acceptable (Mayer et al., 1995). Tomlinson et al. (2020) suggest that integrity can be broken down into two components: behavioral integrity and values congruence, where the former represents the trustee's word-action alignment, and the latter is a reflection of shared values between the trustor and trustee.

As noted above, one approach to measuring trust is Managerial Interpersonal Trust, which is a measure of trustworthiness. In this approach, McAllister outlines two foundations for trust: cognition and affect (McAllister, 1995). Cognition involves all aspects of knowing and awareness and includes reasoning, judgement, and observation. Affect refers to feelings, emotions, and moods (Legood et al., 2022). Cognition-based trust (CBT) is based on knowledge and rational reasons to trust someone. Key characteristics needed for cognition-based trust to develop are competence, responsibility, reliability, and dependability. Affect-based trust (ABT) is related to emotional ties between people. Historical development of this model is based on studies that distinguished between reliability and emotional trust or dependability and faith (McAllister, 1995). The three components of trustworthiness outlined above have been found to be predictors of both ABT and CBT. At the same time, empirical evidence has shown that ability and behavioral congruence are stronger antecedents to CBT, while benevolence plays the most important role in the development of ABT (Tomlinson et al., 2020).

The relationship between CBT and ABT is multifaceted. Studies give no uniform answer to whether cognition or affect-based trust is more important to performance, with some researchers finding evidence for a stronger role of CBT, others of ABT, while some researchers find them equally important (Legood et al., 2022). It has also been demonstrated that in some cases, these forms of trust have no influence on each other (Chowdhury, 2005). At the same time, ABT is typically built on the base of CBT, where CBT is perceived as less deep and special. However, this does not imply that ABT is a higher level of trust but is rather a different component of trust. Furthermore, the balance of CBT and ABT may shift as the relationship matures. With time, one may have experiences that negate the foundations to CBT but continue to experience trust resting on affect (McAllister, 1995).

As far as knowledge sharing is concerned, both dimensions make a significant contribution, though CBT has been demonstrated to have a stronger positive effect on complex knowledge sharing.

2. Theoretical Background

The foundation of trust in a professional relationship can affect various aspects of collaboration. Thus, CBT affects the desire to control others or to proactively create mitigation strategies, with less control and mitigation required in a relationship based on cognition-based trust (McAllister, 1995). Therefore, CBT can reduce the effort needed to monitor performance, ensure that tasks are accomplished and understood. As for ABT, empirical evidence shows that it is linked to frequency of interaction and engaging in interpersonal citizenship behavior (McAllister, 1995). Another characteristic positively linked with ABT, especially in intercultural collaboration, is cultural metacognition, a dimension of cultural intelligence that is related to reflecting on "cultural assumptions to prepare, adapt to, and learn from intercultural interactions" (Chua et al., 2012), meaning persons with higher levels of cultural metacognition are likely to experience higher levels of ABT, which is conducive to effective cross-cultural creative collaboration (Chua et al., 2012).

Culture plays an important role in how these dimensions are perceived. Thus, as ABT is based on emotional ties between people, some may link it to friendship. However, this link between friendship and ABT is not present in all contexts and cultures. Though ABT may develop in hierarchical relationships in different types of cultures, friendship is generally far less likely to occur in China than in Western culture in these types of relationships as friendship between hierarchies, for example between students and teachers, managers and employees, is not socially acceptable. Moreover, the role of friendship may be less significant in China, where the dominating role is reserved for family-based relationships (Chua et al., 2009). As far as CBT is concerned, cultural beliefs may also affect the meaning behind this construct. The view of CBT linked to individual competence is inherent to Western culture. It is important to know that other cultures may incorporate additional components to CBT. Thus, in China, embeddedness, or the indirect social ties that a trustee possess, can also be an indicator of CBT, as a person with connections to the people with the required skill is seen as competent and reliable themselves (Chua et al., 2009).

Specifically in university-industry collaboration settings, the role of CBT and ABT has been mostly studied in terms of the stages of the collaborative relationships. ABT can be important in the networking stage where organizations and individuals look for protentional partners (Tootell et al., 2021). The perspectives on the role of CBT in initial stages vary. While some evidence shows that it plays a more important role at the initial stages of a collaboration (O'Dwyer et al., 2022), other demonstrates that excellence at both dimensions of trust is needed for both initiation, and endurance

2. Theoretical Background

of collaborative relationships (Tootell et al., 2021). In more mature stages of a collaboration, trust based on affect can become more important as it enables the transmission of tacit knowledge (O'Dwyer et al., 2022). Furthermore, a lack of ABT at this stage can place a barrier on relationship development, as emotion-based conscious and subconscious negative assessments can outweigh the rational advantages of the collaboration based on CBT (Tootell et al., 2021).

In this regard, the individuals chosen to be involved in the collaboration come to the forefront. Thus, in situations where CBT is overall low at the start of the project, it can be initially placed in one key actor, an academic champion that has a strong competence-based reputation and is then trusted to identify complementary skills and knowledge among other potential participants (O'Dwyer et al., 2022). In general, collaborations can benefit from the involvement of persons with a high level of interpersonal and technical competence that are able to develop relationships based on CBT and ABT and prevent actions and behaviors that lead to a loss of trust (Tootell et al., 2021). Therefore, skills related to ABT and CBT-building can be an important consideration when selecting participants and leaders for a collaboration.

With respect to trust building in interorganizational settings, two groups of mechanisms have been identified. Bachmann and Inkpen (2011) suggest that trust can be either based on interactions or institutions. Institution-based trust is facilitated through legal provisions, certifications, community norms, and reputation, acting as an informal institution. It is especially important in the early stages of the relationship as a third-party guarantor between parties when those deal with low-specificity assets and require cost-efficient trust mechanisms. Contracts are a widespread instrument used to build trust in interorganizational relationships. They establish an environment of trust through clearly determining roles, obligations, and communication channels, which promotes transparency and interaction. At the same time, they can only carry out the trust-building function if they are not overly restrictive and do not signal a lack of confidence through excessive control (Järvinen & Branders, 2020; Lumineau, 2014). Interaction-based trust, on the other hand, requires more resources but is essential for collaborations with high risk where sensitive information will be shared. It is facilitated through frequent face-to-face contacts and personal experiences (Bachmann & Inkpen, 2011; De Wit-De Vries et al., 2018). One way to build trust through experience is to initiate collaboration in smaller projects with less risk. It is suggested that trust can also be fostered by project managers in encouraging fairness, clear communication, and transparency around

3. Methodology

problems (Barnes et al., 2002). As far as collaboration initiation is concerned, the key drivers of trust at this stage are reputation and previous experience (De Wit-De Vries et al., 2018).

3. Methodology

3.1 Research Method

The research questions were studied through qualitative research as it allows for the understanding of personal experiences in real-world settings (Yin, 2015). Barriers and facilitators to collaboration, as well as trust, are perceived subjectively by those involved in the collaboration, therefore qualitative research is the most appropriate approach to gaining insight on these subjective perceptions. The Horizon Europe framework does not require participants to report on the course of the project, therefore no public written record of barriers and facilitators, including trust, is available for research. Therefore, in order to gain an understanding of the barriers and facilitators, as well as the role of trust, a method that allows for collecting primary data on collaborator's subjective perceptions is the most appropriate. Qualitative research provides for such methods and allows for studying of the significance of phenomena in people's real-world roles to gain an understanding of their perspectives and views. Furthermore, qualitative research allows to take context into consideration (Yin, 2015). This point is crucial for the understanding of the interplay of the diverse factors of collaboration and their impact.

3.2 Data Collection

The data for this study was collected through qualitative interviewing. This method allows for a loosely scripted conversational interview consisting of open-ended questions, which allows participants to express their experiences using their own terms, without being constrained by the language, limited answer options, and terminology selected by the researcher (Yin, 2015). Purposive sampling was used in order to gain the most plentiful data and to maximize information. In order to incorporate a broad range of perspectives, this approach involved participants of diverse affiliations with experience of UIC in Horizon Europe projects, including representatives of universities, industry, and intermediaries. Representatives of universities and industry participants were interviewed with the purpose of gaining insight into their personal experiences and perceptions of collaboration, while representatives of intermediaries were included to provide a more neutral objective overview both of specific projects and of university industry collaboration in general, as they possess specialized knowledge of collaboration in university industry consortia.

3. Methodology

The sample size was defined by reaching the point of redundancy, where data collection was concluded when additional interviews yield little new data (Yin, 2015). The interviewees were selected from Horizon Europe projects listed in the CORDIS database that include both universities and industry organizations based on information about roles and affiliations provided on the website of the respective project.

Best practices recommended by Yin (2016) were used during the interviewing process. These practices suggest that the interviewer should build the interview in such a way to encourage the interviewee to speak extensively, while refraining from speaking too much themselves and attempting to maintain the flow of a natural conversation. In order to achieve this, the interviewer asked only one question at a time, refrained from asking “yes/no” questions, and used probes and follow-up questions to elicit further details from the interviewee. Furthermore, maintaining neutrality and rapport are also important suggestions that prevent the interviewer from influencing the responses and assure that the interviewee does not feel harmed in the interviewing process. An additional recommended practice is attempting to be nondirective. This implies that the interviewee should have as much freedom to express their experience without being directed by specific questions, wording, or question sequence, to the extent possible in the setting. At the same time, in order to yield information pertinent to the research questions, the interview was bound to an interview guide (Yin, 2015). The interviews followed a semi-structured approach, where the interview guide consisted of main open-ended questions and potential follow-up questions that the interviewer referred to, defining the sequence and deciding which questions to ask in the interview itself in order to maintain a natural flow of the conversation (Adeoye-Olatunde & Olenik, 2021). The interviews were conducted remotely using the Zoom software. The duration of the interview was limited to 40 minutes. The interviews were recorded and transcribed using the integrated features of the Zoom software. Permission to record was obtained from all interviewees.

A total of 12 interviews were conducted with individuals having experience with Horizon Europe projects involving both universities and industry. The sample includes a variety of roles and affiliations to produce information-rich data. Out of the 12 interviewees, 6 were affiliated with universities, 4 were affiliated with industry, and 2 were affiliated with intermediary organizations, which allows for a broad understanding of multiple perspectives around UIC in Horizon Europe-funded projects. Furthermore, the sample integrated diverse perspectives in terms of project roles,

3. Methodology

with 3 interviewees involved as coordinators, 3 involved in other leadership roles, and 6 involved only in execution of specific tasks. The detailed sample demographics are presented in Table 1.

Table 1. Demographics of interviewees.

Participant	Affiliation	Role
1	University	Researcher
2	University	Project Coordinator
3	University	Grant Writer
4	Industry	Participant
5	Intermediary	Communications manager
6	University	Scientific coordinator
7	University	CEO, Work package leader
8	Industry	Researcher
9	Intermediary	Project Manager
10	Industry	Project Coordinator
11	Industry	Participant, Work package leader, technical coordinator
12	University	Participant

3.3 The Interview Guide

The interview guide was developed to yield novel insights to inform responses to the research questions and included two key analytical dimensions: barriers to collaboration and trust as a facilitation factor (Kaiser, 2021). Four question complexes were developed to meet these objectives: Introduction, Barriers to UIC and Overcoming Them, Trust, and Building Trust. The first question complex included two “Grand Tour” questions to get the interviewee started on a topic (Yin, 2015), specifically their role in the project and collaborating with universities or industry in the respective project. The second question complex consisted of one question about barriers to UIC to inform research question one, with potential follow-up questions about timing and solutions. This question was intentionally not further specified with explicit barriers stemming from the theoretical framework to remain non-directive as described above (Yin, 2015).

3. Methodology

The third complex, Trust, consisted of five questions and additional follow-up questions. These questions were derived from established theoretical frameworks (Kaiser, 2021) on trust to measure specific dimensions of trust to meet the best practices suggested by McEvily and Tortoriello (2011). Specifically, two measures were chosen to represent both measures expressing trustworthiness and trusting behavior: McAllister's Managerial Interpersonal Trust (1995) to gauge whether the foundations of trust in UIC settings rest on cognition or affect and Currall and Judge's Boundary Role Person's Trust (1995) to assess the trusting behaviors in industry and university participants, which are boundary role persons in this interorganizational setting. These two measures produce a total of six dimensions of trust: cognition-based trust, affect-based trust, open communication, informal agreement, lack of surveillance, and task coordination. One question was developed per each measure based on questionnaires proposed by the respective authors, with the exception of the coordination dimension, which requires the participation of trustor/trustee dyads. Furthermore, this dimension was deemed irrelevant as each project had a coordinator, so the presence or absence of coordination among other participants may not be indicative of trusting behaviors.

