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[The evolution of university-industry linkages-A framework](#)

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The Evolution of University–Industry Linkages: A Framework

Plewa, C., Korff, N., Johnson, C., Macpherson, G., Baaken, T., and Rampersad, G.

Abstract

This qualitative study extends literature on research commercialization by examining the dynamic nature of university–industry linkages (UIL). Thirty in-depth interviews conducted in Australia and Germany/the Netherlands provide evidence of the different phases through which UILs evolve and respective measures of success. Communication, understanding, trust, and people are universal drivers, yet managers must consider the variations in the nature of these factors to ensure successful UILs. This study equips managers involved in technology transfer, innovation, and commercialization with critical insights into developing effective relationships. The proposed conceptual framework also uncovers notable theoretical and managerial implications and offers some key research directions.

Keywords: university industry linkages, relationship evolution, commercialization, trust, communication

1. Introduction

Changes in the global competitive landscape and rapid technological developments force organizations increasingly to seek partners in their quest for ideas, innovation, and competitive advantage (Thorgren et al., 2009). Of the various partnership opportunities (Xu et al., 2012), such as with customers, suppliers, competitors and other stakeholders, universities have established themselves as interesting partners for organizations seeking specialized research expertise (Autio et al., 1996). Whereas universities traditionally served the public interest through education and research, today they also are expected to exploit the value of their knowledge base by establishing

commercial channels of knowledge transfer, and achieving self-sufficiency (Baaken, 2003). The resulting rise in the number of university-industry linkages (UILs), further encouraged by government initiatives, has in turn prompted increased attention by academics (Barbolla and Corredera, 2009; Gulbrandsen et al., 2011, Perkmann et al., 2011), who advocate strategic collaborations rather than discrete, one-way transfers of knowledge or technology (Barnes et al., 2002, Mora-Valentín et al., 2004). The objective of such literature has been to distinguish the structures of UILs and elucidate motivations for developing them (Gulbrandsen et al., 2011; Easton, 2010), as well as identify success factors and barriers to UILs.

Despite the resulting foundational understanding of organizational, contextual, and relational success factors for university–industry interaction, theoretical gaps remain. For example, related disciplines, such as relationship marketing and network theories, advocate for considering the complex, dynamic nature of relationships, in which continued partnerships change over time. A thorough understanding of the phases of UIL evolution however remains to be developed. Hence, literature on university–industry relations can be combined with stages and states theories of relationship marketing and network research. In this research, to fill extant gaps, we adopt a temporal, dynamic perspective on UILs, in an effort to determine how UIL relational success factors might change over the relationship lifecycle. What are the different phases of UIL evolution? How is success measured in each phase? Which relational success factors are relevant for each phase? How do the success factors of each phase interact?

Accordingly, this article aims to provide a deeper understanding of the drivers of UIL success, including their relational characteristics, and assess how these factors change as the UIL evolves. Using the Actor-Resource-Activity (A-R-A) model (Håkansson and Johanson, 1992), which has received strong empirical support by researchers of the Industrial Marketing and Purchasing Group (IMP), we devote particular attention to the actor layer and thus to the “interpersonal links developed between individuals through interaction” (Waluszewski et al., 2008, p. 13). This study thereby adopts a factor-based perspective on relationship evolution by building on and extending

existing literature that has outlined the relevance of success factors such as trust, communication, understanding, and the people engaged in UILs (Plewa, 2009; Rampersad et al., 2010a). Yet extant literature largely has assumed that each success factor will decrease, increase, or remain static throughout the relationship—despite the inherent changes in the characteristics of the relationship and the partners as the relationship develops (Ford, 1982). We apply social exchange theory to explain the changes in the success factors (Lambe et al., 2001).

Beyond these contributions to theory, the findings related to the dynamics and evolution of UILs are important at a managerial level to university, government, and business stakeholders. First, the insights enable university technology transfer offices to initiate and manage relationships more effectively and successfully commercialize university research. Second, these benefits extend to commercialization offices and technology transfer agencies in government research institutes that hope to commercialize transformative innovations, and they can facilitate the effective technology transfer of the best international technologies. Third, this study is relevant to government agencies that foster links between universities and industries. Fourth, the study should be of interest to R&D, commercialization, and marketing managers who engage with external parties, such as universities, to meet their innovation objectives.

In the next section, we establish the foundations for this research with a review of relevant literature on UILs, relationship marketing, and network theories, focused particularly on the drivers and evolution of business-to-business partnerships. The outline of the qualitative research design, including sampling, data collection, and data analysis processes, precedes a discussion of the results and theoretical and managerial implications. In the conclusion, we address some study limitations and suggest further research directions.

2. Background

Ongoing pressure to innovate has driven the development of formal and informal relationships among research institutions, such as universities, and commercial organizations (Perkmann and Walsh, 2007). University researchers actively engage in research with

commercialization potential, which attracts greater funding. Industry, in turn, increasingly recognizes the value that university knowledge can add to commercial R&D.

2.1. University–Industry Linkages

The various UILs take many forms (Gulbrandsen et al., 2011; Steensma, 1996), such as licensing of university intellectual property for commercial purposes to joint R&D activities. Recent categorizations address the intensity of relational involvement. In comparison to research services, which require little or no relational engagement (Perkmann and Walsh, 2007), UILs create a networked organizational structure, because the two separate partners engage in designated research tasks, both with independent objectives yet a high level of reliance on the other party. This status implies the need for a relational approach to initiating and managing UILs (Perkmann and Walsh, 2007; Mora-Valentín et al., 2004).

For this study, we adopt the definition of UILs as bi-directional linkages between university and industry entities, “established to enable the diffusion of creativity, ideas, skills and people with the aim of creating mutual value over time” (Plewa and Quester, 2007, p. 371). Although UILs offer mutually beneficial arrangements (Davey et al., 2011; Frenken Hölzl, de Vor, 2005), managing such cross-sector collaborations can be complex, and most existing research focuses on technology transfer office activities (e.g., Ambos et al., 2008; Debackere and Veuglers, 2005; Siegel et al., 2004) or barriers to collaborative engagement (e.g., Siegel et al., 2003), such as the difficulty of aligning universities’ and industries’ interests in long-term partnerships (Verheugen and Potocnik, 2005). Other studies examine the determinants of UIL engagement, including firm size, R&D activity, status, innovative activity, and openness (e.g., Fontana et al., 2006). Finally, a substantial body of literature pertains to the success factors of UILs, such as organizational structure and culture (e.g., Bjerregaard, 2010; Santoro and Gopalakrishnan, 2000; Siegel et al., 2004).

For this study, a particular area of interest involves the relational factors that drive UIL success. Sometimes classified as organizational factors (e.g., Mora-Valentín et al., 2004), trust and communication actually characterize the interactions between partners and thus should be

considered on the relational level. Trust between partners is vital (Barnes et al., 2002; Thune, 2011), due to the inherent risks of joint research, lack of familiarity with the university/industry culture and environment, and the tendency for prohibitive legal contracts that limit flexibility (Blomquist et al., 2005). Frequent communication, and thus the development of common knowledge platforms and an understanding of each other's aims (Thune, 2011), creates the foundation for successful UILs (Mora-Valentín et al., 2004). In turn, these relational success factors depend strongly on the individual actors within UILs (Bush et al., 2001; Cunningham and Turnbull, 1982; Santoro and Chakrabarti, 2002), whose ongoing personal interactions can help overcome the complexities of the research and the implied need to explain results (Hoppe, 2001).

However, it is unclear whether the same factors drive success throughout the UIL's lifecycle. This is despite several indications in the literature that temporal dimensions influence relationship success, such that studying them can provide "additional insights related to cause and effect dynamics" (Santoro and Gopalakrishnan, 2000, pp. 314–15) and deepen our understanding of UIL relationships. Similarly, prior experience with cross-sector collaborations might influence the processes and outcomes of future UILs (Hoye and Pries, 2009). Finally, perceptions or measures of success may vary for different relationship phases, suggesting the need to examine the evolution of the UIL relationship. In particular, we study whether UILs follow a nonlinear relationship evolution path that varies in the intensity of its cooperation and involvement. In so doing, we develop a framework to understand the evolving nature of UILs and the dynamic factors that contribute to success at different stages of that relationship.

