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#### Recommended Citation

Hakami, Maram; Pradhan, Sojen; and Mastio, Emmanuel, "Learning from Intermediaries to Overcome Cognitive Related Barriers in the University-Industry Collaboration" (2022). *ACIS 2022 Proceedings*. 55. <https://aisel.aisnet.org/acis2022/55>

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# Learning from Intermediaries to Overcome Cognitive-Related Barriers in the University-Industry Collaboration

Full research paper

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## **Abstract**

Previous studies on university-industry collaboration have shown a number of different barriers that affect transferring knowledge through such collaborations. From the cognitive dimension of the social capital theory perspective, this paper explores barriers to knowledge transfer activities through the collaboration between university and industry and how intermediaries contribute to mitigating these barriers. By applying the qualitative research method, a total of 40 semi-structured interviews were conducted, targeting academics and practitioners across the various universities, industries, and intermediary organisations in Saudi Arabia. A thematic analysis of the data was then employed using MAXQDA 2022 software. Based on the findings, this paper contributes to the extant university-industry collaboration literature by providing insights into critical challenges that can be addressed to improve collaborative inter-organisation relationships. Additionally, these insights can also guide related partners in maintaining a successful collaboration.

**Keywords** University-Industry Collaboration, Knowledge Transfer, Intermediary Organisations, Social Capital, Qualitative Method.

## 1 Introduction

Previous studies have investigated the collaborations between universities and the industry in different research settings, with more attention being paid to knowledge transfer through such collaborations. In this study, university-industry collaboration (UIC) is referred to as inter-organisational arrangements between universities and industry aimed at accessing each other resources and transferring knowledge reciprocally through different knowledge transfer (KT) activities (e.g. contract research or patenting). In this paper, the KT through UIC (KT-UIC) term is used for this phenomenon.

As well, this study discusses the involvement of intermediaries as an effective mechanism to facilitate KT-UIC activities in the UIC ecosystem (i.e. collaborative partners within the UIC phenomenon, including university and industry partners). An intermediary is an organisation that "acts as an agent or broker in any aspect of the innovation process between two or more parties" (Howells 2006, p. 720).

Regarding the theoretical foundation, social capital theory is adopted in this study. The role of social capital in inter-organisational relationships context has been investigated by some studies in various fields (Al-Tabbaa and Ankrah 2019; de Wit-de Vries et al. 2019; Inkpen and Tsang 2005; Nahapiet and Ghoshal 1998; Seo 2020; Steinmo and Rasmussen 2018). Social capital is present in the embedded resources in these inter-organisational relationships (e.g. the shared goals) by evolving and growing over a long period of time (Inkpen and Tsang 2005). It comprises three dimensions: structural, relational, and cognitive (Nahapiet and Ghoshal 1998). This paper concentrates on the cognitive dimension and its sub-dimensions, including shared representation/interpretation, common understanding, the system of meaning, shared goals, shared language, and shared cultural assumptions (Inkpen and Tsang 2005; Nahapiet and Ghoshal 1998).

A closer look at the literature, however, reveals several gaps as follows. It was noted that there were inconsistent findings regarding mechanisms to address the lack of social capital resources among partners in the KT-UIC context, particularly the absence or lack of cognitive aspects (Albats et al. 2022; de Wit-de Vries et al. 2019; Villani et al. 2017). Furthermore, studies showed that there is still a lack of clarity on how cognitive differences, such as the lack/absence of the cognitive sub-dimensions of social capital among partners, are mitigated (Villani et al. 2017). The involvement of intermediaries was suggested as a mechanism to mitigate potential barriers especially parries that are related to cognitive differences among heterogeneous partners (Alexander and Miller 2017; de Wit-de Vries et al. 2019; Takanashi and Lee 2019; Villani et al. 2017) within the UIC ecosystem.

Through the lens of social capital theory, this study conducts a semi-structured interview with 40 participants, academics and practitioners who were recruited from universities, industry, and traditional intermediary organisations in Saudi Arabia.