Finally, the fourth complex consisted of two questions intended to inform research question three on trust-building practices. Similarly to the question in question complex two, these questions were intentionally not further specified with trust building approaches stemming from the theoretical framework to remain non-directive as described above.

Two versions of the interview guide were developed, depending on the affiliation of the interviewee: one for university and industry participants and one for intermediary organization participants. The former was developed to elicit responses of interviewees about their own experiences, while the latter was intended to produce responses about other people's experiences. The interview guides appear in Annex A.

3.4 Data Analysis

The data collected in the course of the qualitative interviews were analyzed using the thematic analysis approach proposed by Braun and Clarke (2006). Thematic analysis involves searching for, analyzing, and reporting on repeated themes across a data set to organize and describe it. Themes are important patterns that repeat across the data set and relate to the research question. The advantages of this method are its flexibility, ease of application, and capacity for summarizing

3. Methodology

large bodies of data (Braun & Clarke, 2006), which will serve as a sound foundation for the analysis of the comprehensive data set consisting of transcripts of twelve interviews with individuals of diverse affiliations and experiences.

The data analysis was performed using a deductive-inductive approach, whereby theme development was driven by a theoretical framework around UIC, barriers to collaboration, and trust to yield a detailed analysis about these aspects of UIC in Horizon Europe, while codes were generated inductively from the data. The themes were identified at a semantic level to describe and interpret the explicit meanings of data in relation to established theory. The analysis was conducted under a realist approach that directly links the interviewee's statements and their experiences. Thus, the thematic analysis was grounded in established theory and represents the prevalent themes regarding the explicit opinions and experiences of interviewees around UIC barriers and trust in a Horizon Europe setting.

The thematic analysis method proposed by Braun and Clarke (2006) consists of six phases, which are addressed recursively throughout the analysis process. The first phase involved familiarization with the data through repeated active reading of the transcripts and note-taking. The second phase included generating initial codes, which are characteristics of the data that present an interest and are the most basic element of the data that can be assessed. A total of 49 initial codes were generated. During the third phase, the codes along with the corresponding data extracts were sorted into potential themes. In the fourth phase, the themes were revised according to the principles of internal homogeneity and external heterogeneity, ensuring coherence of data within a theme and distinctiveness to other themes. It should be noted that complete external heterogeneity for this analysis was not achieved due to the interrelated nature of factors related to overcoming barriers considered in themes 1-5 and aspects related to trust in themes 6-8. However, best efforts have been made to avoid overlap through providing greater amount of detail on the role of trust in themes 6-8. All extracts included in a potential theme were reviewed for cohesion. Then, the entire data set was reviewed to ensure validity of the themes for the entire data set and to capture any information that was not coded. Additional codes were developed in this step. An overview of the final codes and themes is presented in Annex B. In phase five, a detailed analysis was written up for each theme, which received a name. A final report was developed at the final phase, which includes a coherent, logical, and interesting representation of the story behind the data, including

4. Findings and discussion

illustrative extracts (Braun & Clarke, 2006). Atlas.ti software was used for coding. No AI features of this software have been used in the preparation of this thesis. A 15-point checklist proposed by Braun and Clarke (2006) was used to ensure proper use of the method.

3.5 Limitations of the methodology

The choice of thematic analysis as a data analysis method is linked to some disadvantages. The flexibility inherent to the method can produce findings that are too broad and difficult to analyze. This challenge was mitigated through linking the analysis to a theoretical framework on UIC. Another disadvantage in comparison to other methods is that thematic analysis does not present a continuous account of an individual or allow for analysis of language use. However, these fields of analysis fall outside the scope of this research (Braun & Clarke, 2006).

Several decisions were made in configuring the thematic analysis. Thus, the data were analyzed at the semantic level, choosing this level over the latent level. Analysis at the latent level can produce knowledge on underlying ideas, assumptions, and ideologies, which was not conducted in the course of this study. Finally, the realist epistemology was chosen over the constructionist one, which does not allow to draw conclusions regarding sociocultural contexts (Braun & Clarke, 2006). Thus, the chosen procedure is not intended to elicit novel knowledge on latent assumptions and contextual preconditions for the identified barriers and facilitators to UIC.

4. Findings and discussion

4.1 Identified themes

This section will describe the eight themes identified in the thematic analysis. The eight themes are: “1. Institutional barriers and overcoming them,” “2. Cognitive barriers and overcoming them,” “3. Social Barriers and overcoming them,” “4. Other barriers and overcoming them,” “5. Absence of UIC barriers and preventing barriers,” “6. Trusting behaviors and their role in mitigating barriers to collaboration,” “7. Interplay of cognition-based trust and affect-based trust” and “8. Trust building.” The first five themes are related to research question one and describe barrier sub-types and implications of each barrier type, as well as the facilitators identified in the sample that helped overcome or prevent barriers. The themes “Trusting behaviors and their role in mitigating barriers to collaboration” and “Interplay of cognition-based trust and affect-based trust” relate to research question two. The final theme aligns with research question three and considers

4. Findings and discussion

the approaches for trust development in the data sample. Further details on each theme are provided in the sections below.

4.2 Institutional barriers and overcoming them

Institutional barriers to university industry collaboration relate to tensions arising from misalignment in values, attitudes to time, goals, procedures. The dataset demonstrated that these types of barriers are the most prevalent in projects funded through Horizon Europe and involving UIC, and were mentioned by all interviewees. The most salient gaps are related to operational conventions, attitudes to time, goals, and IPR.

Discrepancies in operational conventions refer to procedural differences between industry and university participants. A work package leader representing an industrial partner stated: *“from my perspective as an industrial partner, I always feel that we have clear inputs, we do something, we provide outputs, and then our obligations are finished. And, as a partner, we are kind of obliged to take part in multiple different sessions, even I'm not saying single word.”* Thus, the industrial partner believes that his contribution has been delivered when the specification has been met, but this does not align with the rhythm of the project, where they are expected to continue their involvement. This type of misunderstanding can lead to frustration or even missed deadlines, when the inputs beyond the specification are unclear. In general, this reflects a mismatch in the ways of working between industry, that operates on task-based approach, and universities, that operate on a problem-solving approach. A university coordinator shared a similar problem: *“small medium enterprises tend to see the research project as traditional standard work. So, they receive an order. They need to manufacture a specific component with certain features. So, at the beginning of the project, they tend to ask, give me the specification the deadline to manufacture the component, I will manufacture it full stop and deliver it. And so, I'm done. We have to explain to them and try to push them to be involved in the activity in the sense that in 99% of the cases, we don't have the specification at the beginning of the project.”* This coordinator refers to a lack of awareness in industry regarding how development projects lead by universities are carried out, which in turn sets false expectation of industry partners regarding their involvement and requires project managers to make additional effort in communicating the workflow, requirements, and deliverables to all those involved.

4. Findings and discussion

This finding extends previous research by adding a novel dimension of institutional barriers related to customary procedures in industry and university organizations. Although institutional proximity refers to rules, procedures, customs, and values shared by organizations, existing literature has mostly focused on aspects related to values, such as attitudes to time, knowledge dissemination, levels of commitment, and rules, especially those related to IP (Bruneel et al., 2010; Canhoto et al., 2016; Mannak et al., 2019; O'Dwyer et al., 2022; Rossoni et al., 2024; Sa'A & Gunnarsson, 2025), little has been identified with respect to gaps operational procedures, which represent customs and procedures. These have been found to impede collaboration by requiring additional investments of time and effort in defining expectations.

A possible solution to overcoming barriers related to operational conventions involves open communication and adaptability. The university coordinator shared his approach in overcoming SME's specification-based approach: *"so, to get to the final result, we have to work together to check the constraints together and to update the features step by step. So, this process is not easy for them."* This iterative approach requires open communication and adaptability from participants. As open communication is one dimension of trusting behaviors, it can be confirmed that trust plays a role in overcoming barriers related to procedural differences, alongside with adaptability.

Barriers to collaboration can also result from differences in attitudes to time. On the one hand, universities might not have an understanding of industrial lead times that need to be taken into consideration during the planning phase. A work package leader from an industrial partner shares his view of outcomes and goals: *"I think the initial goal of the project was to design something really small, but really variable. I think many people think that it will be a full system variable. However, time for our particular task is short, so we cannot develop anything from scratch. So, we were forced to provide something which we already had with some modifications to fit the project."* Thus, a lack of awareness regarding how long novel industrial-grade solutions need may result in the setting of unrealistic goals. A university coordinator shared similar problems around industrial manufacturing: *"the project also fabricates components, and this is a time-consuming process, so once you design something, then you ought to have this fabricated, it may take about 8 to 12 months. ... Then they had to purchase some new equipment and upgrade, so it was not possible for them to fabricate, so in the end there was a huge delay that accumulated."* Thus, if project requirements are not known in the beginning of the project, it may turn out that the manufacturing capacities do

4. Findings and discussion

not match the specifications once they are developed, and refitting the facilities for the new requirements may require more time as expected and lead to delays. This particular issue was resolved through identifying backup components that are available commercially, meaning that adaptability is again a feasible strategy to overcome challenges.

Another issue related to attitudes to time is related to decision-making. For example, a university interviewee expressed frustration regarding longer approval times in large companies: *“it's more difficult to interact with big companies rather than with small medium enterprises, because in big companies, the decisions are not quick.”* This attitude to decision-making also can affect planning, where some companies tend to plan further ahead and are unable to respond to short-notice requests or calls. One university grant writer noted that opportunities can be missed when requests are sent to companies on short notice as they usually plan their resources and goals for the medium-term and are unable to accommodate these requests. Finally, some companies differ from universities in that they expect faster results and may face disillusionment when this does not occur. One intermediary interviewee stated: *“that's maybe sometimes a drawback for industry partners in European projects, or maybe even they get a bit upset when they're not used to European projects because they just realize it takes much longer than they would probably normally give in the company for things to be developed.”* No interviewees mentioned solutions to these attitudes in timing, other than being aware of these differences in the planning phase. Thus, the data set does not provide any evidence of trust mitigating institutional barriers related to timing differences.

These findings partially confirm the trends identified in extant literature regarding institutional barriers arising from differences in attitude to time of universities and industry (Mannak et al., 2019; Rossoni et al., 2024). As predicted, industry tends to expect faster outcomes than universities, which may affect motivation, resource allocation, and long-term commitment. However, these discrepancies go beyond the long and short-term preferences identified in the literature. Challenges related to attitudes to time also stem from a lack of understanding of the timelines associated with manufacturing and decision-making processes in industry and how they can fit with project scope and deliverables, which can lead to unexpected delays and unmet expectations, making timing a multi-faceted and complex consideration in the project planning phase.

4. Findings and discussion

Misalignment in goals can also produce barriers to collaboration. A university coordinator discussed the impact of this on commitment to the project: *“universities are always much more enthusiastic and committed. Because for them, it's a very significant source of funding. So, all of them want to have a good reputation. And also take advantage of this collaboration in order to publish papers. With the companies, it's not always like that, because companies have their own agendas, their own roadmaps, and depending on how well the scope of the project fits in their roadmap, this also determines, more or less their commitment in the collaborative project.”* Therefore, the goals of universities align with project goals more often compared to those of commercial firms, meaning industry partners can demonstrate less commitment to the collaboration if internal priorities are in conflict with it. These observations are in full alignment with previous research that has demonstrated that a lack of leadership commitment can lead to suboptimal involvement in collaborative projects (Sa'A & Gunnarsson, 2025). The findings have shown that a misalignment in goals can even lead to the termination in collaboration. A project manager from an intermediary organization shared: *“it's not always that consortium breaks up because of bad blood or something, but also just because maybe the company's priorities have changed like topic wise or there's just no personnel capacities left anymore.”* Thus, goal alignment is an important pre-requisite for successful project delivery and outcomes.

One potential solution to this barrier involves gaining a better understanding of the incentives of all participants through assessing previous experience and competent project management by matching individual goals with the most appropriate project deliverables. A university coordinator describes how previous experience factored into his project management decisions: *“we have collaborated with most of them. So, we take into account the level of commitment that they can have, so as to allocate them also a proper role that makes sense, both for the project, but also that aligns with the roadmap. So, this makes it easier to accommodate the trade-off between their roadmap and the project goals.”* Though previous experience is a factor in trust development, the unique role of trust in this mechanism and therefore in overcoming this barrier is unclear.