2.2. Relationship Evolution

Other areas of investigation provide a valuable foundation for studying this evolution. First, the network literature stemming from the Industrial Marketing and Purchasing (IMP) group emerged from interorganizational, social exchange, and new institutionalist theories, as well as earlier and emergent trends in marketing and purchasing (Araujo and Easton, 1996; Håkansson, 1982). Influenced by interorganizational literature, IMP assumes that organizations are dependent

on others for resources, so their characteristics must be investigated in terms of how they relate to each other and the links and interaction among them (Håkansson, 1982). Such theory incorporates the concept of connectedness from social exchange theory (Araujo and Easton, 1996), influenced by the new institutionalists, who recognize that transactions can take place internally within an organization or in a market (Williamson, 1975).

These trends further reflect the notion that both buyers and sellers are market participants who may develop a long-term relationship, with set roles that become institutionalized according to the partner's expectations (Håkansson, 1982). IMP work predominantly focuses on industrial networks, which include "actors involved in an economic process which convert resources to finished goods and services for consumption by end users" (Axelsson and Easton, 1992, p xiv) and also categorises new modes of value networks including science-based innovation networks (Moller and Rajala, 2007). Relationships are central to this literature (Håkansson, 1982), which studies relationship evolution (Ford, 1982; Ford and Johnsen, 2001; Kamp, 2004; Snellman, 2001; Young 2002) in an innovation context between universities and industries (Hoholm, 2009; Ingemansson, 2010). Awaleh (2008) investigates how strategies change to economize resources as a relationship unfolds; Hoholm (2009) explores how innovation processes evolve and technologies develop through interactions between actors; and Ingemansson (2010) provides further insights by noting the difficulty of commercializing new technology in relationships between science and business actors.

Common themes arising from this research stream are uncertainty and experience.

Uncertainty is high in the beginning, due to the great distance between the actors and their inability to gauge the future costs and benefits of developing a relationship, but it decreases with rising interaction experience (Ford, 1982). Yet uncertainty remains inherent to innovation processes (Hoholm, 2009). Furthermore, actors often engage with others with different, complementary experiences, skills, and resources when assessing potential innovation collaborators. Experience in dealing with the other actors may change the relationship over time, as reflected in the development of behaviors and norms (Ford, 1982). For example, the level of commitment to the relationship can

provide a good indicator of the stage the relationship has reached (Ford, 1982).

In addition to network literature, research from the relationship marketing domain notes the dynamic, evolutionary nature of relationships and offers several conceptual models to describe relationship evolution, especially in buyer–seller relationships. Research-oriented UILs fit this categorization, in that they unite a research provider and customer, who collaboratively work toward mutually beneficial outcomes. Many evolution models, commonly divided into stages and states theories (Rao and Perry, 2002), rely on social exchange theory (Blau, 1986; Thibaut and Kelly, 1959), which states that actors evaluate their contributions and the outcomes of an initial interaction to determine the extent of future interactions and whether they will develop relational norms, trust, and other relational success drivers (Lambe et al., 2001).

Stage models explain the change and evolution inherent in relationships, underpinned by the notion that customers or partners move through a series of stages (Egan, 2001), such as awareness, exploration, expansion, commitment, and dissolution (Dwyer et al., 1987) or prospects, customers, clients, supporters, and advocates (Christopher et al., 1991). Yet challengers to stages theory note that change is a nonlinear dynamic process (Tikkanen and Tuominen, 2000) and that relationships grow in qualitatively different speeds and patterns (Grayson and Ambler, 1999). Modified models thus highlight the constant chance of negative transitions and relationship dissolution and recognize the two-way character of relationships (Voss and Voss, 1997). In contrast to stages theory, states theory asserts different relationships can develop between any states or stay at one phase for an undetermined period of time (Rao and Perry, 2002), which reflects the complex and unpredictable nature of relationships and their development over time.

In turn, many authors emphasize the importance of the time dimension in both network and relationship research (e.g., Anderson and Weitz, 1989; Cannon and Homburg, 2001; Grayson and Ambler, 1999; Halinen et al., 2012). The length of a relationship may distinguish transactional from relationship marketing (Grönroos, 1991) and change the nature of the associations of relationship characteristics (Grayson and Ambler, 1999). Despite general consensus regarding the relevance of

relationship duration, however, different views exist on its impact on a relationship. Time might improve relationships, through the greater influence of interaction and involvement on service usage (Grayson and Ambler, 1999), greater interaction effectiveness through increased experience and familiarity, and higher degrees of fit (Anderson and Weitz, 1989). In contrast, time could increase the negative effect of conflict on channel relationship outcomes (Webb and Hogan, 2002) or lower the degrees of trust (Grayson and Ambler, 1999).

The question that remains is whether time or relationship length can explain variations in the existence and relevance of relational success factors. A recent meta-analysis of factors that influence relationship effectiveness could not confirm relationship length as a driver of strong relationships (Palmatier et al., 2006); it did not significantly influence trust, commitment, or satisfaction. Instead, the variation in the relevance of relational drivers may relate to the phase of relationship evolution, rather than its duration, which indicates the need to clarify relationship phases in analyses. The same success factors may be relevant in multiple stages, yet they likely take different forms or have varying levels of influence, depending on the evolution of the relationship. We thus investigate the evolution of collaborative linkages, in particular UILs, in an effort to identify relevant phases and measures and drivers of success.

3. Research Design

This intermediate theory research seeks to build on existing theory by integrating management and marketing literature (Edmondson and McManus, 2007). We used a qualitative research method, namely, interviews, to explore the evolution of UILs and develop an in-depth understanding of key concepts, situations, and behaviors (Flint et al., 2002). The complexity of UILs and limited understanding of the evolution of such linkages suggests in-depth interviews should be a particularly valuable approach; as the information is likely to vary considerably in each unique UIL (Ticehurst and Veal, 1999).

3.1. Sample

For this exploratory study, talking to experts provided an optimal means to gain insight into

the topic (Saunders et al. 2003). The interview participants included seven researchers and eight industry partners in Germany/the Netherlands and eight researchers and seven industry partners in Australia, totaling 15 researchers and 15 industry partners (see Table 1). Both Germany and Australia are developed countries that have successfully negotiated recent financial challenges and exhibit similar expenditures on their higher education research and development per capita (Auranen and Nieminen, 2010). However, their funding systems differ: Germany offers strong core funding for universities, coupled with relatively low external funding opportunities, whereas in Australia, a highly competitive performance-driven funding model dominates (Auranen and Nieminen, 2010). Thus, despite some likely similarities between Germany and Australia in terms of relational success factors, the inclusion of data from these two countries and their differing funding systems and foundations for UILs should help reduce systematic bias (Patton, 2002).

Participants were identified as experts on the basis of their involvement and decision-making roles in UILs. They represent various industry and research sectors, including engineering, pharmaceuticals, aged care, fast moving consumer goods, IT and management services, and government agencies, to capture potential differences and avoid industry-specific biases (Patton, 2002). The research backgrounds of the university representatives also were diverse, encompassing engineering, science, medicine, social sciences, agriculture, marketing, and information systems.

Table 1 here

The respondents indicated their self-rated level of experience with university–industry relationships; leading to equal numbers of people with moderate and high levels of experience in UILs. The perceived level of experience was confirmed throughout the discussion by considering the number and depth of UILs, as well as the length of time involved in such linkages. Such experience was necessary for the data collection, because it enabled us to gather information about multiple UILs from each respondent; many reported on and compared linkages with different relationship lengths and depths.

3.2. Data collection and analysis

Interviews were semi-structured, to ensure we covered the same issues in each interview but still allow for emergent topics to arise. Participants described their involvement and experience with UILs, with a particular focus on relationship evolution. To detect the dynamic nature of success factors, we asked the respondents to distinguish different phases of UILs, considering their current state of engagement and the process of development in current/previous relationships. Although such a retrospective study allows us to identify development periods and cycles (Halinen and Törnroos, 1995), it also might prompt the respondents to focus on their current relationship phase, if they find it challenging to differentiate occurrences between current and previous phases and therefore reinterpret occurrences similarly (Tikkanen and Tuominen, 2000). To overcome this challenge, we regularly clarified the phase being discussed from prior interview content.

The interviews were conducted face-to-face or by telephone, using the interview guide in the Appendix. They each lasted for approximately an hour and were digitally recorded. From the full transcriptions of the audio recordings, we analyzed the interviews thematically, aided by the digital coding software NVivo8 (QSR). By using an inductive approach, we could identify emerging topics. We began by developing initial codes to reflect the literature review and interview guidelines. In a second step, the transcribed interviews were coded and recoded, documenting every new insight gained about the different phases in UILs and success factors in each phase. The triangulation of the data, relevant quotations, and prior literature continued until no new aspects emerged (Carson et al. 2001). Finally, we summarized reoccurring issues, concepts, and themes in a final categorization and chose representative quotations for illustration purposes.