With the above in mind, this paper aims to explore the KT-UIC barriers through the lens of the cognitive dimension of social capital theory. It also aims to shed light on the intermediaries as a proposed mechanism to mitigate these barriers. Accordingly, the following research question was formulated: **'How could intermediaries contribute to addressing barriers related to the cognitive dimension of social capital, within KT-UIC activities?'** The next section briefly reviews related literature and the theoretical foundation of the social capital theory, followed by an outline of the methodology. Findings regarding cognitive barriers to KT-UIC activities are then provided, and different aspects of intermediaries are discussed. Finally, the conclusion is presented with the implications.

## 2 Literature Review

### 2.1 Knowledge Transfer through University-Industry Collaboration (KT-UIC) Activities

Knowledge is embedded in an organisation's members, skill sets, tools, technology, tasks, and in its internal/external relationships. So, when knowledge is transferred between two organisations, they mainly seek to acquire the embedded knowledge from each other. Thus, KT is defined as "the process through which one unit (department, group, or division) is affected by the experience of another" (Argote and Ingram 2000, p. 151); in which KT can take place either explicitly or implicitly within the UIC ecosystem (Alexander and Childe 2012; Alexander and Martin 2013; Argote and Ingram 2000). Explicit knowledge is defined as "words and numbers and shared in the form of data, scientific formulae, specifications and manuals" (Alexander and Childe 2012, p. 538). Explicit knowledge can be clearly codified, documented and accessed in tangible formats; whereas, in the implicit mode, it can be hard to obtain/codify the knowledge embedded in the intangible resources (e.g. organisation's social norms, rules, or routines) (Argote and Ingram 2000).

The KT-UIC process is applied through various activities, where formal KT-UIC activities (e.g. contract consulting work) and informal KT-UIC activities (e.g. meetings) coincide, that is, simultaneously, aiming to achieve collaboration's objectives. Explicit knowledge can be transferred through formal and contractual activities, such as agreements of patenting or licensing (D'este and Patel 2007; de Wit-de Vries et al. 2019; Perkmann and Walsh 2007). However, implicit knowledge needs face-to-face interaction to be apprehended and then transmitted "to develop competence and more direct collaboration and interactional expertise" (de Wit-de Vries et al. 2019, p. 1243). Accordingly, implicit knowledge can be transferred through activities that incorporate more personal interactions, such as research partnerships (e.g. collaborative research and development (R&D)) and research services (e.g. contract research and consulting) (D'este and Patel 2007; Perkmann and Walsh 2007).

The KT-UIC activities can be categorised according to their contractual matter. A recent study by Schaeffer et al. (2020) developed a framework to distinguish between formal and informal KT activities, considering the level of face-to-face interaction. This is presented in Table 1.

	Contract-based KT-UIC Activities	Non-Contract-based KT-UIC Activities
KT-UIC Activities Without face-to-face interactions	<b>Purely Formal Activities</b> Licensing (patents, software)	<b>Informal Non-Interactive Activities</b> Scientific publications
KT-UIC Activities With face-to-face interactions	<b>Formal Interactive Activities</b> R&D projects Contract research Academic spin-offs U-I doctoral theses Contractual consultancy	<b>Purely Informal Activities</b> Teaching activities Academic conferences and workshops General public conferences Non-contractual consultancy

Source: Adopted from Schaeffer et al. (2020, p. 35).

Table 1. A Classification of KT-UIC Activities.

A wide variety of KT-UIC activities is in the interest of academics and their industry partners to promote individual skills in research engagement (D'este and Patel 2007); because of the heterogeneity in the UIC partners (Howells 2006; Schaeffer et al. 2020). Furthermore, Arza (2010) argues that varied activities provide intellectual and economic benefits for universities while solving production issues, university research commercialisation, and supporting innovation strategies within the industry. Several other studies have examined the importance of variety in KT-UIC activities. These refer to the role of various KT-UIC activities in individual and institutional characteristics (D'este and Patel 2007) and scientific disciplines' knowledge characteristics and factors (Bekkers and Bodas Freitas 2008).