One final aspect related to institutional barriers is the treatment of IPR. One member of an intermediary organization claimed that this is one of the most significant challenges: *“the academic partners collect the data and then the industry uses it to improve the product. So, the IP is, I'd say, one of the biggest issues. ... So, I think that a lot of project partners from academia and also*

4. Findings and discussion

industry, they do have a lot of hesitations when it comes to these collaborative projects.” Therefore, lack of clarity around IPR protection can hinder the project from going further, which is aligned with previous findings that have demonstrated that lack of IP arrangements can occur if universities and industries diverge in terms of attitudes to IPR (O’Dwyer et al., 2022). However, while previous studies have focused on the challenges that university expectations regarding IPR can create (Bruneel et al., 2010; Canhoto et al., 2016), in the projects observed in this study, it was industry partners that set additional requirements related to IPR. For example, an industry coordinator shared their approach when it comes to IPR: *“before you go and disseminate the potential results, we have an IPR department, talk to these guys and analyze if this solution, this technology can be protected.”* Another industry partner has corroborated this approach, adding: *“that has never been a problem so far. I think everybody understands that companies need to protect their IPR.”* Therefore, considerations related to IPR can hinder the project by introducing delays required to internally coordinate IPR strategies. However, in practice, this is not always seen as a barrier, especially when all involved have experience in UIC collaboration.

At the same time, if problems do occur, one possible solution to this is engaging competent intermediaries. An industry researcher shared how IPR issues were resolved through the project coordinator who was an intermediary organization: *“we needed to find clinical collaborators that can give us samples for these specific projects, and these are doctors ... there's a bit of negotiations in terms of who owns the data, ... and all we need to do so far, we had to be transparent, and then ask the coordinating partner. ... Basically, we send to them, so they have the eye of the what the EU Commission requires, and how is the contract signed for this project.”* In this case, the issue of IPR was delegated to a specialized intermediary organization and the project could proceed without further obstacles. In this case, the dominant instrument for overcoming institutional barriers are intermediary organizations.

The data set included in this study did not include any observations related to barriers stemming from differences in attitudes to knowledge dissemination and research priorities that were identified in extant literature (Bruneel et al., 2010). This may proceed from the requirements inherent to Horizon Europe projects, as research priorities are defined in specific calls that partners voluntarily respond to, and knowledge dissemination requirements are defined in Horizon Europe open science

4. Findings and discussion

obligations that all partners must adhere to (European Commission, 2025). Therefore, the Horizon Europe framework itself acts as factor mitigating potential institutional barriers.

As evident above, institutional barriers related to differences in procedural approaches, time, goals, and IPR, can be overcome through adaptability, trust, intermediary organizations, previous experience, competent project management, reliance on HE framework, or due planning. The key dimension of trust in this regard is open communication. The present study extends previous research by providing additional perspectives on differences in attitudes towards time and IPR, by identifying a novel barrier type related to differences in procedural conventions, and by shedding light on facilitation mechanisms prevalent for each barrier. Furthermore, the present study introduces additional facilitators, not previously identified in literature, such as adaptability and the HE framework.

4.3 Cognitive barriers and overcoming them

Cognitive barriers refer to gaps from different knowledge bases of collaborators. Though university and industry partners might be professionals in the same field, their cognitive bases still might differ. An industry work package leader shared a situation where both industrial and university partners were expected to prepare prototypes of a similar device, but the university partner produced a different result: *“with one partner, we feel we are speaking the same language, while another partner, I don't know how to explain this. ... While we communicate on the face-to-face level, it seems that they understand what we are doing, but in the end, they are providing prototypes that are not exactly what we expected.”* This situation proceeded from an atmosphere where decisions were made through informal agreements. The same interviewer mentioned: *“In this type of projects, we don't need to explain very simple, small technical aspects.”* As informal agreements are a dimension of trusting behaviors, it can be inferred that the partners in this project trusted each other, but this trust actually jeopardized results, as the trust that the partner implicitly understands all requirements prevented the partners from discussing specific requirements for the prototype. This is supported by literature, whereby lack of formalized updated project plans has been found to create hurdles (De Wit-De Vries et al., 2018). The identified case did not have a solution and required the partners to adapt their plans to the results. When prompted to discuss mitigation strategies, the interviewee responded: *“It's a little bit late, unfortunately.”* Therefore, planning and

4. Findings and discussion

anticipating cognitive gaps is an important strategy for preventing cognitive barriers, which is aligned with the results of previous studies (Morandi, 2011).

Cognitive barriers can also affect the spread at which progress is made and decisions are made. An industry researcher described his experience with partners he hasn't worked with before and hasn't developed a common knowledge base with yet: *"you have to explain yourself much more because there is a language being developed as you work with people together. And since you don't have that language developed, it's slower because sometimes even though we are really saying the same thing, it takes some time to understand that we are saying the same things because we use different language."* Therefore, cognitive distance can lead to delays related to additional efforts needed for clarifications. In this case the cognitive distance proceeded from a lack of previous experience, which gives more weight to the belief that there is indeed a link between cognitive proximity and previous experience established in extant literature (De Wit-De Vries et al., 2018). However, the findings do not provide enough evidence to confirm that the opposite is generally not true, therefore this link may vary on a case-by-case basis.

In another situation, professionals from the same field in healthcare research also faced challenges from insufficient cognitive overlap. An industry researcher shared: *"there was one case of a bit of a misunderstanding how to apply gels, and we realized something one way, others did the other way, and of course, it gives you different results."* Therefore, these cognitive misalignments can produce differences in results in the health field as well. In this particular case, open communication helped overcome the barrier. The industry researcher noted: *"but it really needed one meeting with everybody presenting data, and then we realized why are we seeing different things. Better open communication."* Thus, trust, with open communication a dimension of trusting behavior, can have an effect on overcoming cognitive barriers. This corroborates previous findings that open communication is a facilitator in overcoming cognitive barriers, which allows collaborators to gain a deeper understanding of the methods and knowledge available to their partners (De Wit-De Vries et al., 2018). In this particular case, open communication allowed collaborators to present the various approaches to their partners without fear of retaliation for making mistakes that could have led to different results.

4. Findings and discussion

Furthermore, cognition-based trust (CBT) can prevent cognitive barriers. In the same project, the interviewee stated: *“this project was put together with a group where everyone really brings something different. And so, you're not really the expert on what the others are doing, and you really need to believe a bit.”* The phrase *“brings something different”* indicates that the interviewee perceives the competence of the other participants, which is consistent with CBT. She recognized that she does not fully share the cognitive base with other partners and recognized the need to “believe” in them. While previous studies have suggested that CBT facilitates knowledge sharing (McAllister, 1995; O’Dwyer et al., 2022), and especially the transmission of tacit knowledge, this study expands on them by demonstrating that CBT can enable knowledge transmission also in cases where cognitive misalignment was present.

Cognitive bases can also differ in terms of experiences with different product development stages, where industry tends to have expertise in advanced phases related to commercial exploitation of the research results, and universities specialize in the earlier research phases. An industry coordinator shared how he experienced this cognitive misalignment: *“when we go to TRL five to seven, then we speak basically different language. By speaking different language, I mean different words, different meaning of the words. Our goal is to move from research to industrialization. Whereas the academics, their goal is to only speak about research.”* In this case, the interviewee is referring to technical readiness levels (TRL) related to product validation and demonstration involving prototypes, pilots, and other constructs that academic partners are not as knowledgeable and skilled with as industrial partners. The proposed solution lies in dividing the work and distributing work streams to those who are the most fit to address them. The interviewer explained: *“Basically, what we did is to split the work in two parts, where the academics will exploit as a group the research activities ... and then the industrial partners, we group together and then we discuss aspects like can we build a product.”* Therefore, competent project management and task allocation can be successfully used to overcome cognitive barriers. This facet of cognitive distance, as well as the corresponding mitigation strategy, provides a new perspective, not identified in previous research.

In other projects, cognitive misalignments can produce a competitive environment and affect overall outcomes. An interviewee from an intermediary organization, shared a negative experience from a prior project: *“in terms of expertise, they don't agree, and they defend strongly what they*

4. Findings and discussion

do.” This type of attitude can prevent the project from progressing as partners cannot decide on a common vision. This project did not find a solution to this barrier.

Finally, differences in cognitive bases can result in inefficient resource allocation. One university researcher stated: *“if, in the course of the project, you realize that a certain task needs to really develop a product, but you have assigned mostly PMs from a university or the other way around, ... then, the outcome is not as good than if this is assigned properly.”* The reason for universities and industry to collaborate is to bring different skills and expertise, therefore a lack of understanding of these cognitive foundations may lead to these skills being applied inefficiently. The speaker did not provide suggestions on overcoming this barrier, other than having to adjust. Therefore, a key component in this case is adaptability.

The findings of the present study provide extended insights on the implications of cognitive barriers on the course and outcome of UIC sponsored through HE and go beyond merely stating that they can affect ease of communication (Steinmo & Rasmussen, 2018) by suggesting that they can lead to poor resource allocation, conflict resulting from defensive behavior, and unsuitable deliverables. The observed findings do not include any cases of cognitive barriers affecting motivation to participate in collaborative projects or research area selection identified in previous studies (Mirza et al., 2020; Muscio & Pozzali, 2013). This may be explained by the HE framework: the selection of the research area does not require mutual agreement of collaborators as it is already defined in HE calls.

4.4. Social Barriers and overcoming them

Social barriers are by definition linked to trust and signify that collaborators do not have sufficient trust or social ties to share information. These types of barriers were not as prevalent in the data set, but several examples were named. An interviewee from an intermediary company shared her experience working in a renewables project: *“I work in renewables with engineers, and this is not like this at all. They don't share. And even between partners, they don't want to share. That creates tensions.”* Another social factor she mentioned in this project was related to gender balance: *“there is another aspect I've observed: when you don't have a gender balance, when it's very mannish, ... I see strong resistance and competition.”* Therefore, a lack of openness, specifically stemming from gender-based competition, can create tensions and resistance. While the identified tensions

4. Findings and discussion

stemming from a lack of desire to share knowledge adequately fit the definition of lack of social proximity (Boschma, 2005), the gender-balance perspective provides a novel insight around the possible antecedents to this barrier in interorganizational settings.

Social conflicts can also be linked to individual interpersonal relationships. Previous studies have demonstrated that past negative experience with UIC can prevent collaborators from engaging in new projects (Mirza et al., 2020). The data obtained in this study corroborate this suggestion and specify it by demonstrating that previous negative experience can preclude organizations from working with specific actors, or generally from engaging in UIC. Thus, another intermediary shared that previous negative experience can disqualify potential partners from being invited to a project: *“if you have a bad experience with someone, that might also be a blocker. So, I was in a consortium where there was another partner proposed and then another one said, oh, I don't want to work with them again. We had some blockages on their side in the project, so I might not want to work with them again. So, they were not invited.”* Therefore, previous experience demonstrated that this partner was not reliable. As reliability is related to CBT, it can be inferred that a lack of trust can hinder or stop collaboration. This can also occur in ongoing projects. An industry researcher shared her experience: *“it's very difficult to work with people who are not fond of working with other people. We did have some self-oriented persons. And in that case, you let him move by himself, and then you work with the other people.”* A personal judgement of a collaborator can affect the dynamics in a project, where a negative perception can exclude de facto an individual from the collaboration, even if they officially remain a partner. Personal perceptions are linked to ABT. Therefore, a lack thereof can hinder the collaborative relationship, which corroborates previous findings that have suggested that a lack of ABT can hinder the development of professional relationships, even if CBT is present (Tootell et al., 2021). These particular findings show a unique perspective on the role of CBT and ABT in various collaboration stages, whereby lack of CBT precluded new collaborations and lack of ABT hindered the endurance of an ongoing collaboration, which can enrich existing perspectives on the interplay of ABT and CBT.

Previous research has shown that opportunistic behavior is another social factor that can impede collaboration by generating perceived or actual losses stemming from inequitable distribution of power and benefits (Tootell et al., 2021). A university researcher reflected on a situation where industry partners can take advantage of university expertise when assigned to research-intensive

4. Findings and discussion

tasks: *“if you have a task that is really research-focused, and the research partners take over, and the industry partners are more along for the ride, and they are happy that work gets done to a good quality level ... without them needing to deliver a lot of actual results. And it's not as nice, because we could have reached a lot better results if industry was more concerned with actually delivering.”*

In this context, opportunistic behavior negatively affected a project by causing frustration from other parties and through not providing enough resources to achieve ambitious results. This finding builds on Tootell et al. (2021) by demonstrating that opportunistic behavior can also stem from imbalances in resource use.