The data collection and analysis should enhance construct validity and limit potential bias. For example, our choice of respondents ensured they would provide diverse perspectives based on various disciplines, backgrounds, and organizations, in support of the triangulation of information sources (Choudhrie et al., 2003; Patton, 2002). Furthermore, two investigators analyzed and discussed the data (Denzin 1989), leading to a subsequent revision of results, which further reduced

any chance of researcher bias (Yin, 1994).

4. Findings

In line with our research questions, we first identify the phases of UIL evolution, leading to a discussion of relevant success factors and drivers of success. We identified the progression through the phases outlined in Figure 1, yet this progression is not necessarily accurate for each relationship, which may remain at any one stage for an indefinite time or move into a latent stage.

Figure 1 here

4.1. Development of University–Industry Linkages

The results of this study clearly confirm the dynamic evolution of UILs, according to the multiple relationship phases identified by the respondents. Table 2 summarizes the related evidence. The majority of respondents described distinct phases, yet their emergent, interwoven nature led to respondents describing the identification and characterization of phases as challenging, in that “we work on the relationship continuously” (Industry #A1¹) and “you’ve got all these stages going on at once” (University #A4). Because these data indicated no clear, singular path in relationship evolution, each UIL should be considered individually for its successful management. In support of theories of relational development, however, the data also revealed similarities in the respondents’ understanding and characterization of three linkage phases, preceded by a pre-linkage stage and followed by a latent phase.

Table 2 here

The pre-linkage phase entails the identification of individuals or teams as potential research partners: “I guess there’s this identification ... you identify that you want to work with each other. Then there’s ... the whole phase of determining how you work together and if you can work together” (University #A7). In line with recent research on researcher–manager relationships (Easton, 2010), our respondents noted a range of options for meeting potential partners: open

¹ A/G refers to the country of origin for each respondent (Australia and Germany respectively)

forums such as conferences, workshops, and symposiums; referrals from colleagues; and Internet searches. The persons involved, their reputation, and their existing networks determined any UIL initiation, considering the uncertainty experienced in this phase, lack of experience with the potential partner, and undefined costs and benefits that developing such a relationship would bring (Ford, 1982). This pre-linkage phase concludes with discussions relating to a concrete project.

Then in the establishment phase, respondents generally noted long, frequent discussions, usually face-to-face, that aimed to identify not only each party's strengths, needs, and interests but also their expectations and likely deliverables from the first project. Ford (1982) similarly describes the early stage of relationship development as the time when actors engage in negotiations, often prior to contract signing. Among the Australian respondents, this phase ended with the signing of an agreement; German respondents instead reported forming both contractually and non-contractually based linkages. Whereas an agreement between actors previously has been described as the conclusion of such an initiation phase (Aarikka-Stenroos, 2008), we find instead that there is a separation of initial awareness, screening, and meeting potential partners (pre-linkage phase) from the interactions that actually lead to an agreement (establishment phase).

The start of the actual working relationship marked the beginning of phase two: "There is getting to know you and trust building. Then there is working together" (University #A6). This phase, which we designate engagement, involves the development of processes and mechanisms that enable the establishment of a collaborative, trusting working environment. It encompasses actively working on a specific project. The completion of this phase depends on the scope and timeframe of the first UIL project between the partners, such as the conclusion of the first project or deliverable. The transition from phase two to three is well captured in the following quote:

I guess you start working together and initially it's very technical. After that, it becomes more, there's a professional relationship and the induction period is less. You can alter the project, your thoughts are aligned, you know, you're working for the same end in mind. And that only happens through, you know, developing the relationship. (Industry #A3)

Feeling part of a team and engaging in value creation beyond the contractually defined project thus emerged as the key characteristics of this advancement phase, described by one interviewee as “sustaining the relationship” (University #A1). These longer-term relationships often involve multiple formal projects and related deliverables, including the deliverables of the first project if it is a long-term undertaking; informal value-adds also contribute to the success of the relationship and its continued development:

You really feel like you can ... just either pick up the phone or drop [them] an email and just say, “Look, we’re having trouble with this,” bang, and it has nothing to do with the project that you’re on, “I’m just asking advice,” or something. You know, it, it goes beyond the project in the sense of saying you have an ongoing working relationship. I think ... the industry gets more value out of everything else than it does from the actual work that we do. (University #A7)

Although the respondents thus were able to characterize phases, we cannot assume a linear or predestined evolution of UILs. Instead, the results confirmed the dynamic, nonlinear, situation-dependent nature of relationship evolution outlined in previous research viewing evolution through the lens of states theory (Rao and Perry, 2002; Snellman, 2001). For example, even if an initial project was successfully completed and relational structures developed (phase 2), further engagement and development (phase 3) may not be suitable due to a lack of funding, lack of relevant continuing project, or simply an unwillingness to continue working together. In this case, UILs enter a latent phase, which may remain dormant in a formal working relationship but that nurtures the potential for future cooperation through a continued personal engagement. Depending on the circumstances, the latent phase may entail a lack of desire for continuous or future engagement, as discussed elsewhere (Sadowski and Duysters, 2008). A latent phase can also plausibly occur after phase 1 or phase 3, depending on the unique circumstances of each UIL.

4.2. Success of University–Industry Relationships

The definition of success differed, depending on the relationship phase, as substantiated in

Table 3. For example, a successful pre-linkage phase was one in which both parties agreed that they wanted to work together and “felt comfortable that we could actually communicate” (Industry #A1); success in the establishment phase was closely linked with the actual project, such as a clear definition of the project goals, plan, and deliverables, and then the speedy completion of an agreement so that the actual work could start.

Table 3 here

The engagement phase, characterized as the actual project phase, required project-specific deliverables for success: “Oh simple, just achieve the goals on time and on budget” (Industry #A3) or “For both sides to be doing their job” (Industry #A4). Hitting milestones and being able to address the questions that needed answering were often mentioned by our respondents when asked to define success at this stage. The advancement phase instead was measured in more attitudinal and behavioral intention terms, related to the further development of the relationship: “I think probably the greatest measure of success is that you’re confident enough to go back to people and actually say to them should we be involved” (Industry #A1) or “Success is being asked to do more work” (University #A8). Word of mouth emerged as another critical measure of success, as the following quote demonstrates: “That they do pass my name on to other people. It’s drawing these networks in. Expanding the networks and also to identify, pass their name on in relation to a particular topic. Recommending people, be a referee.” (Industry #A5). These outcome measures all went beyond descriptive, objective outcome measures, such as the number of publications or prototypes identified in a recent literature review as key outcomes used to measure teams operating in the innovation context (Henttonen, 2010).

Finally, opportunity emerged as the main term to describe a successful latent phase. A current contract or project did not characterize a UIL at this stage, so the focus instead was on opportunities for further collaborative work. Thus our results indicate that any analysis of relationships and relationship success requires the consideration of time and a clear elaboration of the phase in which the relationships under investigation are situated.

4.3. Drivers of University–Industry Relationship Success

Although the extensive discussion of UILs in academic literature and government reports has established several UIL success factors (Barbolla and Corredera, 2009; Thune, 2011), it remains unclear whether the drivers are the same or differ throughout the relationship. Therefore, we focus on relational characteristics that reflect the interpersonal linkages between actors, which represent the actor layer of the A-R-A model (Håkansson and Johanson, 1992). Of course, these features necessarily are interlinked with the integration of resources and activities in any relationship, but because previous research already provides an excellent outline of relationship complexity (Hohlm, 2009; Ingemansson 2010), we may perform a thorough analysis of only those interpersonal success factors that appear relevant to UILs and their change over time. We analyze these success factors for the establishment, engagement, and enhancement phases, which go beyond initial contacts and encompass the interparty interactions required for relationship evolution (Tikkanen and Tuominen, 2000).