## 2.2 Intermediaries in the UIC Ecosystem

Intermediation as a process and intermediaries as organisations/entities help to manage inter-organisation relationships in general and KT-UIC in particular by facilitating the crossing of various boundaries among heterogeneous partners/stakeholders, including both university partners (academics) and industry partners (practitioners) (Al-Tabbaa and Ankrah 2019; Albats et al. 2022; Alexander and Martin 2013; Alexander and Miller 2017; de Wit-de Vries et al. 2019; Howells 2006; Takanashi and Lee 2019; Villani et al. 2017). Intermediaries, in this study, are agents/brokers/boundary organisations between university and industry (Howells 2006). Prior studies of the KT-UIC have revealed and discussed several examples of intermediaries, including university technology transfer offices (UTTOs), university knowledge transfer offices (UKTOs), technology licensing organisations (TLO), university incubators (UIs), intellectual property headquarters (IPHQs), and university-industry cooperative research centres (UICRCs) (Howells 2006; Takanashi and Lee 2019; Trune and Goslin 1998; Villani et al. 2017).

Intermediaries have been shown to mitigate cognitive differences by positively moderating cultural differences, developing a settlement in the KT-UIC process, and building trust among partners (de Wit-de Vries et al. 2019; Muscio and Pozzali 2013; Villani et al. 2017). The role of Intermediaries is

summarised as "bringing people together, helping to build links, identifying gaps and needs, and sharing ideas" (Bielak et al. 2008, p. 220). Integrating intermediary organisations within the UIC ecosystem enriches such collaborations to build a successful long-term KT-UIC by facilitating effective communication and dealing with inter-organisational barriers among partners who differ in their capability to absorb the transferred knowledge (Alexander and Martin 2013; Howells 2006; Takanashi and Lee 2019; Trune and Goslin 1998; Villani et al. 2017). The industry can assist universities in acquiring resources and commercialising academic research while expecting universities to provide them with expertise in a specific domain. For that reason, intermediaries, with their embedded resources and experts who mediate the academic and industrial culture, reduce cognitive differences and better understand each partner's needs (Alexander and Miller 2017; de Wit-de Vries et al. 2019; Villani et al. 2017).

Moreover, considering the variety of the KT-UIC activities (Bekkers and Bodas Freitas 2008; D'este and Patel 2007), the wide range of heterogeneous UIC ecosystems and the complexity of the contexts (Alexander and Martin 2013; Howells 2006; Schaeffer et al. 2020), and the inconsistency in the KT-UIC literature (Al-Tabbaa and Ankrah 2019; de Wit-de Vries et al. 2019), the scholarly debate is continuing regarding the roles/forms of intermediaries in the KT-UIC (Albats et al. 2022; Villani et al. 2017). Consequently, several forms/strategies of intermediation have emerged as a significant trend in the KT-UIC phenomenon, ranging from a traditional form of intermediation (e.g. UTTOs/UKTOs) that has been investigated in the literature, to other forms (e.g. crowdsourcing platforms) that remain unexplored in the KT-UIC context (Al-Tabbaa and Ankrah 2019; Albats et al. 2022; Alexander and Martin 2013; Howells 2006; Villani et al. 2017). Several forms of intermediaries based on their architectures have been proposed in the work of Alexander and Miller (2017), including the following: an intermediary organisation that is located within their host institutions (e.g. within universities), located within arms-length institutions, based outside of the host institutions, or based on a virtual platform. Similarly, different structures/strategies of intermediaries as physical or virtual organisations were also introduced by Albats et al. (2022). Physical intermediaries are categorised as traditional intermediaries (located physically within the host institution (in-house)/arm-length) or regional clusters (located remotely). In contrast, the virtual ones are classified as virtual-community (working virtually and not having a permanent digital platform) or digital intermediaries (handling entirely virtual activities via a digital platform).

Although related studies in intermediation within the KT-UIC context have been conducted by a number of authors, the involvement of intermediaries as a mechanism to mitigate potential barriers and their forms/roles in such a collaboration are still insufficiently explored (Alexander and Martin 2013; Alexander and Miller 2017; de Wit-de Vries et al. 2019; Takanashi and Lee 2019; Villani et al. 2017).