The data shows that social barriers can affect information sharing and the decision to work with organizations and individuals. Trust, both ABT and CBT, is an important factor, as the loss of trust can produce these types of barriers. The interviewees did not share any mitigation strategies to overcome these barriers, which signifies that no efforts have been taken to overcome them. Collaborations with these types of barriers were either not initiated at all or allowed to continue as is, even if this adversely affected outcomes. From a practical standpoint, these findings demonstrate the lack of instruments available to managers to address these barriers and suggest directing attention to the antecedents of social barriers in developing potential solutions. One can assume that if a lack of ABT and CBT contribute to the development of social barriers, fostering these dimensions of trust can also help mitigate social barriers. However, further empirical evidence is required to corroborate this suggestion. From a theoretical standpoint, the present findings shed light on the links between CBT and ABT and social barriers, as well as on additional facets of the nature of opportunistic behavior in UIC. Finally, this study contributes to the existing theoretical framework by identifying a gap in research on UIC enablers, showing that little is known about facilitators that aid in overcoming social barriers.

4.5 Other barriers and overcoming them

This section will outline less prevalent barriers, including organizational, geographical, and HE-specific barriers, that were identified in the data set.

Organizational barriers refer to weakness of ties between and within organizations that hinders collaboration. A university researcher explained that the result quality may be jeopardized if important information does not flow from work package leaders to the project coordinator in a

4. Findings and discussion

timely manner: *“I have also seen where these problems are allowed to fester a little bit, and this information is not necessarily making its way up, and then you have some real problems at the end of the project, when you have to scramble to fix this stuff.”* This situation refers to weak ties between partner organizations reflected in insufficient transparency that will require adaptability to overcome the resulting difficulties. Weak interorganizational ties can also affect the inception of a project. A university grant writer described that large projects with 20-25 partners can look like a “mess” and disincentivize bigger companies from participating. No solution was provided to this barrier. However, one can infer that additional incentives that outweigh poor organization can affect the decision to participate in a project.

These findings contribute to the existing literature by identifying additional risks of organizational barriers. While previous research has shown that a lack of effort to establish communication pathways can be detrimental to outcomes (Steinmo, 2015), these findings suggest the specific ramifications of inadequate communication arrangements: they prevent problems from being solved in a timely fashion.

No other organizational barriers have been identified, which may be linked to the presence of the enablers identified in literature. Bruneel et al. (2010) suggest that previous experience can aid collaborators in establishing standard procedures. Indeed, a university coordinator described how previous experience affected his coordination efforts: *“some partners that are currently involved in the project were already involved in the previous project. So, we had the chance to get used to this activity and now we are coordinating a new project.”* Many other interviewees also mentioned previous collaborative experience, whether with a specific partner or in a similar consortium setting, which could have prevented any organizational barriers.

Geography was not mentioned as a barrier by most participants. However, a university grant writer explained that geography can be an important consideration when preparing projects. If universities run pilot projects, they tend to involve partners that are located relatively close to them to improve the logistics: *“you can't just go drive back and forth all the time to Portugal and run the show, because you need a local desk, so this may be just a practical issue.”* Furthermore, equal geographical representation may be desirable in a project and will require selection of partners based on their location. The university grant writer stated: *“typically you need to have some kind*

4. Findings and discussion

of political balance that you need partners from North, South, East, and West.” Therefore, in this data set, geography is not seen as a source of difficulties, but rather a partner characteristic that requires consideration, which is aligned with the expectations derived from previous studies (Laursen et al., 2010).

A third group of barriers in this section falls outside the scope of the five proximity dimensions but reflects the nature of UIC in HE projects. Specifically, some partners see the bureaucracy inherent to HE projects as a significant barrier. This view is characteristic of industrial partners rather than academic ones. Thus, a work package leader and CEO of a private enterprise shared: *“what we as industrial partner are not very happy with is the amount of the reports. We don't have a special person allocated for that work.”* In another project, an industry researcher claimed that she sees the difficulty in meeting Commission requirements: *“everybody's trying to adapt to make the Commission happy, with their requirements for budgeting, or reporting.”* A university grant writer confirmed that this is a view that many SMEs share, while a specialized intermediary organization member expanded saying that most of the administrative burden in the implementation phase falls on the project coordinators. While aligned with the expectations around bureaucratic barriers suggested in HE literature (Shortall & Meredith, 2025), this finding demonstrates that the theoretical framework placing UIC barriers around five proximity dimensions can be complemented by an additional sixth dimension reflecting barriers external to the university-industry relationship, which could incorporate bureaucratic barriers not related to proximity dimensions.

The data set included two potential solutions to this barrier: engaging partners with expertise to support individual partners with paperwork and outsourcing overall administrative tasks to intermediaries. In the first case, universities can be a point of contact to SMEs as they have dedicated supporting departments. A grant writer from a university shared: *“with SMEs, it is easy to approach it. We can say we can give hand. ... We can do quite a lot that relates to bureaucracy.”* In the second case, intermediaries take over the administrative responsibilities for the entire project to allow collaborators to focus on scientific tasks. A project manager from an intermediary organization clarified: *“we do see a rise in us being asked to take over administrative and financial project management ... and that is mostly due to the high administrative burden that these*

4. Findings and discussion

European projects come with.” This is aligned with the service function of intermediaries that facilitate collaboration by providing administrative support (Lopez-Vega & Vanhaverbeke, 2009).

Correspondingly, trust was not mentioned as a factor in overcoming bureaucratic hurdles. The main strategies involve developing a network to detect partners with administrative expertise and outsourcing reporting and other administrative tasks to intermediaries.

4.6 Absence of UIC barriers and preventing barriers

Despite the barriers outlined above, a dominant trend among most of the interviewees was a generally positive view of the collaboration, where some of them failed to identify any barriers to collaboration. Interviewees have used the phrases *“very collaborative,” “satisfied,” “the project is going quite well”* and *“I don’t think there are major problems”* when asked about project barriers and challenges. In one case, an interviewee from an academic organization underscored his positive perception of collaboration with industry: *“there’s also a lot of benefits in the work. I just want to make sure that it’s not like I have a strong negative opinion of industry partners I work with, that’s not the case at all.”* He explained that if the interview created a negative impression of UIC, it was because the interview questions were focused on barriers and barrier mitigation, but not because he had a negative view of such collaboration. Another interviewee, a CEO of an industrial partner, though having shared some challenges of working with a university partner, described the relationship as close and expressed a desire for continued collaboration: *“I want to have this collaboration closer, because I think every industrial partner feels that they need some young people to come.”* In this case, the positive perception was explained by the motivation of the collaborator to attract young talent to his firm. Another industry participant shared how valuable she considered the input of academia: *“the technical responsible from the university was bringing some very interesting skills in terms of theory and explanation of how to do things ... it’s coming from some very good teachers at the university and that is something that is quite remarkable for a project to have this view from a very clever teacher.”* She also added that this collaboration led to further initiatives, like student exchanges and mutual PhD defenses. Thus, it should be noted, that although this thesis, and therefore the interview guide, is focused on barriers and strategies to overcome them, the experiences of the interviewees were predominantly positive.

4. Findings and discussion

The interviewees suggested several prerequisites that may explain why the projects unfolded so smoothly. After failing to identify any barriers, an industry participant explained that this might be because the project was coordinated by a specialized intermediary, *“both projects, they have a partner that is a company that manages your projects. So that already solves many problems.”* She also added that all participants had a scientific background, regardless of whether they are affiliated with a university or industry, and that this is *“the baseline that unites everybody,”* suggesting that there was some cognitive proximity amongst the participants. Furthermore, she underscored the atmosphere of openness in the project. Finally, there was an alignment of goals among the participants as the project was in the early development stages, and there was no reason for conflict around commercialization interests.

Other interviewees stressed the importance of proper setup and preparation. One university researcher claimed: *“you want your work focused on the early parts of the year project, because then you don't have any issues.”* This may take the form of having joint discussions on the project vision and procedures or detailed written project descriptions. With respect to the former, a project manager from an intermediary organization shared some best practices: *“at the beginning of each project we bring them together, to get a general mindset from everyone, the expectations and setting a good pacing so that everyone feels that it's realistic and within their expected time.”* She added that these types of meetings are also important as they provide participants with the opportunity to see the people behind the names and emails. Therefore, some efforts to build ABT are made. These initial discussions are also helpful in preventing conflicts around IPR. The intermediary shared: *“We have never had any huge issues with IPR after projects because we really facilitate these discussions from the very beginning.”* As far as written agreements are concerned, a university coordinator shared that he puts significant effort into drafting a clear consortium agreement: *“we try to be very clear in the grant agreement, in the consortium agreement. So, for example, in a consortium agreement, I used to write that every industrial partner is committed to deliver all the technologies, components that are needed to retrofit the two, three, four case studies depending on the project.”* He also shared that these deliverables are explicitly not expressed in specific quantities and units, but rather they reflect a commitment to meet all requirements of a case study, as specifics of case studies may change. Thus, the initial consortium agreement already incorporates some degree of adaptability.

4. Findings and discussion

Furthermore, previous collaboration experience contributed to successful collaboration. An interviewee from an intermediary organization shared that previous experience is an important enabler: *“so it's always a benefit if you have worked with a partner before and had good experience.”* Previous collaborations help by facilitating communication. An industry researcher shared: *“there is a very good exchange between us. And it's not the first time we work together.”* Thus, previous experience is a good antecedent for establishing effective communication patterns.

Another feature of smooth projects is ABT. An industry technical coordinator described how in-person meetings affected the collaboration and facilitated decision making: *“that helps to build a relationship, and I think that helps also to later in the development of the project to reach consensus easier.”* Another industry participant mentioned how closer relationships built through in-person meetings improved progress in her project: *“it's really helpful, because we know the people better. We can discuss in between the meetings and adjust things. It's making a lot of progress on the project. It makes things go faster.”* Referring to knowing individuals better is indicative of ABT. In this case, ABT facilitated the project through encouraging adaptability in participants.

One final factor that prevented significant issues is competent project management. Thus, an industry researcher shared her positive assessment of the university coordinator of the project: *“The university here are doing quite a huge work, they are leading the project very well, actually. They're always pushing to make progress, and ... they can adapt the deliverables and so on.”* In addition to highlighting the crucial role of project management, this statement also reflects a positive assessment of the coordinator's leadership skills and adaptability.

While previous studies have already identified the positive role of planning (Morandi, 2011), open communication (De Wit-De Vries et al., 2018), previous collaboration (Bruneel et al., 2010), and competent project management (O'Dwyer et al., 2022) in preventing barriers to collaboration, the findings provide additional insights into the contribution of intermediaries and trust. Thus, while the role of intermediaries in the cases above fits within the service function proposed by Lopez-Vega and Vanhaverbeke (2009), it goes beyond mere administration and includes multifaceted project management and problem-solving support, making intermediaries true participants of the project and not just auxiliary parties. As far as trust is concerned, the findings extended on the premise of trust enabling the endurance of collaborative relationships (Tootell et al., 2021) by

4. Findings and discussion

showcasing some of the mechanisms through which ABT does this: it accelerates decision-making, facilitates unscheduled communication, and encourages adaptability. Finally, the data demonstrate that as far as dimensions of trusting behavior are concerned, open communication comes to the forefront in preventing barriers.

While an adequate level of proximity by definition prevents barriers (Boschma, 2005), the data sample provides examples of what cognitive and institutional proximity may look like in practice. Thus, cognitive proximity proceeded from all collaborators sharing the same scientific background and identity, regardless of their organizational affiliation. This finding can be used as one of the considerations in determining team compositions, where shared background can be deemed a prerequisite if cognitive proximity is deemed a priority for the collaboration. In terms of institutional proximity, it was found that a lack of commercialization perspectives can facilitate goal alignment. Therefore, it may be useful to plan and implement projects in such a way that commercialization considerations only affect advanced stages that are inherently tied with them, leaving earlier stages free of commercialization-related conflict.