The key relational characteristics emerged as central to relational development in this study, including trust and communication (Mohr and Nevin, 1990; Morgan and Hunt, 1994; Perkmann and Walsh, 2009). Understanding between the parties involved in the UIL also emerged as critical at every stage of the process. The following quote summarizes the relevant drivers, according to a respondent currently in the advancement phase of an UIL:

Well it's working with people who I know are on the same wavelength; that you have an open and trusting relationship where you can provide feedback; and that I'm involved in project meetings and you can get across your needs and understanding. So that's, the people I work with generally at the moment, this is great. We have very fruitful relationships. (Industry #A5).

Although these same interpersonal factors emerged as relevant across all phases, a closer examination revealed that they take different forms, depending on the phase. We present these relevant dimensions in Table 4, along with examples from the Australian and German data sets.

Table 4 here

4.3.1. Communication. Communication has been recognized in the IMP literature as a key factor for relational success through time (Mason and Leek, 2012; Lindberg-Repo and Grönroos, 2004). Our interviews consistently confirmed the critical influence of communication at any stage; only the form, formality, and topics of communication changed throughout the relationship. For example, the establishment phase demanded extensive face-to-face communication and thus a substantial investment of time by the persons involved (Ford, 1982) to ensure understanding between the parties early on in the engagement process. As one respondent stated:

I think we had that synergy; we talked and talked and talked and really the research question just came quite easily between both of us so I would say that that was the point where once we had the research question in place that was the point where we thought, well we're just going to start seeking some, a linkage grant or something to do the research. (Industry #A1)

Even if discussions were technical, the level of distance among actors (Cummings and Teng, 2003; Ford, 1982), the quality of information sharing, including the level of transparency, and listening skills, emerged as vital:

It's definitely being able to communicate, that's the key. Communicate what you do in an applied manner that people from diverse, you know, educational levels can understand.... And it's more than just spouting off your opinions or some high-tech research methodology, it's being adaptable, listening and being friendly, and putting, you know, getting on the same level, and really listening. (University #A8)

Meetings were common modes of communication across the UIIs, though during the engagement phase, email and telephone conversations appeared more frequently in the communication mix. According to task–media fit theory and research by Mason and Leek (2012), communication media must be suitable for the situation and aim, and information-rich media commonly provide satisfactory results, even if they do not seem required. The development of

regular, open, informal, two-way communication mechanisms helped ensure a way to deal with challenges as they arise. These mechanisms, such as integrating high-level personnel and frequent interactions, reflect significant human resource investments and accentuate the parties' commitment to the relationship (Cunningham and Turnbull, 1982; Ford, 1982).

Another reason for the importance of communication mechanisms in the engagement phase related to the satisfactory delivery of results. Only if the partner is allowed to participate (Hoholm, 2009) and engage throughout the research process can any deviations from the anticipated solution be identified and corrected, with related knowledge being transferred (Cummings and Teng, 2003). When research and innovation-oriented networks unite diverse actors in an uncertain context (Blomquist et al., 2005), ongoing communication allows for continuous positive evaluations of the project by the partner and increases the chances that all parties' goals will be achieved, leading to a successful project conclusion:

I call it drip feeding. I always say to the younger staff here, "do not just work on something and then present a report at the end." Involve and engage your client, make them see for a start that you're actually working on their project. (University #A1)

They might be just more interested in the theoretical basis on which their discipline's based, and not to see how it might be applied or other factors that need to be taken into account. So I find that quite frustrating, and I've been on committees where fairly large pieces of work have been commissioned and then the final report has been impenetrable. So dissemination of research is really crucial, and especially when you're dealing in non-academic organizations or domains. And this is where most researchers struggle. (Industry #A5)

These results align with the network theory perspective; Hoholm (2009) argues that communication delivered by group leaders must be clear, especially when the project participants originate from different professional fields and do not speak the same technical language. Project participants may be talking about the same things, but each partner might not really understand his or her counterpart. Hiding or only partially informing the partner about developments affecting the project work affects

not only the entire project work but also trust development. Regardless of their background or specified role, involved parties thus should be treated as participants in the process.

Such participatory approach strengthens and broadens during the advancement phase. Formal and informal communication related to ongoing projects remains relevant, yet to drive success in this phase, communication had to go beyond project-related topics, and extended value creation demanded discussions about any information that might be of interest to the partner.

4.3.2. Understanding. Communication facilitates the development of understanding, and understanding drives relationship evolution and success (Ingemansson 2010; Barnes et al., 2002), in all phases of the relationship. Understanding developed through prior interaction can reduce transaction costs and improve the ease of knowledge transfer (Kim, 2009); similarly, greater familiarity among partners leads to a reduction in the social distance between actors over time (Ford, 1982). At the start, because of the technical nature of communication, efforts in the establishment phase focused on establishing an understanding of the partner's needs, business, and goals:

You need to know what the company does. You need to find out what they want. You need to be able to suggest things that they may not have thought about. You also need to understand what their commercial drivers are, and why the project is important to them. And you've got to show them that you understand all these things. You have to tell them "Yes, we understand. That we're not doing this as a pure research thing, that we know it's important to you because of this, this and the other". (University #A2)

Many interviews noted the researchers' efforts to understand the industry environment and needs, yet the industry respondents also realized the importance of understanding each other (Industry #A5) and thus the relevance of understanding the needs of the researchers in any project (Industry #A1). Moreover, understanding the needs of partners is not limited to their stated needs. Rather, interaction during the engagement phase should lead to the identification of unspoken needs: "Often

we don't really know what it is we want and I think the conversations with universities can be really enlightening for us to actually really identify what it is we want" (Industry #A1).

During the engagement phase, understanding established prior to the initiation of the project increases due to the learning experience of engaging with the partner throughout the research process, and thus gaining experience with 'each other's norms and values' (Ford, 1982, p. 295). In addition to developing more understanding of the partner, the parties involved may learn more broadly about the partner's environment:

They've got to give us something along the way: Give us preliminary findings; give us something. Or have us involved so I can sit there and I can learn, and then I can, because part of my, the role is for me and others to learn about research: The process and all of that as well.... We don't want black holes. (Industry #A5)

Such understanding is critical for the relationship to move to the next phase:

And a good understanding of each other's organization, how it operates, capabilities on both sides, interests. You know, by then you'll get the phone call that says, "look I know you're interested in such and such" and it will have nothing to do with what you've been doing with them, but they just know you well enough to know that this would be something that you'd be interested in working on. (University #A1)

Finally, the level of understanding between the two parties in the advancement phase enables those parties to view themselves and act as part of the same team, working toward the same end goals. These findings confirm Hoholm's (2009) findings that a thorough understanding of what is expected from each project team is essential, not only for project success but also for the teamwork atmosphere. Members of project teams must understand their role and responsibilities so that they can act accordingly and avoid any misunderstanding. Truly understanding each other is of particular importance in the establishment phase, to recognize each partner's needs and expectations of the project. Furthermore, Ingemasson (2010) recommends explicitly considering the likely differences

between industry and academic representatives when engaging in a collaborative project. Even if their motivations overlap partially, they remain distinct (Easton, 2010) and cannot be neglected.

4.3.3. Trust. The critical nature of trust, or “a willingness to rely on an exchange partner in whom one has confidence” (Moorman et al., 1992, p. 315), for relationship success has been confirmed in many streams of literature, including UILs (Mora-Valentin et al., 2004; Plewa, 2009) and IMP (Rampersad et al. 2010a, 2010b), in line with commitment–trust theory (Morgan and Hunt, 1994). According to social exchange theory, trust “allows firms to move from discrete transactions to relational exchange” (Lambe et al., 2001, p. 21). Some authors argue that trust develops at a slow pace through investment, experience, and repeated interactions (Collins and Hitt, 2006; Dahl and Pedersen, 2005); others note that trust can be built and evaluated quickly and intensely through negotiation, shared vision, and fast appreciation of the value contributed by the partner (Blomqvist et al., 2008). Trust as a relational characteristic also has varying levels of relevance in various phases (Grayson and Ambler, 1999).

The establishment phase is characterized by a lack of familiarity with the other party, which implies that both partners rely on the reputation and perceived integrity of the counterpart as a starting point for the development of trust. As the phase unfolds, observations of the other party’s behavior can strengthen the initial development of trust: “But I guess after some information sharing and building of trust on various aspects and it’s you know, it might be as small as replying to their email or calls and information, trust was built I guess over time” (Industry #A6).