### 3 Social Capital Theory

The social capital theory has been widely defined based on its applicability to a variety of contexts. In this study, social capital can be defined as "the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit" (Nahapiet and Ghoshal 1998, p. 243). It comprises three dimensions: structural (the nature of an organisation's social networks), relational (the quality of relationships), and cognitive (the shared frames of reference among partners), according to Nahapiet and Ghoshal (1998). Each dimension comprises a number of further sub-dimensions (Inkpen and Tsang 2005; Nahapiet and Ghoshal 1998; Seo 2020), as summarised in Table 2.

In this paper, we focused on the cognitive dimension and the related cognitive differences among partners. The cognitive dimension refers to "resources providing shared representations, interpretations, and systems of meaning among parties" (Nahapiet and Ghoshal 1998, p. 244). It contains the following sub-dimensions: shared representation/interpretation, common understanding, the system of meaning, shared goals/vision/interests, shared language, and shared cultural assumptions. Having shared goals and cultural frames of reference will facilitate access, when necessary, to the knowledge and experience of each partner (Inkpen and Tsang 2005; Santoro and Gopalakrishnan 2000; Santoro and Saporito 2003; Steinmo and Rasmussen 2018), which lead to common interpretation among partners to enable transferring knowledge. Shared language is "the acronyms, subtleties and underlying assumptions that are the staples of day-to-day interactions" (Lesser and Storck 2001, p. 836). Additionally, "the collective goals and aspirations of the members of an intercorporate network" is referred to as the shared goals sub-dimension (Inkpen and Tsang 2005, p. 157).

Nevertheless, concerning the cognitive dimension of social capital theory, it is still not clear how the absence/lack of cognitive aspects among partners in the KT-UIC context can be reduced (Villani et al.

2017). Besides, there is still a shortcoming in terms of the mechanisms that contribute to addressing these cognitive-related aspects among partners, considering the current inconsistency in the literature (Albats et al. 2022; de Wit-de Vries et al. 2019; Villani et al. 2017).

<b>Social Capital Dimensions</b>	Structural Dimension	Relational Dimension	Cognitive Dimension
<b>Sub-Dimensions</b>	Network ties Tie strength Network configurations Network stability	Trust Norms Obligations Identification	Common interpretation System of meanings Shared language/codes Shared goals/vision

*Table 2. Social Capital Dimensions and Sub-dimensions*

## 4 Methodology

Due to the emerging inter-organisational nature of this study, we chose a qualitative research method and social capital theory to explore and identify KT-UIC barriers. In particular, this paper focuses on the cognitive dimension of social capital, which is still less explored than the other dimensions in relation to the KT-UIC phenomenon (de Wit-de Vries et al. 2019; Schaeffer et al. 2020; Steinmo and Rasmussen 2018).

### 4.1 Research Context

In the Saudi context, KT/TT-UIC is one of the significant R&D ecosystem pillars in line with the national priorities for innovative research, which include the following: the health sector, environmental sustainability, energy and manufacturing, and emerging technologies (Ministry of Education 2020). Recently, a new model for an 'internal' intermediary organisation 'affiliated with' the university has emerged at a number of public universities, with a promising added value to bridge the gaps between university and industry by investing and commercialising university resources. By doing so, the intermediaries' long-term goal is to make a new revenue stream for universities and help deliver economic opportunities of national and global value in all sectors. The intermediary (in this Saudi context) is a semi-government organisation affiliated with the university, which includes members from the university (academics) and industry (practitioners) on its board of directors.

### 4.2 Data collection

A semi-structured interview was considered a suitable qualitative tool to obtain in-depth insights into the investigated phenomenon. Data collection was held between June 2021 and June 2022. It was conducted in Saudi Arabia across five public universities and their traditional (in-house) intermediary organisations, in addition to a number of public, private, and not-for-profit organisations selected from several industries, such as technology, education, health, and management consulting, etc. Participants who hold a managerial-level position and have experience in KT-UIC activities were interviewed. A total of 40 interviewees who were either academics or practitioners were selected as follows: 19 (university partners) and 8 (traditional (in-house) intermediary organisations partners) were recruited by a purposive sampling technique, and 13 (industry partners) were recruited by a snowballing sampling technique (Bernard 2017). The same protocol was followed in all interviews using open-ended questions relating to participants' background and experience, partners/projects selection criteria, challenges of UIC activities, motivations to involve in UIC activities, and recommendations. Additionally, secondary data collection was undertaken gradually from March 2021 to March 2022 to explore the nature of the KT-UIC activities in Saudi Arabia, including publicly available information on selected organisations' websites, news, and annual reports.