In addition, the current study builds on previous research by showcasing the role of the consortium agreement in setting up the collaboration for success. This is a required instrument for HE projects, and it allows to prevent conflict by defining collaboration procedures and commitments in advance. As outlined in the example above, in order for this instrument to be effective, it needs to strike an appropriate balance in the level of detail as to anticipate a sufficient amount of conflict, while still allowing flexibility to respond to emerging challenges. It remains to be studied, how this balance can be consistently established in practice.

Finally, one important aspect in perception of barriers to UIC is that some interviewees often failed to distinguish between university and industry partners, and therefore could not name barriers specific to a certain type of partner. One industry researcher confirmed this lack of differentiation by stating: *“I don't keep track of exactly where each collaborator sits.”* A university researcher shared a similar sentiment: *“sometimes the distinction gets a little bit blurry as well.”* Furthermore, even in situations where this distinction is perceived, he did not identify a difference in collaborating with these distinct types of partners, especially as far as trust, and specifically openness are concerned. When asked about ease of exchange of information, he stated: *“I think*

4. Findings and discussion

that depends a lot less on what the entities are, more on the personal relationship you have with the actual people. ... And I think there is not really a lot of distinction between industry and academia in that regard, the difference is mainly, if you spend a lot of time on the events of the project together.” Therefore, the barriers identified may not always be related exclusively to collaboration between universities and industry, but rather to collaborative projects where many types of stakeholders are involved.

Extant literature does not provide any theoretical background regarding the role of perceptions of organizational affiliations. The present study has identified that UIC participants do not always perceive who their collaborators are affiliated with and focus instead on individual relationships and project-specific dynamics. This can have both positive and negative implications. On the one hand, without preconceived notions of how a new partner may behave based on their organizational affiliation, it might be easier for teams to establish efficient unbiased collaboration procedures. On the other hand, if the barriers inherent to UIC are indeed present in the collaboration, being aware of the partner’s affiliation and the potential challenges may help anticipate and mitigate or overcome these barriers. Future research is needed to explore how these scenarios emerge in practice.

4.7 Trusting behaviors and their role in mitigating barriers to collaboration

This section will give an overview of the manifestations of the four dimensions of trusting behavior in the collected data sample and how they related to the barriers. One of these dimensions is open communication. All interviewees expressed a high degree of openness in their ongoing projects. An industry researcher shared: *“we discuss openly about problems, potential solutions.”* Another industry participant shared how open communication is a standard approach to handling problems: *“whenever a red flag comes, ... it has been very easy to just say, look, but we did it as well, we saw something different.”* Other interviewees underscored that they do not experience any difficulties with open communication, indicating a certain level of trust.

At the same time, interviewees intrinsically distinguished between two scenarios of communication: internal communication between participants for furthering collaboration, making decisions, and solving problems, and external dissemination of project information and results, which triggers IPR protection concerns. A university work package leader spoke of this distinction:

4. Findings and discussion

“so information, if it's like contribution to discussion, there are no issues whatsoever. If it's other kind of asset, you need to go through the industrial partner clearances and procedures.” An industry coordinator elaborated on how these two scenarios are treated: *“what we put in the projects is fully open. At disposal of consortium. Sometimes as the project progresses over time, the things that you create, we have this strategy that before you go to public, talk to the IPR department.”* The issue of IPR protection is particularly salient for industry participants. An industry work package leader shared: *“I will not share some documents from my company, which is not allowed. I will only share some things related to the project and we check before that we can share it.”* Thus, interviewees shared a readiness to share relevant information with team members, but expressed an awareness of the IPR constraints and regulations they face in their organization. While the role of IPR protection in restricting collaboration has been well-studied (Bruneel et al., 2010; Canhoto et al., 2016; O'Dwyer et al., 2022), the present study offers additional details on how it is perceived in practice. In HE consortia with established benchmarks for open communication, IPR protection is not seen as a barrier, but rather a consideration to be made in planning for time required for the appropriate release authorizations. Furthermore, in some cases, when partners perceive that their knowledge contribution will only be used for internal discussions, they are able to forgo any IPR protection considerations altogether. Further research is required to establish the antecedents to this attitude.

One common view that interviewees shared is that the foundation for the environment of openness is previously signed legal agreements. During the proposal stage, potential partners, especially industry, sign an NDA that mitigates risks of sharing sensitive information. A university grant writer shared his experience in preparing proposals: *“at the proposal level, there might be a global NDA, and if there's no global NDA, typically between companies, there might be bilateral NDAs, but between university and company, very seldom there are bilateral NDAs, they are probably a global NDA that is relevant to everyone.”* This may signify that industry experiences less distrust toward universities compared to other companies, as they are not required to sign any special partner-specific clauses. He also added that in some situation an NDA might be signed at a later stage, when the project gets funded, which is indicative of a higher level of trust.

When the project gets funded, all partners are obligated to sign a grant agreement and a consortium agreement. A university coordinator explained that such an agreement prevented created a safe

4. Findings and discussion

environment for open communication: *“all this information-sharing process is already specified, even from the project beginning, with a consortium agreement where you specify where the IP belongs, and what information can be shared, so everyone knows about that, and then everyone is also open, feels safe.”* An industry researcher further elaborated on how these agreements relate to knowledge sharing in her project: *“in these projects, it's really clear that what you create belongs to the project. And it's also part of the contract signed that information is free. You have to exchange information created there, and all partners have right to use and right to ask for materials, and so on. And I think it's decided a priori how we would deal with that.”* Another participant noted that open communication and sharing are also linked to the open science requirements in Horizon Europe. A project manager with expertise in Horizon Europe projects elaborated that the EU already has regulations put in place to facilitate the sharing of results which set a baseline and alleviate hesitations in partners with experience working in such projects. Thus, the dataset clearly shows that regulations around Horizon Europe projects establish a certain minimum level of trust by requiring consortium members to discuss and come to an agreement around knowledge sharing at the outset of the collaboration.

The role of NDAs and consortium agreements in fostering open communication is aligned with extant literature that establishes a positive link between formalizing roles, obligations, and communication pathways and transparency (Järvinen & Branders, 2020; Lumineau, 2014). The present study elaborates on this by specifying that these agreements also need to formalize the information-sharing procedure and IPR ownership considerations to facilitate open communication. Furthermore, the findings show that at the proposal phase the attitudes of industry in terms of IPR protection may differ with respect to other firms and universities, with less stringent NDAs being acceptable if the counterparty is a university.

Some interviewees identified additional antecedents to open communication. First, partners communicate with their counterparties more openly when they feel this is required to move the project further along. An industry researcher explained: *“they have to speak all together to share their results, because each of them are part of the chain.”* This also includes working for a common goal, like making a joint publication. Second, partners share information more readily when they do not work with competitors, who might “steal” it to gain a competitive advantage. A university coordinator clarified how this prevented problems with communication: *“the partners are*

4. Findings and discussion

exchanging freely the information because I think there are no overlaps between one partner and the other partner. So, a partner is developing heat pumps, there is another partner manufacturing the thermal insulation.” Though this example applies to two manufacturers, it can also apply to UIC, as universities and manufacturers are also not competitors on the open market. Third, open communication is also linked to ABT. An industry participant described the atmosphere in the project: *“it's open enough and friendly enough that you can just chat.”* Another industry researcher clarified how ABT towards some project partners enabled more candid and frequent communication about the project: *“the fact that we have a personal relationship, we get to talk about the project even off hours. Things that we don't understand, for instance, we clarify with each other even off hours.”* This is aligned with previous knowledge suggesting that ABT contributes to the sharing of tacit knowledge (O'Dwyer et al., 2022). Finally, CBT has also been mentioned as a factor that promoted open communication. A university researcher stated: *“if I think someone is especially competent, I do want to work with them more closely, and also try to share more information with them.”* Therefore, open communication occurs when all partners are committed to a common goal and when they do not fear opportunistic behavior from competitors. While McAllister (1995) already suggested the link between ABT and CBT and open communication, the present study identifies a unique combination of antecedents to open communication in HE UIC projects consisting of the consortium agreement, goal alignment, lack of competition between participants, ABT, and CBT.

As mentioned in previous sections, open communication can play an important role in overcoming and preventing barriers to collaboration between universities and industry. For example, when faced with the need to obtain sensitive data required for the project from clinicians, an industry researcher shared that the task was solved through being transparent. Communication was also key in overcoming a cognitive barrier stemming from different methods used by project members: *“my colleague showed me a result that was different. ... they explain how they do; we explain how we do, and then we may find the reasons why they are different.”* Thus, in this situation, communication helped close a cognitive gap around methodology. As far as institutional barriers are concerned, open communication can help bridge gaps around differences in operational approaches to work. As mentioned above, manufacturers tend to view their role the same way they do when they receive commercial orders: they produce goods that meet a predefined specification. However, in scenarios where they are supposed to conduct joint research and development with

4. Findings and discussion

universities, they need to shift to a new approach of iterative codevelopment of the specification. A university coordinator explained how open communication helps overcome this barrier: *“we have to explain to them and try to push them to be involved in the activity ... to get to the final result, we have to work together to check the constraints together and to update the features step by step.”* Therefore, open communication helps bridge operational differences and align approaches. The findings are generally consistent with previous research on the role of open communication in overcoming these barriers (De Wit-De Vries et al., 2018). At the same time, they provide novel insights into the unique contribution of open communication to bridging methodological and operational differences inherent to UIC projects funded through HE.

Conversely, it has been demonstrated that projects without a culture of open communication encounter difficulties. As described above in section 4.4 *Social Barriers and Overcoming Them*, a project where most collaborators were unwilling to share, even with their own partners, was characterized by tensions. This behavior was linked to a gender-based competitiveness. Thus, a lack of openness jeopardizes the collaborative spirit and can be linked to social barriers.

The second dimension of trusting behavior is entering into informal agreement. There are no projects funded through Horizon Europe that fully rely on informal agreements. All interviewees referred to the consortium agreement as a required document defining all key aspects of the collaboration. A university coordinator shared: *“we try to be very clear in the grant agreement, in the consortium agreement.”* Generally, the interviewees shared that the consortium agreement provided a solid foundation for the collaboration and was drafted well in advance. In some cases, the agreement has a very high level of detail from the beginning. The university coordinator continued: *“in a consortium agreement, I used to write that every industrial partner is committed to deliver all the technologies, components that are needed to retrofit the two, three, four case studies depending on the project.”* This approach, however, is not shared by all projects. Many do not find it possible to incorporate all details, as some of them become apparent only in later stages. Another university coordinator noted: *“once you have an idea, let's say 3 years ago ... it's very often that not everything out of what you had in your mind works in the end.”* The gap between the content of the signed agreement and the developing reality serves as an area where informal agreements can be useful. A university researcher explained: *“at the start of the project, each institution agrees to what it wants to do and that's binding, at least my experience. But then, over*

4. Findings and discussion

the course of the project, a lot of work needs to be done that hasn't been thought of, or that hasn't been assigned to anyone. And then you informally agree on who wants to do it." Therefore, the consortium agreement is a formal agreement that serves as the foundation upon which further informal agreements can be built. Though extant literature suggests that the lack of formal agreements is an indicator of trusting behavior and can accelerate the establishment of administrative frameworks for UIC (Currall & Judge, 1995; De Wit-De Vries et al., 2018; Ulhøi et al., 2012), the reliance on consortium agreements should not be seen as an indicator of distrust in HE settings, as collaborators have no control over deciding to conclude this type of agreement.

The interviewees had differing views regarding how formal agreements need to be when decisions not covered by the consortium agreement are made. An industry work package leader shared that the approach in his project tended to be more informal: *"almost everything is decided on the regular offline meeting, face-to-face. The problem is that when it comes to realization, one partner does exactly what we expected, and another seems with different experience, has a different, feeling about what they should provide."* Therefore, the participants of this project engaged in trusting behavior toward each other by entering informal agreements, however the cognitive barriers between them led to miscommunication about the results. This is consistent with previous studies, that suggest that the absence of formal agreements can actually create hurdles (De Wit-De Vries et al., 2018). Other interviewees tended towards more formal approaches, where all decisions are documented in meeting minutes. A university work package leader explained his approach: *"I just finished the meeting of work package two. And of course, I was taking minutes of the decision and I think this is a good way to go when you need to synchronize people."* Nevertheless, there are subjective differences on the extent to which minutes are perceived as a formal agreement. Thus, the speaker above did not perceive them as an informal agreement, while an industry principal researcher had a different view: *"I think the relationship that we have has enough trust between each other to just rely on our verbal agreements. Most that we do is, of course, we write these agreements in minutes of the meetings, but that's as much as we do. We don't sign papers or things like this."* Therefore, when compared to signed documents, minutes may not constitute a formal agreement. The project in question was perceived as smooth in terms of cognitive barriers, but the information to claim that this is linked to practices around more formal agreements to document decisions, such as minutes, is insufficient.