The importance of developing trust appeared most prominently in respondents’ descriptions of the characteristics driving success in the engagement phase, when it sets the foundation for the successful completion of the project. However, in some situations the industry partner might be keen to “rush” a project (University #A6), which did not allow for the learning or trust required to establish a positive relationship and project evolution. This finding is in line with prior literature, which acknowledges that exchanges between parties over time decrease their social distance and thus allow trust to develop (Ford, 1982; Thune, 2011). Trust in the engagement phase emerged as

closely linked to the individual partner with whom a respondent engaged during the relationship:

I actually think that getting relationships between key people where you actually make a connection and you build up some sort of relationship where you actually start trusting and respecting each other is actually the first most important component. And I think why a lot of the relationships and partnerships fail is because they go into partnerships with people for convenience and then set up a lot of I think written documentation such as agreements and letters of agreement and MOU's without actually establishing that preexisting trust to go out and do the actual projects. (Industry #A1)

This personal trust then led to more encompassing trust in the relationship during the advancement phase, or "trust in good, solid working relationship" (University #A1):

We've got good enough relationships now with quite a number of clients that we've had for many years that rather than actually simply tendering for a project and winging it, they'll actually call us and they'll talk about what they're planning and they get our input as to what a particular initiative should look like, because they trust us. (University#A1)

4.3.4. People. The critical nature of people for facilitating relationship success is undisputed (Cambra-Fierro et al., 2011; Santoro and Chakrabarti, 2002), yet a closer evaluation of the different phases of relationship evolution provides a more fine-grained view. Synergy, or an instant rapport with the potential partner, was noted by all the respondents as an important characteristic of the establishment phase, and it was particularly relevant for the industry partner, because of its investment in the relationship:

I think that we felt comfortable that we could actually communicate with them ... because we had to actually, we had to invest industry dollars and resources into it we wanted to make sure that we felt that the person was going to use those things appropriately and also that we would get results at the end (Industry #A1)

Synergy also relates to similarity in working customs, such as the speed with which people respond

to emails or calls (Industry #A7). The notion of enjoying working with some people more than others continued into the discussion related to the establishment phase; one respondent stated, “a person has to know what they want. They have to be skilled and they’ve got to be pleasant” (University #A6). Much of the discussion in the engagement phase pertained to the development of a personal relationship, which seemed particularly critical for long-term relationship maintenance. The social aspect can provide a personal benefit (Easton, 2010), except when the relationships with individuals seemed transitory (University#A6), particularly in high employee turnover industries.

In line with previous literature, in which champions are associated with greater relationship intensity (Santoro and Chakrabarti, 2002) and relationship commitment (Plewa and Quester, 2008), personal relationships helped advance the relationship beyond the initial project and engagement phase. A professional link could progress into a friendship: “I don’t, I didn’t put an importance on maintaining professional relationship. I didn’t put that focus because we sort of developed an almost, you know, friendship, professional relationship was almost implied” (Industry #A3). An interpersonal connection also enables a deeper exchange among parties, beyond the context of the defined project, and informal adaptations that would not otherwise be possible (Ford, 1982). However, these personal links are valuable for continuing professional engagement only if the relevant skills and interests are in place:

I don’t always stick with people I know, but if the people I know have the skill sets I require, then there’s just less induction period trying to build a relationship, get things going, you know, you can start with a handshake and a conversation and you’re more or less into the project. (Industry #A3)

Figure 2 depicts the overall framework of the evolution of UILs, summarizing the changes of UIL measures of success and success drivers across the establishment, engagement, and advancement phases.

Figure 2 here

As is evident in Figure 2, these three phases denote clear and distinct definitions of success and four

specific drivers of success (communication, understanding, trust, and individuals). Success in the establishment phase offers a clear definition of project goals, plans, and deliverables, as well as an agreement to work together. In phase 2, the engagement phase, the delivery and completion of predetermined project-specific goals determine success, and then in phase 3, advancement is successful if both partners engage in an ongoing relationship and continue to work collaboratively on any suitable project that arises. After completing the project, the distribution of positive word of mouth is an important component that contributes to the perceived success of phase 3.

To achieve the success—whether deciding on project goals, deliverables, or time frames—communication quality is crucial. Any lack of communication or possible miscommunication in the initiation stage can significantly impede project establishment and progress. After the project has commenced, success in phase 2 requires open, bi-directional communication. In phase 3, communication should go beyond project-specific content to ensure the greatest possible value is created for each partner.

The understanding component of the framework is initially related to becoming acquainted with partners' needs for the project and possible problem-solving approaches. In phase 2, both partners gain a better understanding of how their counterpart works and how the related institution functions. The partners learn about and understand each other's environments. Finally, understanding in the last phase focuses mainly on a feeling of having achieved something through team effort. Furthermore, success is manifested by both partners acting in an integrated manner.

As identified in previous studies (e.g., Collins and Hitt, 2006), trust must be developed over time. Therefore, in phase 1, the trust aspect depends on what the partners know of each other's reputation and credibility. After the partners initiate actual project work (phase 2), trust refers to believing in the counterpart to deliver and perform the assigned responsibilities. When the project is terminated (phase 3), trust extends from the individual to the entire relationship, so partners trust that the relationship is long-lasting and continues to be beneficial.

The relationships among people involved in the relationship also undergo progressions. In the

establishment phase, people decide to work together based on the potential synergies of their collaborative work and similar interests. As they work closely together during the project, they start to develop a personal relationship. When work on the initial project is extended or broadened, the intensive collaborative work leads to a personal relationship that goes beyond professional work and often progresses to friendship. Although these drivers vary in their form and characteristics across phases, they cannot be regarded separately; they are inherently interconnected.

5. Conclusion and implications

This study aimed to (1) identify phases of UIL evolution, (2) determine the measurement of success in each phase, and (3) establish the success factors and their forms throughout the relationship. To meet these objectives, we conducted a series of in-depth interviews with university and industry partners in Australia and Germany/the Netherlands. By confirming the different phases through which relationships evolve and the respective outcome measures that indicate success in each phase, we also identified several impacts on the success of these outcome measures: communication, understanding, trust, and individual champions. Similar factors influenced success in each phase, yet variations in the nature of the success factors arose, indicating the need to differentiate among phases when studying or managing UILs. Consider trust for example. Initial confidence in another person's credibility may transform into trust in the person and the relationship. Our comprehensive framework outlines the identified phases, the measures of success, and the factors that drive success in each phase of UIL evolution.

We also enrich existing theory by drawing attention to the specific success factors and their changes throughout UIL development. Previous research has drawn on network theory formed by the IMP to illustrate the complexity of the relationships among actors, resources, and activities over time (Hoholm, 2009; Ingemansson 2010). To extend this broad line of enquiry, we focused on interpersonal success factors and provided an in-depth, detailed investigation of changes to the relevant success factors during the evolution of UILs. In addition, this study extends prior work on trust and communication by examining the specific context of university–industry relationships and

the key communication practices during relevant phases: establishment, engagement, and advancement.

Unlike extant literature that ignores the presence of relational success factors at different points of relationship evolution; we contribute to the literature by going beyond a generic definition of relational success factors and identifying specific forms that are most relevant at different relationship phases. Extending current theory, our results also reveal different forms of trust, communication, understanding, and individuals across the three phases of relationship evolution, highlighting the need for researchers to reveal which relationship phase they investigate while also adopting an appropriate, phase-specific definition, measurement, and management of relevant success factors. We do so in the context of UILs, which provides a solid foundation for researchers seeking to engage in future empirical testing of UIL development. In addition to these theoretical implications, the results provide insights for third parties, such as government, that often fund university–industry engagement.

For persons engaged in UILs (researchers and industry partners) or who serve them (e.g., technology transfer office managers, industry innovation managers), these findings show that aligning strategies and support structures with the changing form of success factors across different phases of relationship evolution can increase the success and long-term continuation of UILs. Furthermore, the insights into the success factors that function across different phases of the relationship inform technology transfer staff about which areas of engagement they should facilitate or develop through training programs. Specific managerial implications related to each evolutionary phase provide guidelines for using these results to foster UILs and their success over time.

First, during the establishment phase, managers should foster early-stage UILs by establishing opportunities for open, face-to-face communication and using these meetings to learn about the partners, their needs, and their goals, as well as identify people with similar working styles. Staff at the technology transfer office should learn to focus on facilitating communication, to advance the contract negotiations. Furthermore, technology transfer, human resource management, and

marketing professions play a critical role in hiring, training, and promoting people to develop the UILs. Because initial trust depends on a person's expertise and reputation, academic accomplishment often precedes successful engagement in UILs (Larsen, 2011), so such accomplishments should be communicated externally. However, academic accomplishment by itself cannot ensure the successful initiation and management of cross-sectoral engagement. Recruiters therefore should consider academics' experience with industry engagement; staff with limited or no such experience should receive specific training and mentoring programs, to grant them the perceived behavioral control that leads to intentions and behavior (Ajzen, 1987, 1991).