### 4.3 Data Analysis

Interviews data were then analysed based upon the thematic analysis approach proposed by Braun and Clarke (2006) and displayed using the data analysis method established by Gioia et al. (2013), as presented in Figure 1. This approach has been widely adopted to identify, analyse and then report emergent themes within the investigated data by following the six-phase guideline, namely "familiarising yourself with your data, generating initial codes, searching for themes, reviewing themes,

defining and naming themes, and producing the report" (Braun and Clarke 2006, p. 87), as shown in Table 3. MAXQDA software was used to manage, code, analyse and cluster the data.

<b>Phase</b>	<b>Description of the process</b>
1. Familiarising yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting data features in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Source: Braun and Clarke (2006, p. 87)

Table 3. Phases of Thematic Analysis

## 5 Findings

We found that practitioners' interpretation of barriers related to KT-UIC activities was predominantly linked to the three cognitive sub-dimensions: common interpretation, shared language, and shared goals (see Figure 1). In the following, we outline the enactment of these barriers and examine their influence on inter-organisational aspects.

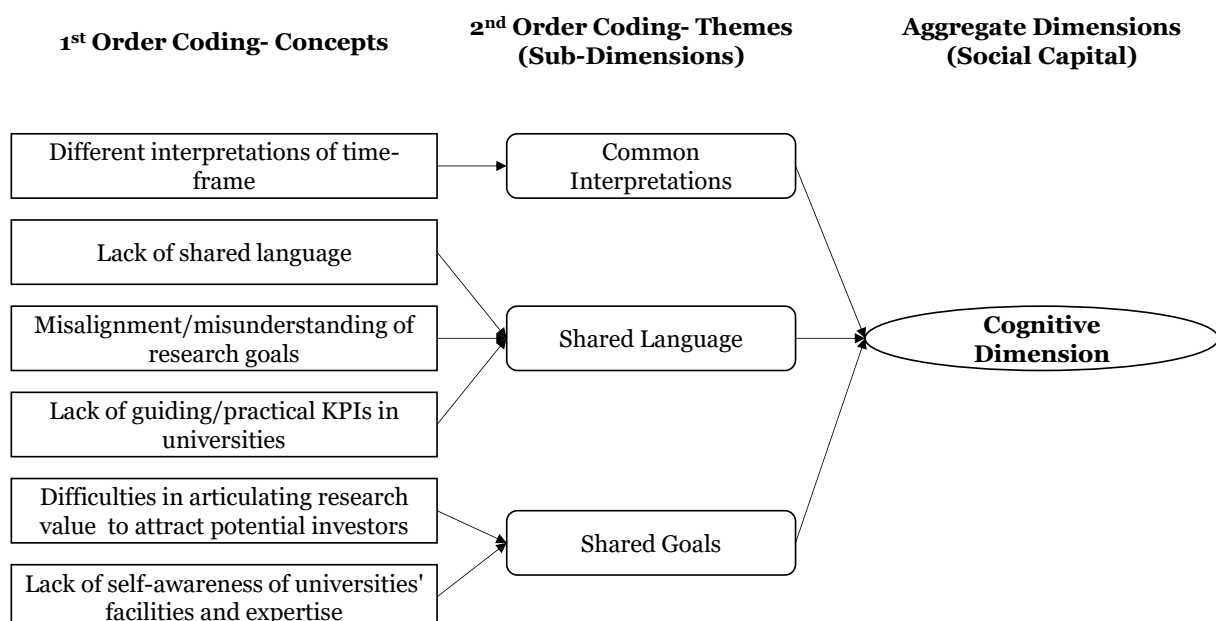


Figure 1. Cognitive Dimension of Social Capital-Related Barriers to KT-UIC

Regarding the first sub-dimension: the common interpretations, we found that the differences in interpretations among partners depend on the organisations' culture, which in turn is manifested in the importance of sharing goals to promote mutual understanding and transfer of knowledge. This study found that having different interpretations of time-frame was mainly attributed to the inability of the industry to recognise the nature of universities in terms of organisational structuring. Accordingly, one of the academics said:

*"Some challenges are caused by these differences. The private sector is very fast [...]; we are trying to keep pace with this speed in the private sector. But they do not realise it."*

As well, the challenge of differentiation in time-frame interpretations was also reported by one of the practitioners as:

*"[...] most of our universities are affiliated with the government, which is why our view of the time is different. In fact, we have different time-frame."*

Moreover, in the second sub-dimension: the shared language, it has appeared that the lack of a common language among partners can be a cognitive barrier to achieving collective goals for organisations. This study found that frequent and regular communication helps to develop a common language among partners. The lack of a shared language among partners often revolves around their different knowledge/educational backgrounds and experiences, which also reflects the nature of research (i.e. basic or/and applied research) in universities. As well, misunderstanding of academic research from the industry also was reported by academics in which they also have been accused of being theorists, which lessens the value of their research. As revealed by one of the academics:

*"I mean, some academics or many academics are accused that their works are theoretical, i.e. scientific theories and scientific foundations, where sometimes the reality [i.e. industry interests/mindset] is somewhat different from academic practice."*

Likewise, practitioners also stated the lack of shared language as:

*"Academics are not able to address their challenges and translate them to the language of business. No common language serves the business interest [...]; it is a matter of translation!"*

Other practitioners also reinforced the misalignment and lack of applicability of scientific research with some viewpoints that explained why there was an unwillingness from the industry to cooperate with universities. For example:

*"Most universities' specialised research usually takes years for its outputs to materialise and become applicable, and the private sector does not have the luxury of time to wait for research outputs."*

Furthermore, most universities lack clear key performance indicators (KPIs), which have been reported to be another common cognitive barrier by academics and practitioners. This is one of the main significant reasons why there are cultural barriers in terms of growing individualism within the system. A quote from a practitioner was stated as follows:

*"Unfortunately, universities do not have [clear] KPIs, neither at the level of individuals nor at the level of the whole system. [...] in order to be prepared, they must begin to feel pressure; KPIs equals the pressure."*

Additionally, on the subject of the third sub-dimension: the shared goals, the finding reflected the lack of shared goals on the partners' extent of understanding the projects' success criteria, as the opposite proves otherwise. This study found that the differentiation in the culture and mindset among organisations and their members contributed to creating this misalignment. This is exemplified by academics regarding their challenges in convincing their partners due to their incompatibility and the lack of self-awareness of universities' facilities and expertise:



*"One of the challenges in research-based projects is the lack of conviction of the potential partners/investors in the universities' products or academic capabilities."*

Practitioners, on the other hand, highlighted that the lack of shared goals intensifies the absence of a common language which eventually leads to miscommunication and poor collaboration.

## 6 Discussion

Intermediaries in literature have been proposed as an effective facilitation mechanism to mitigate barriers to KT-UIC activities. However, relatively little is known about the role of intermediation in mitigating cognitive differences among partners, i.e. the lack/absence of the cognitive sub-dimensions of social capital (Al-Tabbaa and Ankrah 2019; Albats et al. 2022; Alexander and Martin 2013; Alexander and Miller 2017; de Wit-de Vries et al. 2019; Howells 2006; Villani et al. 2017). To answer our research question: **'How could intermediaries contribute to addressing barriers related to the cognitive dimension of social capital, within KT-UIC activities?'**, we discuss how these barriers could be addressed by intermediaries; which can be drawn from related literature and the experience of our participants.