4. Findings and discussion

The third dimension of trusting behavior is low level of surveillance over the counterpart. Previous research suggest that the absence of surveillance and monitoring of collaborators is an indicator of trust (Currall & Judge, 1995). The collected data set demonstrates that with respect to this dimension, it is important to distinguish between behaviors of contributors without any management role and that of coordinators and project managers. Individual contributors express a rather low level of monitoring over other project members. An industry researcher shared her attitude on monitoring activities of others: *“you're busy with your own thing, so you don't look at the details of how the others are doing, because it's very clear they are their tasks, not my tasks.”* Coordinators, on the other hand generally see it as their obligation to monitor the course of the project. A university coordinator shared his approach: *“You cannot start the project and say, you have to do this activity and we will meet again in two months or three months. You have to get in touch with them every week.”* He also added that he checks progress step by step by requesting photos of the work in progress or by conducting site visits. Another university coordinator confirmed that he always must maintain contact with partners. A technical coordinator shared that he is involved in most meetings: *“I'm very involved in all the work packages. I'm basically in 90% of the calls in all the work packages and I am very active in all of the discussions. So, it's kind of, I wouldn't say micromanaging, but small managing.”* It should be noted that in this extract the speaker accentuates his active involvement in all discussions and not a desire to check progress. Therefore, it could be possible that the propensity to monitor partners does not stem from mistrust, but rather from an interest in their work. Finally, an industry coordinator shared an opposite *laissez-faire* approach to coordination: *“I like to give freedom to people, when the project starts, it starts, right? Because I don't want people to feel that I'm their boss. No, not at all. Right. I mean, it's a trusted environment.”* Indeed, in this interview the speaker accentuates the high level of trust stemming from previous experience and the small size of the project. Furthermore, the desire for people to not perceive him as his boss may be linked to an attempt to avoid social tensions characteristic hierarchical relationships. Therefore, lack of surveillance may prevent or help overcome social barriers. In summary, project contributors may exhibit less monitoring behavior, while coordinators engage in monitoring more due to the nature of their role, however, this is rooted in their roles and respective responsibilities, rather than in trust or lack thereof. Therefore, this dimension of trusting behavior can be considered not highly relevant for UIC consortia funded through HE.

4. Findings and discussion

Finally, as previously mentioned, the fourth dimension, coordination was outside the scope of the interview as all projects had a coordinator, who was expected to make coordination between contributors obsolete. Indeed, a university coordinator confirmed this notion: *“usually I do the focal point in the sense that I'm getting the specification, I'm trying to understand who needs what and try to put together everything.”* At the same time, one interviewee mentioned a situation when this is not necessarily the case. In her project, the coordination was done through the intermediary, who took care of all administrative tasks. However, they did not have the capacity to coordinate participants from a scientific point of view. The interviewee shared how scientific coordination was conducted by the scientific contributors: *“what [the project management company] doesn't do is the detail, scientific alignment. ... this is what we, more from the scientific part, need to do, is really to talk to the others that are also working in the biological systems to make sure that we need to have experiments that are comparable, we need to be able to extrapolate the results from one to another.”* She underscored that coordination is different from monitoring in that she doesn't keep track of timelines during this scientific coordination. Thus, in this project trust also manifested through coordination of interdependent tasks. This type of activity prevents cognitive barriers, as the speaker demonstrates an awareness that incomparable experiments caused by differences in cognitive bases of distinct research teams are a possibility. Therefore, this dimension of trusting behavior can play a limited role in HE consortia, even though a dedicated coordinator is a required element of every consortium.

The findings demonstrate that the key dimension of trusting behavior in HE consortia involving universities and industry is open communication, which has been demonstrated to be a facilitator in overcoming cognitive and institutional barriers. Open communication can be encouraged through establishing an adequate consortium agreement, goal alignment, lack of competition between participants, building ABT and CBT. Therefore, in settings where cognitive or institutional misalignments are possible and their effects are likely to cause significant problems, managers are advised to incorporate appropriate antecedents to open communication in project planning, initiation, and implementation. Furthermore, informal agreements are also present to some extent in UI consortia in the implementation phase after the consortium agreement is concluded, though foregoing formal documentation of decisions may have the adverse effect of achieving disparate or incompatible results. Thus, managers are advised to take the level of trust and cognitive proximity in consideration when deciding on the level of formalization of

4. Findings and discussion

intermediate decisions. Finally, managers and coordinators of consortia are advised to take advantage of the coordination dimension of trusting behaviors exhibited by contributors in order to facilitate specialized coordination around scientific tasks if they themselves are not experts in the project domain.

From a theoretical perspective, the findings demonstrated that the four dimensions of trusting behavior proposed by Currall and Judge (1995) in the Boundary Role Person's Trust framework is generally adequate for assessing trusting behaviors in HE consortia involving universities and industry. However, the contribution of each dimension to trust and successful collaboration is imbalanced, where open communication is drastically more important in establishing effective collaboration patterns and overcoming barriers and lack of surveillance is virtually irrelevant, at least in projects with competent coordinators. The contribution of informal agreements and coordination to trust perceptions and project outcomes is uneven across projects and requires further research.

4.8 Interplay of cognition-based trust and affect-based trust

This section describes the aspects of cognition and affect-based trust exhibited in the data sample, as well as outlines the implications of CBT and ABT for the collaboration. CBT in Horizon Europe projects is strongly linked to perceptions of skill, knowledge, performance, reliability. Several interviewees spoke highly of their partners' skills. For example, a university work package leader reflected on his team: *"they can trust me, and I can trust them because of their technical skills."* Others referred to knowledge, by using such words as *"expertise," "profile," "technology," "specific competence,"* or *"brings something different."* Performance was indicated through such words and phrases as *"work well," "have everything under control," "do a good job," "knows how I work."* Another assessment of performance-linked CBT was provided by an industry coordinator: *"the university partners were definitely the main pillar of the project, and their outputs were always on a great level."* Finally, another component of CBT is reliability. An industry researcher explained how she reflected on trust in the projects: *"are the things being said, being done? It helps to have this trust between the partner."* Another interviewee explained his perception of core collaborators that he has worked with numerous times: *"you can rely on them."* Therefore, CBT founded on perceptions of skill, competence, and reliability was observed in the data set.

4. Findings and discussion

In all these instances, reference to various aspects of CBT was strongly linked to partner selection and repeat collaboration. An interviewee from an intermediary organization stated: *“the most important thing in consortium building is for sure the knowledge or the expertise.”* Many others shared this sentiment and illustrated how CBT factors into partner selection. For example, a university coordinator explained that he finds new partners by looking *“at specific competence online,”* after which *“they contact them, do an interview, check their skills, and involve them.”* In this case public information about a required competence and a skilled-based interview already allow to build some level of CBT. Others demonstrated that having someone’s CBT affected their recruitment to the project. For instance, an interviewee from an intermediary organization shared how she became a part of the consortium: *“a consultant I know, he knows how I work, so he introduced me.”* In this case, she was recruited because an acquaintance placed CBT trust in her based on her previous performance. Building CBT in the consortium also affects future collaborations. An industry researcher shared how CBT affected her company’s decision to engage with a consortium partner on a new project: *“we even had a small collaboration that was not related to the project, because we see their work, we’re thinking about other projects of ours.”* Another interviewee shared that this tendency to invite trusted partners from previous consortia to new collaboration is a widespread pattern, where demonstrating good performance to partners leads to invitations to participate in new proposals. In both cases CBT and the decision to work together again was linked to partner performance. Conversely, losing CBT in a partner may disincentivize organizations from working together. A university grant writer shared: *“if you feel with some other partners that they are not, working as well as they should, then of course, you minimize the cumbersness of that.”* Finally, it should be noted that with partner selection, CBT takes precedence over ABT. An industry coordinator explained: *“it doesn’t really matter your personal connection. If these guys are not going to perform well in a project, they are not going to be invited to join us.”* He added that inviting a potentially unreliable partner, trustworthy as they may be in terms of ABT, is a risk: *“nobody wants to be exposed to that level. Right. These are the guys that I brought to the project, and they are not performing well.”* Therefore, CBT plays a dominant role in partner selection and recruitment.

4. Findings and discussion

It should also be noted that as noted above, CBT plays a role in overcoming cognitive barriers. Furthermore, as demonstrated above, lack of CBT can result in social barriers, so this dimension of trust can also be linked to the prevention of social barriers.

The findings contradict some previous research suggesting that ABT is more important for partner recruitment (Tootell et al., 2021) and corroborates those that claim that CBT is more significant at the initial stages of collaboration (O'Dwyer et al., 2022). However, the present study goes beyond previous findings and establishes a strong link between CBT and partner selection in HE consortia involving universities and industry while at the same time ruling out the contribution of ABT to this process. From a theoretical perspective, these findings contribute to the research on the interplay of CBT and ABT at the different stages of collaborative relationships, identifying a strong influence of CBT at the early stages involving partner selection. In practical terms, these findings can provide guidance to aspiring partners in HE consortia and suggest that investing in building CBT is a meaningful strategy for being selected to participate in these collaborations.

As for ABT, this aspect is also present in Horizon Europe UIC. The following phrases were indicative of ABT: *“we have a personal relationship,” “we are friends,” “it’s a friendly, nice atmosphere,” “interpersonal understanding,” “pleasant, beyond just science.”* An interviewee from an intermediary organization explained what this means in practice: *“I would be very comfortable to contact some people just to pop in and to have a coffee. And that helps for sure to work. It’s like a normal work team, then.”* These examples are indicative of a personal affect between the participants that is unrelated to competence, performance, or reliability. Rather, these examples describe sympathies and a personal comfort in the working environment.

Even though ABT does not affect partner selection, it does have some positive effects on the collaboration. A closer personal relationship allows individuals to come to decisions with more ease and feel comfortable spending more time together. An industry researcher illustrated how long-term friendships affect the collaboration: *“I think it helps because we don’t have to sign papers, discussions or arguments get settled much easier. And because we have a personal relationship, we get to talk about the project even off hours. Things that we don’t understand, for instance, we clarify each other even off hours.”* Therefore, ABT can help partners overcome barriers, including cognitive ones, through more frequent and transparent communication and

4. Findings and discussion

readiness to make decisions without formal agreements. In another example of how ABT improves communication, a project manager from an intermediary organization describes how personal informal contact, and therefore developing ABT, can facilitate communication: *“if you meet face to face, you spend more time together. So, the small talks, they kind of deepen, you kind of share some more information on the company or even sometimes like a private aspect. ... you get to know the person behind the role. It's always easier to reach out to them, because you've kind of shared, even if you have not shared personal information, you at least shared being at the same place.”* In this case, affect can promote trust and improve communication even in individuals without previous personal relationships.

ABT can also affect performance as a motivator to go beyond the bare minimum of agreed deliverables. A university coordinator shared how personal affect influenced the collaboration: *“when there are some personal relationships then you have a positive impact. When there are not any personal relationships, then this doesn't mean that it has a negative impact. It just moves on, like as it has been agreed, but it might be that sometimes you might miss some extra things that could be done, if you have some stronger personal relationship.”* Thus, ABT helps partners to take on and follow through with additional deliverables.

Finally, ABT can help make the collaboration more pleasant and help overcome minor challenges. A university work package leader explained that ABT can affect how deadlines are set to accommodate personal difficulties: *“if I know they have some temporary issues, of course, I'm not going to put a deadline for this person, just when that person told me that he won't be available, or she won't be available.”* This type of attitude can prevent social barriers stemming from personal tension around project deadlines. Furthermore, ABT can mitigate insufficient CBT. A university researcher reflected on such relationships: *“even if the competency is not as good, if there's an interpersonal understanding, then I think that there still can be trust there, and a good working relationship.”* Thus, in some cases ABT can help overcome cognitive barriers.