Second, during the engagement phase, ongoing communication mechanisms are necessary for effective technology transfers to occur. A feedback loop that supports early, frequent discussions of preliminary and ongoing results helps the parties deliver on project goals. Sharing intermediate steps often is not naturally part of researchers' work, so universities should establish training schedules and support mechanisms, facilitated by the technology transfer office. Well-established communication mechanisms also encourage further development of understanding between the partners; it should include an ongoing reevaluation of expectations and project deliverables. As previously discussed (Plewa, 2009; Thune, 2011), it is critical to allow time for personal connections and trust to develop. Therefore, managers should plan the project with as generous a timeline as practical for all parties involved. The development of trust also can be fostered by ensuring an internally consistent approach and communication, sharing benefits, and keeping promises (Bitner, 1995). Managers should think strategically about identifying opportunities by continuously assessing congruent interests, skills, and objectives that prevail throughout the engagement phase, which can facilitate a smooth transition into a fruitful advancement phase and thus foster the long-term development of an UIL.

Third, much of the success of the advancement phase results from knowledge exchanges and mutual support, beyond actual projects, crossing into various aspects of the partners' broader operations and interests. Managers should balance the need for people to feel free to engage with

their counterpart outside of the contractual scope with a good understanding of when legal documentation is required. The opportunity to interact freely appeared particularly important for developing deep understanding and trust in the overall relationship. The evolutionary nature of UILs provides technology transfer office managers, researchers, and partners with opportunities to manage relationships strategically, so that the effort put into the early phases can be exploited in the advancement and latent phases to produce collaborations that offer value to both partners.

As with all research, this study suffers several limitations that must be taken into account when considering its results and implications. In particular, the discussion provided here cannot describe the full range of complexities that mark business relationships and their evolution over time. Instead, we undertake a thorough analysis of interpersonal success factors previously indicated as relevant to UILs and their changes over time. That is, we aimed to provide a succinct account of the findings rather than an all-encompassing account of all possible exchanges and outcomes over time.

Furthermore, the in-depth interviews we conducted have some methodological limitations. Specifically, such interviews allow researchers to draw on the thinking and detailed understanding provided by interviewees, but they cannot provide an account of actions taken. The interviews conducted in Germany/the Netherlands, and Australia showed similarities among these regions: They are developed and have a recent strong history in UILs. Therefore, additional research should provide further comparisons with less developed regions. All the interviewees were categorized according to their level of experience with university–industry relationships, yet this rating is subjective and relative. Some interviewees may rate themselves as highly experienced while others, with a greater scope of experience, may consider themselves moderately experienced. Although we confirmed the levels of experience according to the number, depth, and length of UILs the respondent has previously engaged in, we cannot ensure the generalizability of the findings.

To date, few authors have applied IMP and relationship marketing theories to UILs. We provide one step in this direction and hope further research continues along this path. For example, researchers should duplicate and extend this study in other countries in which linkages between

research universities and industry are well developed. Our findings also should be empirically quantified through survey research. A quantitative survey could more clearly differentiate universities and other research institutions, as well as different disciplines, industry sectors, and areas. Academics and practitioners would benefit from a more thorough examination of the success factors at various phases of the relationship and descriptions of how research institutions can adopt these factors in their UIL and research commercialization efforts.

Innovation often is heralded as the key to competitiveness in turbulent global economies. Modern economic uncertainty amplifies the demand for innovation-oriented collaboration, which can “play a major role in lifting economies out of the downturn and finding new and sustainable sources of growth and competitiveness” (OECD, 2011, p. 1). In response, and considering the rapid technological change characterizing many industries, collective efforts have evolved among private sector organizations, governments, and universities (Gulbrandsen et al., 2011; Perkmann et al., 2011). This article contributes to the ongoing investigation of UILs and their success by developing a framework that integrates the phases of UIL evolution, the measurement of success in each phase, and the success factors and their changing nature throughout the relationship. We thus provide a detailed foundation for further research in this important area.

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Table 1: Sample Profile

Australian Interviewees	German/Dutch Interviewees
8 academic researchers 3 medium experience with UIL 5 high experience with UIL <i>engineering, science/medicine, social sciences, agriculture.</i>	7 academic researchers 4 medium experience with UIL 3 high experience with UIL <i>engineering, marketing, information systems.</i>
6 industry partners 4 medium experience with UIL 2 high experience with UIL <i>engineering, science/pharmaceuticals, government agency, aged-care provider.</i>	8 industry partners 3 medium experience with UIL 5 high experience with UIL <i>fast-moving consumer goods, IT, management services.</i>