Shared cognitive aspects among partners have received little attention in the literature (de Wit-de Vries et al. 2019). Cognitive differences among partners can be mitigated by raising frequent communication to bring the viewpoints closer and by involving intermediaries that could benefit collaborative partners (Alexander and Miller 2017; Howells 2006; Takanashi and Lee 2019; Villani et al. 2017). Findings from this study also underlined the importance of an intermediary organisation as an enabler for a translation purpose aiming to reach a point of convergence and to understand partners' requirements/needs; as suggested by one of our practitioners, *"We do not share the same ambition, research/work [projects] interests, or anything else. Without a translator or knowledge broker, we will not understand each other."*

The misinterpretation of time-frame is related to how projects are managed and how goals are created (Steinmo and Rasmussen 2018), which is associated with the applicability and complexity of knowledge background (basic vs applied research) (de Wit-de Vries et al. 2019), causing the insufficiency in the shared cognitive aspects (Inkpen and Tsang 2005). To the extent that "what really matters to increase the probability of interaction is the applicability of research to the industry context, not its quality, judged by traditional academic standards" (Muscio and Pozzali 2013, p. 500).

As well, the lack of clearly guiding/practical KPIs in universities has an impact on fostering KT-UIC, as it causes a lot of confusion in dealing with other sectors (de Wit-de Vries et al. 2019; Inkpen and Tsang 2005). As Schaeffer et al. (2020, p. 51) stated that the evaluation of the contribution of university actors' research to society is usually based on the amount of patents, licensing, the number of start-ups for a period of time; however, "we should be very careful when evaluating mechanisms of knowledge transfer at a single point in time. It is obvious that these measures miss most informal universities transfer activity. But, above all, they miss the interactions between the different [KT-UIC activities]. Clearly, a systemic evaluation of [KT-UIC activities] is needed". For that reason, they also recommended that the role of intermediaries should be well developed "to contribute to fostering the development of interaction between stakeholders".

Intermediaries have been identified as an effective mechanism for overcoming cognitive-related barriers among partners, such as the lack of shared language (Alexander and Miller 2017; de Wit-de Vries et al. 2019; Villani et al. 2017). It was advised by Villani et al. (2017, p. 94) that "Cognitive distance is reduced thanks to the strong intermediation of people who are highly knowledgeable about the two worlds [university and industry partners]". It was also corroborated with the findings of Albats et al. (2022), who highlighted the role and forms of intermediaries that vary from traditional to digital-based ones. They concluded that traditional intermediaries, considering their geographic locations to their host institutions, "tend to offer the largest range of services, whilst controlling the transfer of knowledge with a range of contractual and IP related processes and conditions" (Albats et al. 2022, p. 13). However, virtual-community intermediaries provide only limited KT-UIC services, whereas digital intermediaries can offer some crowdsourcing and partners' matchmaking services. In the future study, the existing digital forms of intermediation (i.e. digital platform-based intermediaries) in the KT-UIC context need to be further explored/analysed in terms of their engagement and their roles/services as a facilitator of such a collaboration.

## 7 Conclusion and Implications

This paper presented barriers to KT-UIC through the lens of the cognitive dimension of the social capital theory. We found a number of cognitive-related barriers among partners, including different interpretations of time-frame, lack of shared language, misalignment of research goals, lack of guiding/practical KPIs in universities, and difficulties in articulating research value to attract potential investors. To answer our research question, intermediary organisations within the UIC ecosystem were also discussed as an effective mechanism to mitigate these barriers.

Besides, there are two main potential implications from our study. First, it emphasises and highlights the role of different forms of intermediaries in facilitating the KT-UIC process, especially in mitigating cognitive barriers to KT-UIC, which can assist academics, practitioners, and policymakers in mechanisms for facilitating KT-UIC. Second, this study adds an approach to putting social capital theory into practice, which can benefit other researchers to employ it in different contexts.

Future research could be undertaken to explore the structural and relational dimensions of social capital theory in order to study KT-UIC barriers (and enablers). For practitioners, our study provides 'cognitive' guidance to avoid pitfalls when engaging in KT-UIC activities. For IS solution/service providers, we provide insights for the development of 'digital platform-based intermediaries' that facilitate social capital in a KT-UIC context.

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