These findings are aligned with previous studies suggesting that ABT enables more frequent communication (McAllister, 1995) and knowledge sharing (O'Dwyer et al., 2022). However, the findings go beyond the benefits identified in extant literature and demonstrate that ABT can foster deeper engagement beyond initial commitments and can help in overcoming cognitive and social

4. Findings and discussion

barriers. From a practical standpoint, this makes ABT an key factor in complex collaborative settings with multifaceted barriers and in long-term collaborations with possible extensions and requires attention from managers and coordinators who wish to set the foundation for a successful collaboration. Furthermore, the findings enrich the theoretical landscape around ABT and CBT by demonstrating some of the mechanisms behind the contribution of ABT to the endurance of successful collaboration between universities and industry in a HE setting.

4.9 Trust building

This section will consider the various routes to building trust that were taken by the interviewees in the sample. As suggested by Bachmann and Inkpen (2011), they can be grouped into institution-based and interaction-based antecedents. With the exception of the consortium agreement, all trust-building measures were based on interactions. Many noted the organic nature to developing trust, with previous experience serving as the key foundation for trust. A university grant writer stated: *“trust comes with that you have worked many times with people.”* A university researcher expanded on that by sharing that trust is built not only through repeat collaboration between individuals, but also between organizations: *“it's always similar partners over a long time, so they've been a lot of your projects already on autonomous driving, and so the institutions all know each other, even if the personnel is switching a lot. ... And so, I think there's a high baseline level of trust already.”* Furthermore, this previous experience might not be necessarily linked to previous UIC or other research or innovation collaboration, but also to time spent together in educational programs. A university principal investigator shared how trust had developed with the consortium partners: *“with many of them, we are in PhD together. So, then our paths follow different ways. So, people working in the industry, people working in academia, and then when you have a call, you better work with people you know, and you trust because you know each other since a long time.”* Therefore, contact related to joint educational experiences also builds trust.

Having joint experience can build both CBT and ABT. An interviewee from an intermediary organization described how working together for several years provides an opportunity to showcase performance level, a component of CBT: *“you bring together for 3 or 4 years. And most of the time, if you do a good job, you are basically called by one of the partners to participate to another proposal.”* In this case, *“doing a good job”* is indicative of high performance resulting in CBT. In

4. Findings and discussion

terms of ABT, previous experience can make relationships closer. A university researcher clarified how this occurred in practice, *“I worked together in a project with an industry partner where I personally knew the contact because they also came from here from the university and from the institute. So, then the working relationship is a lot closer.”* Thus, the aforementioned joint educational experiences can support the formation of ABT. Furthermore, time spent together in collaborations can affect not only working relationships, but also personal ones. A university coordinator stated: *“ee are friends now after many years working together.”* Therefore, through many years of collaboration in a UIC project, the participants form a friendship.

Another route through which trust in HE projects is built is through in-person meetings, especially informal ones. A university technical coordinator explained how in-person project meetings and their informal extensions help build trust: *“we organize frequent, like maybe four, physical plenary meetings on the premises of some of the partners in the consortium. And we have coffee breaks, then we have social events like dinners or things like this, and that helps to develop the trust that I don't have with them, but I already have with some others. That's pretty much it. You just talk about things that are not necessarily about the projects. You can talk about, you know, football or whatever.”* Thus, in-person conversations about mutual interests unrelated to the UIC have contributed to the formation of trust. A university coordinator in another project shared the same approach: *“staying together, spending time together, also for a dinner or an evening together, in my opinion, it's a good way to start the project because you relax a bit, you start speaking with people and also trusting each other.”* At the same time, he underscored that the effect is not the same for remote meetings: *“you cannot do just a virtual meeting. When it's feasible, but at least once in a year, you have to do a physical meeting.”* An interviewee from an intermediary organization shared how in-person meetings have facilitated trust-building and collaboration: *“it's easier just to reach out to someone or call them on the phone if you have seen them before. So that's usually a huge trust builder.”* All these cases describe settings where personal contact is established and affect is developed in in-person meetings, therefore they serve as a driver of ABT.

In-person meetings can be formal, such as plenary or general assembly meetings, or informal, like dinners and other leisure activities. A university researcher shared that in his experience, trust proceeded mostly from the informal components: *“the most effective trust-building exercises are those that are not sponsored by the institutions themselves. When it comes to these events, ...*

4. Findings and discussion

usually these dinners still happen, and you just have to pay for them themselves. And I think these are events also where really these personal relationships form and collaboration and trust gets really promoted.” He further explained why formal events might not be as conducive to trust-building as informal ones: *“if you are only there as a partner without having some management responsibility, then you're generally not as involved in these events, and you might not even know the other person really well face-to-face, and then the trust is not really there to the same level.”* This demonstrates that active engagement in formal meetings can be limited to a select group of individuals, therefore informal meetings are a more effective setting for driving interactions and trust between all collaborators.

Meetings, both online and offline, can serve as a substitute to previous experience. An industry technical coordinator who knows most people in the consortium shared how he uses meetings to build trust with the few partners he does not know: *“especially in calls and in physical meetings that we organize periodically, we kind of try to engage with them more than if we already knew them from before.”* In this case, trust-building requires a conscious recognition that there is a lack of trust with some partners and that this requires attention.

Intermediaries can also play a role in building trust between the consortium partners. An interviewee from an intermediary organization shared how this occurs in practice: *“we are the neutral partners to help to build trust between these partners because we do workshops on the IPR, we handle all the documents so they are not afraid that someone can put something into a document and then no one sees it.”* In this regard, the neutral status and the expertise in sensitive topics, such as IPR, helps intermediary organizations build trust. These organizations can also help by organizing the in-person meetings. Furthermore, intermediaries can facilitate trust development by taking over the administrative tasks to allow researchers to focus on the primary objectives. The interviewee shared the potential effects of this type of delegation: *“I think that's also maybe a thing that builds trust in consortia, because if the scientist or the coordinator has time to do the scientific work, they do collaborate also closer with the other partners in the consortium because they do have more time for that.”* Therefore, delegation of administrative tasks grants the collaborators more time for interaction with their peers through which trust is built.

4. Findings and discussion

One additional approach to building trust involves demonstrating commitment and providing opportunities to demonstrate commitment. When sharing approaches to building trust, a university coordinator shared that he had no specific approaches other than “*trying to do the best possible way in the world that you have often also even more work compared to what you are obliged to do.*” Thus, demonstrating good work ethic and performance is seen as a way to develop trust. Since these characteristics are linked to CBT, this effort-based approach leads to the development of this dimension of trust. In an extension of this approach, an industry coordinator shared that his approach is based on giving new collaborators opportunities to demonstrate trustworthiness: “*the best way to create this trust is give them ownership of the activities that they're doing. Let them work, but there be a very high-level supervision.*” This implies that one approach is to trust new collaborators from the outset, without having any foundations for trust.

Furthermore, the findings have also identified antecedents to open communication – one of the dimensions of trusting behavior. They include institution-based factors, such as an adequate consortium agreement outlining all key details of the collaboration, and other factors, such as goal alignment and lack of internal competition. They are described in detail in Section 4.7 above.

Finally, it is important to note that when asked about trust-building efforts, some interviewees did not mention any specific activities or routes to trust-building. This demonstrates that in some projects, trust-building is not a conscious objective and is not considered to be an important factor for the collaboration.

The findings corroborate previous research suggesting that face-to-face contacts and previous experience facilitate the formation of interaction-based trust (Bachmann & Inkpen, 2011; De Wit-De Vries et al., 2018). The present study expands on this research by providing additional insights on the pathways to trust through experience and meetings and identified two additional trust-enablers: intermediaries and exhibiting commitment. With respect to previous experience, it has been demonstrated that a range of types of past experiences can enable trust-building, including mutual experiences in educational settings and other consortia, and that these experiences affect both ABT and CBT. As for in-person meetings, the present study has identified that informal meetings offer additional opportunities for trust building to a wider range of individuals than formal meetings do. Furthermore, evidence has shown that in-person meetings can compensate for a lack

5. Conclusion

of previous experience between collaborators in terms of building trust. This is of particular interest to managers of collaborations where trust-building efforts are required and justifies the investment of time and other resources into scheduling informal personal-meetings. They can also turn to specialized intermediary organizations to enhance the trust building process. Finally, the mechanism of driving trust through displaying and observing commitment can be of use to any participant in interorganizational settings wishing to develop trust with their counterparts.

From a theoretical perspective, the present study provides further detail to the institution and interaction-based framework of trust formation proposed by Bachmann and Inkpen (2011). Both categories can be expanded to include the role of intermediary organizations in trust development, both with respect to their assistance in developing an adequate consortium agreement and collaboration framework for institution-based trust, and with respect to their expertise around informal contact management needed to develop interaction-based trust.

5. Conclusion

Considering the strategic importance of research and innovation for EU's competitiveness, achievement of sustainable development goals, and growth, this thesis set out to research Horizon Europe, the EU's flagship program for promoting research and innovation. In particular, it focused on the barriers to university-industry collaboration in HE consortia and the role of trust in mitigating these barriers. Drawing on a thematic analysis of 12 semi-structured interviews, the present study has provided several key insights with respect to the research questions guiding this study.

One of the questions this thesis set out to answer relates to barrier mitigation approaches in university-industry collaborations in projects funded through Horizon Europe. The barriers were analyzed through a lens based on five proximity dimensions. The study has identified that most hurdles in the cases considered can be attributed to institutional, cognitive, social barriers, as well as to barriers external to the five proximity dimensions framework, such as bureaucracy. The strategies applied to mitigate and overcome these barriers ranged from competent project management, to engaging intermediaries, to aspects related to trust, such as open communication, cognition-based trust, and previous experience. Furthermore, due to a lack of serious barriers in many of the analyzed cases, potential barrier prevention factors have been identified and include

5. Conclusion

engaging a professional coordinator, operating under cognitive and goal alignment, project management, previous experience, affect-based trust and reliance on the consortium agreement. Therefore, trust and some of its dimensions, such as ABT, CBT, and open communication are involved in preventing and overcoming UIC barriers, but its role is not exclusive and should be combined with other best practices relevant for each barrier type.

These findings carry practical implications for those involved in Horizon Europe projects. First of all, fostering open communication as a dimension of trusting behavior is a key priority for overcoming institutional and cognitive barriers related to gaps in knowledge bases, goal alignment, operational convention, attitudes to time and IPR. When initiating a project where any of these gaps are present, it is recommended to encourage open communication to align expectations, procedures, and objectives. Second, the engagement of a competent project manager, whether from one of the participating institutions or an intermediary organization, can anticipate challenges stemming from these gaps. Some instruments the project managers can rely on are adequate planning, allocation of individuals to teams to enhance proximity within these teams and take advantage of unique skills efficiently, and on using past experience to guide their expectations of project participants. An important element of the planning stage is the consortium agreement. It provides an opportunity to define common expectations of the goals, methods, timelines, knowledge sharing and treatment of IPR to prevent barriers in the course of the project. Failure to address the aforementioned challenges can lead to delays, inadequate deliverables, suboptimal outcomes, and inefficient resource allocation.

The present study makes contributions to the theoretical understanding of barriers and enablers of UIC in a Horizon Europe setting. First of all, it demonstrates that the five proximity dimensions are a useful framework for analyzing barriers and enablers to UIC, that can however benefit from an additional sixth category of barriers reflecting obstacles external to university and industry collaborators and unrelated to proximity. These hurdles include the bureaucratic burden imposed by the Horizon Europe requirements. Second, this research extends previous research on enablers by linking each enabler to specific barriers. Third, the present study demonstrates that the Horizon Europe framework, including the requirements related to the consortium agreement, can mitigate some barriers to UIC. Finally, this thesis raises the issue of absence of differentiation between university and industry partners in Horizon Europe consortia.

5. Conclusion

The second research question addresses the nature of trust in UIC collaborations and its role in overcoming barriers. The present study has determined that trust, both affect-based and cognition-based, is present in all projects that were the subject of this study. The nature of trust in these collaborations can be predominantly described by the open communication dimension of trusting behaviors, which facilitated the mitigation of cognitive and institutional barriers by encouraging collaborators to identify, discuss, and bridge their differences. The study has identified a number of antecedents to open communication, with the consortium agreement holding a particular importance. The presence and contribution of other dimensions of trusting behavior is less prevalent, as the HE framework, including the required coordinator and consortium agreement, make coordination and lack of monitoring largely obsolete as indicators of trust. The adoption of informal agreements as a trusting behavior require more scrutiny from managers as this dimension can both facilitate and challenge collaborations, depending on the level of cognitive proximity between the partners. As for CBT and ABT, it has been demonstrated that CBT plays a crucial role in partner selection, while ABT contributes to project endurance by encouraging open communication, additional efforts, and a positive working environment where minor challenges do not compromise the collaboration.