Figure 1: Evolution of UIL phases

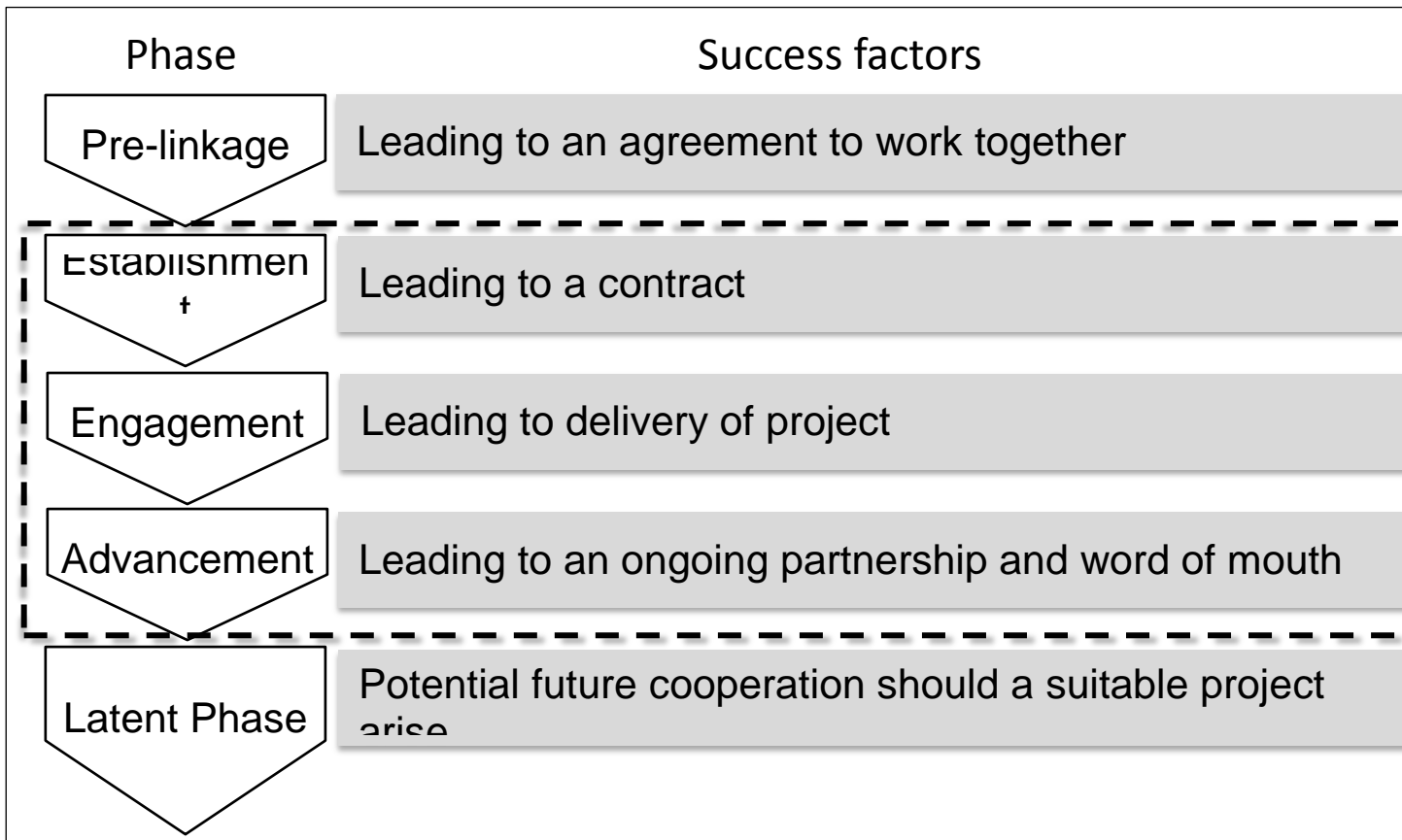


Table 2: UIL Evolution and Phases

Description	Evidence Strength	Example
UILs evolve dynamically through relationship phases	Strong	<p><i>University #A2:</i> I mean there's stages to everything, right? The first one is obviously a get to know you stage, and then the second one is where you start delivering. And that's what I might call an evaluation stage. And then you have a more established stage where they're happy with what you're doing and you either finish the project and examine other projects, or you might end it, I mean it's different with different projects.</p> <p><i>Industry #G7:</i> Yes, in the beginning you somehow have a first idea, which is developed through a random meeting or which was generated by a customer. Here you sit together with a partner and build 'air castles' – we are going to conquer the world – euphoria phase. Then there is a phase of anticlimax and then either a discontinuation or you believe in the collective potential and everything achieves the respective substance.... It may also be that a project results directly from the euphoria ...</p>
Pre-linkage phase: identification of potential research partners	Strong	<p><i>Industry #A4:</i> So the first stage is making contact with the person, somehow. So somehow you identify an academic that you want to work with and that's usually very amicable. And you make contact with them and they're usually, you know, happy to talk about ... because you're, obviously, addressing the area that they work in, so that's all good.</p> <p><i>University #G5:</i> Industry partners contacted us in the first place, because they understood what kind of expertise we have. We were surprised by all the word-to-mouth propaganda and what kind of opportunities we have to offer.</p>
Establishment phase: discussion of what will form part of the collaborative work, leading to a mutual agreement	Strong	<p><i>University #A1:</i> If it's brand new relationship, it's what I call the establishment phase, where you are very clear about mutual expectations and who can deliver what, how, within what time, negotiating milestones, deliverables, timeframes, all of that. Getting to understand their needs as an organization and then around a particular issue, service, program, whatever it is that you're going to be working on.</p> <p><i>University #G2:</i> In the beginning there is the "get to know" phase, which can also be a number of years ago. It may be that this phase is shortened because someone recommended you to another partner. In most cases the partner has vague ideas of what is to be done and what results are to be generated. We on the other hand, put a lot of work into generating those results – so we plan and specify our processes in order to achieve everything. All that is then written down in the contract agreement.</p>
Engagement phase: partners actually working together	Strong	<p><i>University #A2:</i> ... then the second one is where you start delivering. And that's what I might call an evaluation stage.</p> <p><i>University #G4:</i> Then follows a kind of a 'performance phase'. After that a critical phase where you need to decide to either pursue the common goals or to change something.</p>
Advancement phase: value creation beyond the initially defined project	Strong	<p><i>University #A1:</i> The next stage is really what I'd call sustaining the relationship. And that's when they come back to you for more work, you've established what you need, you've built the trust, you've established how they like you to communicate, how they like the work presented, and it just gets better. You know, it reinforces, you get closer</p>

to them, you get to know them better. So three stages, yeah.
Establishment, building a foundation, and sustaining it.

Industry #G7: ... those who think longer-term and are willing to make investments are also in partnerships; with them you can enter into a strategic cooperation.

Latent phase: no formal working relationship exists

Strong

Industry #A4: we don't really have any relationship with them, at the moment. We don't have a contract. We're not doing any work together. But it doesn't mean that ... they're definitely in the back of my mind as a resource I would recommend to anybody.

University #G4: Well, I think the majority of projects are concluded by the industry side.... At some stage every Problem is beaten. You can't expect to work on all problems your whole life.

Table 3: Definition of UIL Success across Relationship Phases

Dimension	Description	Evidence Strength	Example
Success pre-linkage phase	Agreement that want to work together	Moderate	<p><i>Industry #A4:</i> I guess if you go ahead with the paperwork; that makes it a success ... if it can occur fairly quickly</p> <p><i>Industry #G7:</i> You need to have realistic experiences as well as patience. And develop a feeling for doing a good screening of the partner – is there a good fit.</p>
Success establishment phase	Definition of project goals, plans and deliverables	Strong	<p><i>Interview #A1:</i> I think that it's that you can actually come to a final research question or a series of research questions and even a project plan that looks really good for everybody.</p> <p><i>Industry #G4:</i> Initiation phase can be difficult – success here comes from consistency, reliable delivery, initiation to project sometimes does not happen, trust builds as you deliver success to them.</p>
Success engagement phase	Completion of project-specific deliverables	Strong	<p><i>University #A6:</i> Well, the project being executed, as per protocol, is successful. Of course, everyone gets a rosier glow if the drug works but that only happens one in 10. That's okay [if they don't work]. But people want a good, clear answer. They don't mind if it's negative, provided it's clear. U#6</p> <p><i>Industry #G2:</i> If as a bottom line I get exactly what I needed. The objective target was accurately formulated and also achieved. That for me is a perfect project.</p>
Success advancement phase	Continuing engagement and WOM	Strong	<p><i>University #A8:</i> Success is being asked to do more work. Like, success is being asked to come back, and being asked to present the research you did at meetings, or whether it would be meetings with the industry, be it meetings with policy makers; that to me is success, having them appreciate what you've done and want more.</p> <p><i>University #G5:</i> [The company] knew here exists a certain expertise and got aware of us; and then were astonished, based on word of mouth, what opportunities existed here.</p>
Success latent phase	Opportunities for future work	Moderate	<p><i>Industry #A3:</i> Because I think if you've developed a good relationship it's time enduring. So just because you don't, you're not in contact over a period of time because there's no professional reason, doesn't mean you can't pick up where you left if an opportunity arose.</p> <p><i>University #G7:</i> You can measure success in continuation, or on a contract. You have a successful cooperation if you continue over time.</p>