Project managers and coordinators are encouraged to promote open communication at every stage of collaboration, paying particular attention to the consortium agreement as the foundation for knowledge sharing and open communication. Furthermore, they are advised to exert caution with respect to trust development, as not all dimensions of trusting behavior are always beneficial for the collaboration. In addition, this study suggests that investing in ABT can be beneficial for project endurance and outcomes. Finally, those considering participation in UIC projects are advised to develop CBT within their professional networks to facilitate recruitment to such projects.

The present study contributes to the theoretical framework by determining that both managerial interpersonal trust and boundary role person's trust frameworks proposed by McAllister (1995) and Currall and Judge (1995), respectively, are appropriate for analysis of trust in university industry collaborations in a Horizon Europe setting. Additionally, it underscores the dominant role of one of the dimensions of trusting behavior, open communication, in overcoming institutional and cognitive barriers, as well as of CBT and ABT in overcoming cognitive barriers and preventing social barriers. Furthermore, the present study contributes to extant research on the contribution of

5. Conclusion

CBT and ABT to various stages of collaboration by demonstrating the crucial role of CBT in partner selection and initiation and the important contribution of ABT to collaboration endurance at more advanced stages.

The final research question is related to trust-building activities. The present study has determined that most of these efforts involved interaction-based mechanisms, such as in-person meetings and previous experiences, with informal meetings being found more effective for trust-building as formal ones. As far as institution-based instruments are concerned, the consortium agreement provided a solid foundation that reduced ambiguity around issues that can be detrimental to trust. These activities facilitated the development both of CBT and ABT, as well as open communication. One final finding concerned the absence of conscious trust-building strategies in most projects.

Coordinators and managers of HE consortia are advised to take a more strategic approach to building trust and plan for specific trust-building efforts, such as scheduling regular in-person meetings to facilitate trust building, especially if collaborators have no experience working together. Furthermore, the study suggests that some meetings should be informal. Finally, it is suggested that consortia make an effort to draft an appropriate consortium agreement at the beginning of the collaboration.

The contribution of the present study to the theoretical framework on trust-building is related to the role of intermediary organizations that can promote and facilitate both interaction and institution-based trust-building initiatives.

Despite its contributions, this study is subject to several limitations. First of all, due to the small sample size of 12 interviewees and the large heterogeneity of HE projects, the findings of the study cannot be generalized to all university-industry collaborations funded through Horizon Europe. Therefore, it may be warranted to conduct additional quantitative studies on a larger sample to corroborate specific findings, such as the role of open communication in overcoming specific sub-types of institutional and cognitive barriers. Furthermore, these studies could be conducted separately for different industries. An additional limitation is linked to the overrepresentation of positive views of UIC funded by HE. It is possible that the interviewees were subject to a self-selection bias, where only those individuals satisfied with their experiences were willing to discuss them with a third party. Therefore, individuals with negative views were potentially excluded from

5. Conclusion

the study by simply being unwilling to invest time in sharing their negative experiences. This could be mitigated in the future by conducting comprehensive longitudinal case-studies involving all collaborators of a project in multiple interviews throughout the course of the project. This would allow to capture all perspectives on the collaboration at different time-points, making the likelihood of discovering barriers and challenges higher. Finally, the methodological limitations include analysis at the semantic level over the latent level, which excluded the production of knowledge on underlying ideas, assumptions, and ideologies. Furthermore, the realist epistemology was chosen over the constructionist one, preventing this study from drawing conclusions regarding sociocultural contexts. Additional studies adopting a constructionist epistemology including latent analysis could mitigate this limitation.

Several further avenues for research have emerged from this study. First if all, the findings have identified that the consortium agreement plays a crucial role in overcoming barriers and building trust. Therefore, further research into best practices around drafting an effective consortium agreement is warranted. Analysis of the content of consortium agreements from different domains and its relationship to barriers and outcomes would yield valuable recommendations for consortia managers and EU policymakers, as well as important theoretical findings about institutional-based trust in a Horizon Europe setting. Second, one of the dimensions of trusting behavior, informal agreement, can both enable collaboration and create challenges when collaborators trust each other, but do not have sufficient cognitive proximity. This suggests a need to conduct additional research on the interplay of informal agreement as a dimension of trusting behavior, barriers, and cognitive proximity. It is expected that such research would produce practical recommendations to mitigate barriers resulting from informal agreement, as well as a deeper theoretical understanding of the four dimensions of trusting behavior.

One final potential direction involves gaining a deeper understanding of the involvement of intermediary organizations in HE consortia. The present study has identified their important contribution to overcoming barriers, especially those linked to IPR, and to building trust. Future studies may help understand patterns around the involvement of intermediate organizations in HE consortia, the advantages and disadvantages of their involvement, and the rationale for choosing to engage an intermediate organization. An analysis of these factors would provide practical recommendations to consortia leaders and EU policymakers regarding the strategies for

5. Conclusion

involvement of intermediary organizations, as well as theoretical insights on the role of intermediary organizations in university-industry collaborations.

The findings of this study underscore the importance of addressing institutional, cognitive, and social barriers through fostering open communication and trust, engaging intermediates and project managers, as well as preparing adequate contractual foundations to support effective Horizon Europe consortia operation and performance. A deeper understanding of the nuances behind the multi-actor landscape of Horizon Europe consortia allows managers and policymakers to effectively use resources invested by the stakeholders and provide the highest impact for the strategic goals for competitiveness and growth of the EU.

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Annex A. Interview guide

Version 1. For university or industry participants:

Question Complex 1. Introductory (10 min)

Thank you for agreeing to participate in this interview. As I have mentioned, as a part of my master thesis in international business administration, I am researching how university-industry collaboration is conducted in projects funded through Horizon Europe. I am particularly interested in barriers that emerge, how projects deal with these barriers, and what role does trust between partners play.

1. Could you briefly describe your role and your organization's involvement in Horizon Europe projects, specifically project X?
2. Could you please describe how the collaboration, specifically with partner X is organized?

Question Complex 2. Barriers to UIC and overcoming them (10 min)

3. What kind of challenges have you experienced in the collaboration with partners from universities/industry?
 - a. At what stage of the collaboration does this occur?
 - b. How did you approach overcoming challenge X, Y, Z?

Question Complex 3. Trust (15 min)

4. How freely do you exchange information with partners from universities/industry?
 - a. Are there any examples of this?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
 - c. How has this changed with time? How/Why?
5. In this project, to what extent do you need a formal written agreements or agendas in order to act, versus relying on informal understandings with university/industry partner?
 - a. Can you give an example?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
 - c. How has this changed with time?
6. How do you check or monitor that your project partners deliver the tasks they are responsible for, if at all?
 - a. Has this changed with time?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?

Annex A. Interview guide

7. How do you assess the competence, professionalism and reliability of partner X, Y, Z?
 - a. How has this changed over time?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
8. How do you relate to partners X, Y, Z on an interpersonal level, beyond formal task execution?
 - a. How has this changed over time?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
 - c. Did you know any of the participants before the project started?

Question Complex 4. Building trust (5 min)

9. At the beginning of the project, were there any efforts or practices aimed at creating a sufficient level of trust for partners to start working together?
10. What efforts, if any, are taken to sustain or nurture trust between partners over the course of the collaboration?

Conclusion

Thank you! This interview will provide me with very valuable insights for my thesis. May I contact you by email in case I have follow-up questions?

Version 2. For intermediaries:

Question Complex 1. Introductory (10 min)

Thank you for agreeing to participate in this interview. As I have mentioned, as a part of my master thesis in international business administration, I am researching how university-industry collaboration is conducted in projects funded through Horizon Europe. I am particularly interested in barriers that emerge, how projects deal with these barriers, and what role does trust between partners play.

1. Could you briefly describe your role and your organization's involvement in Horizon Europe projects, specifically project X?
2. Could you please describe how the collaboration between partners, specifically universities and industry partners is organized?

Question Complex 2. Barriers to UIC and overcoming them (10 min)

3. What kind of challenges have you experienced in the collaboration between university and industry partners?
 - a. At what stage of the collaboration does this occur?
 - b. How did you approach overcoming challenge X, Y, Z?

Question Complex 3. Trust (15 min)

4. How freely do the parties exchange information?
 - a. Are there any examples of this?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
 - c. How has this changed with time? How/Why?
5. In this project, to what extent do partners need formal written agreements or agendas in order to act, versus relying on informal understandings?
 - a. Can you give an example?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
 - c. How has this changed with time?
6. When partners are responsible for tasks or deliverables, what kinds of checking or oversight practices are typically used?
 - a. Who checks/monitors?
 - b. How has this changed with time?
 - c. How, if at all, does this relate to the challenges you mentioned earlier?
7. How do partners in this project assess each other's competence, professionalism and reliability in practice?
 - a. How has this changed over time?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
8. How do partners in this project relate to each other on an interpersonal level, beyond formal task execution?
 - a. How has this changed over time?
 - b. How, if at all, does this relate to the challenges you mentioned earlier?
 - c. Did any of the participants know each other before the project started?

Question Complex 4. Building trust (5 min)

9. At the beginning of the project, were there any efforts or practices aimed at creating a sufficient level of trust for partners to start working together?

Annex A. Interview guide

10. What efforts, if any, are taken to sustain or nurture trust between partners over the course of the collaboration?

Conclusion

Thank you! This interview will provide me with very valuable insights for my thesis. May I contact you by email in case I have follow-up questions?

Annex B. Codes and Themes

Code Name	Theme
Adaptability	Institutional barriers and overcoming them
Aligned incentives	Institutional barriers and overcoming them
Institutional proximity	Institutional barriers and overcoming them
IPR	Institutional barriers and overcoming them
Lack of commitment	Institutional barriers and overcoming them
Misaligned goals	Institutional barriers and overcoming them
Operational conventions	Institutional barriers and overcoming them
Overcoming barriers IPR	Institutional barriers and overcoming them
Overcoming institutional barriers	Institutional barriers and overcoming them
Overcoming lack of commitment	Institutional barriers and overcoming them
Timing differences	Institutional barriers and overcoming them
Unrealistic goals	Institutional barriers and overcoming them
Cognitive distance	Cognitive barriers and overcoming them
Cognitive proximity	Cognitive barriers and overcoming them
Overcoming cognitive barrier	Cognitive barriers and overcoming them
Social barriers	Social Barriers and overcoming them
Opportunistic behavior	Social Barriers and overcoming them
Previous experience - negative	Social Barriers and overcoming them
Bureaucracy as a barrier	Other barriers and overcoming them
Geographical barriers	Other barriers and overcoming them
Geographical proximity	Other barriers and overcoming them
Organizational barriers	Other barriers and overcoming them
Overcoming barriers- org	Other barriers and overcoming them
Overcoming bureaucracy	Other barriers and overcoming them
Motivations	Absence of UIC barriers and preventing barriers
No barriers	Absence of UIC barriers and preventing barriers

Annex B. Codes and Themes

No UI distinction	Absence of UIC barriers and preventing barriers
Preventing barriers	Absence of UIC barriers and preventing barriers
Previous experience	Absence of UIC barriers and preventing barriers
UIC positives	Absence of UIC barriers and preventing barriers
Consortium agreement	Trusting behaviors and their role in mitigating barriers to collaboration
NDA	Trusting behaviors and their role in mitigating barriers to collaboration
Coordination	Trusting behaviors and their role in mitigating barriers to collaboration
Informal agreement	Trusting behaviors and their role in mitigating barriers to collaboration
Monitoring	Trusting behaviors and their role in mitigating barriers to collaboration
Openness	Trusting behaviors and their role in mitigating barriers to collaboration
Reasons for openness	Trusting behaviors and their role in mitigating barriers to collaboration
ABT	Interplay of cognition-based trust and affect-based trust
CBT	Interplay of cognition-based trust and affect-based trust
CBT/ABT	Interplay of cognition-based trust and affect-based trust
Partner selection	Interplay of cognition-based trust and affect-based trust
Trust building misc	Trust building
Trust building through more contact	Trust building
Trust through commitment	Trust building
Trust through HE framework	Trust building
Trust through in person meetings	Trust building
Trust through informal meetings	Trust building

Annex B. Codes and Themes

Trust through intermediary	Trust building
Trust through openness	Trust building
Trust through outsourcing admin work	Trust building
Trust through previous experience	Trust building
Trust through showing work ethic	Trust building
Trust through time together	Trust building