Table 4: Dimensions of Success Drivers

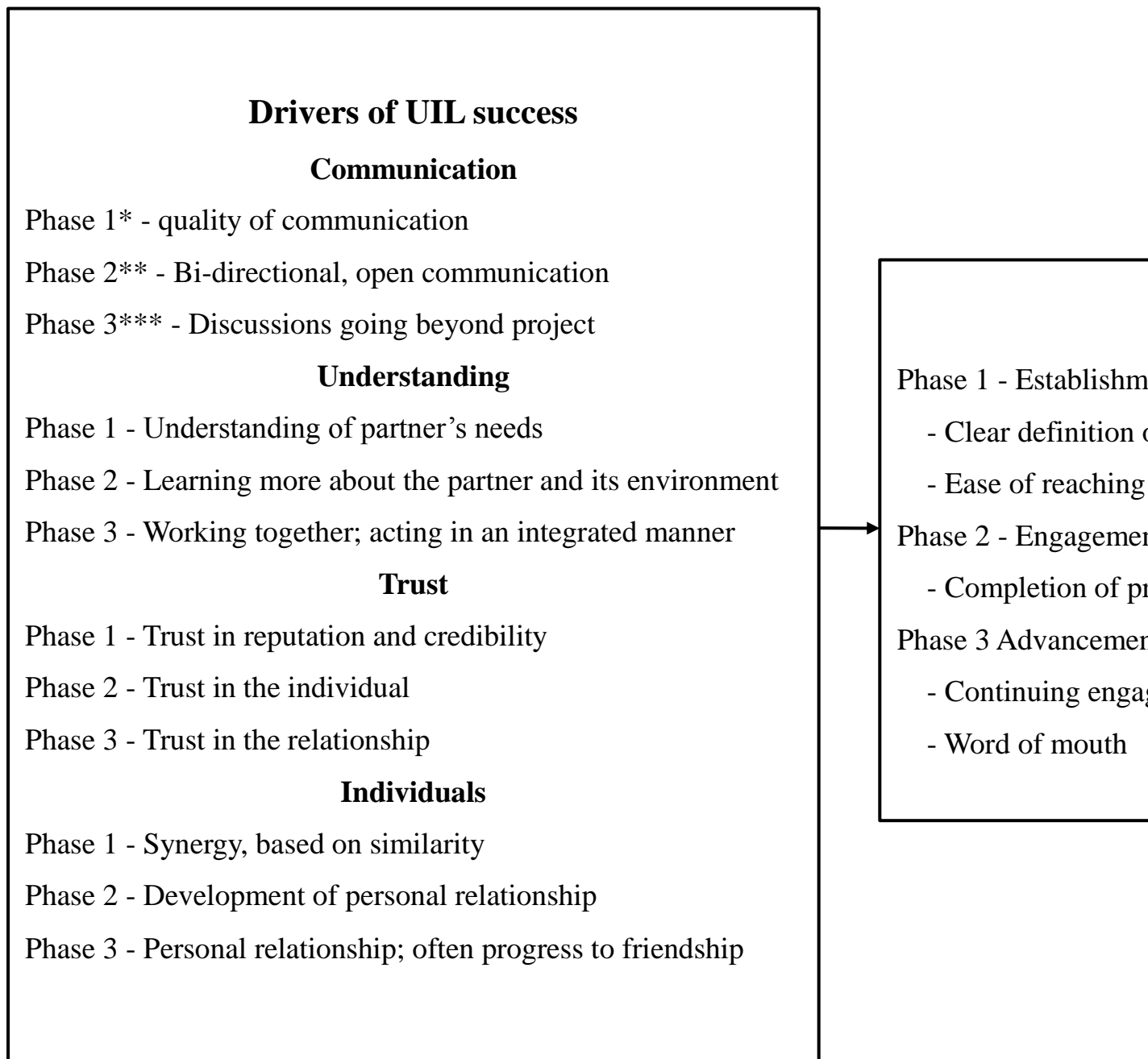
Dimension	Description	Evidence Strength	Example
Communication			
Establishment phase	Quality of communication	Strong	<p><i>Industry #A1:</i> We spend a lot of time talking to people so we'll have an idea or the University has an idea and they'll come to us or we'll go to them and start talking about it and I think that refinement together is really important.</p> <p><i>Industry #G7:</i> In most cases the aims of the project are unofficial. But it is always good to write them down as well so you have a certain certainty. That does not happen very often. It is rather a letter of intent, so a functional description giving orientation.</p>
Engagement phase	Bi-directional, open communication	Strong	<p><i>University #A2:</i> I mean you need to establish good relationships, good communication, so if things go pear shaped, you can ring up and tell them they're going pear shaped, while they're going pear shaped. Or if things are going well you can ring up and, so I think the other thing is maintaining a regular communication. Irrespective of how things are going. So that there are no surprises. Because I mean a lot of, I mean this is research so things don't always work as planned.</p> <p><i>University #G2:</i> For the most important thing is that you maintain a close communication link with the client. So that he knows what works, where problems lie, where you stand etc.</p>
Advancement phase	Regular discussions; going beyond project	Moderate	<p><i>University #A1:</i> It's not like waiting for them to think up a project, but...I mean some of our work is projects they haven't even thought of and we'll have coffee with them, so they'll talk about a problem they're having and we'll say "have you thought about doing this?" They create a project around it, they come back to us to do it.</p> <p><i>University #G2:</i> What I noticed during projects is that you focus the research on one specific area or on one specific customer segment... and when you find something not directly related but think it may be interesting for the customer, you still send it to the partner saying "have a look at this – this might be of interest to you.</p>
Understanding			
Establishment phase	Understanding of partner's needs	Strong	<p><i>University #A4:</i> And so it's important to have a mutual understanding of what your different needs and objectives are and to find ways to, to satisfy them both and keep communicating where there's problems, which inevitably will</p>

			<p>arise and to keep the focus on the big picture and on the benefits that can be obtained from partnership rather than getting bogged down in the challenges which are inevitably there.</p> <p><i>Industry #G2:</i> It is always a matter of settling of projects. To be clear, the starting point – the problem needs to be clear. To have a clear focus of a project, what exactly is the task and in which time schedule and quality do we need to perform. This is the prerequisite.</p>
Engagement phase	Understanding of partner and its environment	Strong	<p><i>University #A1:</i> And a good understanding of each other’s organization, how it operates, capabilities on both sides. Interests. You know, by then you’ll get the phone call that says, “look I know you’re interested in such and such” and it will have nothing to do with what you’ve been doing with them, but they just know you well enough to know that this would be something that you’d be interested in working on.</p> <p><i>Industry #G5:</i> To understand both interests; and university should understand our interest, and we should understand the interest of the university.</p>
Advancement phase	Acting in an integrated manner	Moderate	<p><i>University #A6:</i> So you’re acting as part of the team. It’s not, you, me, where ... you know, you’re the payer and I’m the client but, actually, we’re sharing these common goals.</p> <p><i>Industry #G1:</i> So when we work together, we are stronger and can offer a problem-solving solution – not just the product but a whole solution by working together [...] it is of importance to create something together which is unique.</p>
Trust			
Establishment phase	Trust in reputation and credibility	Strong	<p><i>Industry #A3:</i> I don’t actually pick an institution. I look for the person that I have a professional rapport with, who I trust and it, it doesn’t matter whether they’re at a university, private lab, CSIRO, I actually chase the person that I want to work with wherever they are. So it’s not necessarily the institution, it’s the skill set and the relationship that I have with that person that counts the most.</p> <p><i>Industry #G6:</i> The trust starts rather late indeed. Firstly, there is the phase of confidence. This confidence develops to trust. This behavior has to go through very strictly. If I lack confidence in someone there is no way to develop trust to the end</p>
Engagement phase	Trust in the individual	Strong	<p><i>Industry #A1:</i> I actually think that getting relationships between key people where you actually make a connection and you build up some sort of relationship where you actually start trusting and respecting each other is</p>

Advancement phase	Trust in the relationship	Moderate	<p>actually the first most important component and I think why a lot of the relationships and partnerships fail is because they go into partnerships with people for convenience and then set up a lot of I think written documentation such as agreements and letters of agreement and MOU's without actually establishing that pre-existing trust to go out and do the actual projects.</p> <p><i>University #G6:</i> There is a lot more trust. This is actually the core, the keyword. You could establish that in the first project. May it be in relation to the way of working, as well as to the accessibility, as well as to the project results.</p> <p><i>Industry #A6:</i> It comes down to honesty and trust, the fact that you know, no bullshit involved, it's we're open and honest and we trust each other.</p> <p><i>Industry #G7:</i> Theoretically, the more trust you have in each other the more critical or bigger projects you can do together. That means when you can trust someone extensively, then I can of course rather approach a long-term, big, critical project than if I do it with someone that I don't know. It is that way, yes.</p>
Individuals			
Establishment phase	Synergy, based on similarity	Strong	<p><i>Industry #A1:</i> I've sat down with people and we've started having it and you realize fairly quickly that your thoughts aren't congruent but you can feel that synergy and that might be the first part of the relationship you can feel that synergy pretty quickly and people start saying this, I think we should pull these people in or we should do this so I think that establishing that synergy and that happened fairly quickly.</p> <p><i>University #G4:</i> You don't have to imagine it to be like someone contacts you and ask to cooperate. This was a long-term process which was mainly due to my website. You have to do some advertisement for yourself. This way people take notice of you. When I first started, it was all based on personal contacts.</p>
Engagement phase	Development of personal relationship	Strong	<p><i>University #A7:</i> For me it's normally getting a personal relationship with the person. So more times than not I'd ask them about their family; they ask me about my family. You know, what've you been doing, what's the weather like, da-da-da-da-da, and then you're working with a person instead of a company. I actually think that's really important.</p> <p><i>University #G5:</i> The most important thing from my point of view is the personal contact. The exchange needs to actually take place between the people and you need to know who sits on</p>

Advancement phase	Personal relationship, often friendship	Strong	<p>the other side so that you can openly discuss things. Only written communication – a lot of information goes missing [...] communication is the A and O – you can write a lot but it doesn't mean that the person understood everything you are talking about, what you do and your intention behind it.</p> <p><i>Industry #A3:</i> I didn't put an importance on maintaining professional relationship. I didn't put that focus because we sort of developed an almost, you know, friendship, professional relationship was almost implied.</p> <p><i>University #G6:</i> If you want to do more projects with that partner, it is of value to note their birthdays. Or to call once in a while to talk about what has been going on. Just to stay in contact.</p>
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Figure 2: Framework of the Evolution of UILs



*Phase 1 = Establishment phase

**Phase 2 = Engagement phase

***Phase 3 = Advancement phase

APPENDIX Interview Guide

I. General

Information about the interviewee

1. What kind of linkages with industry/university are you involved in?
2. How many projects/relationships are you involved in?
3. When did those partnerships commence?
4. Have you been employed in industry/at university previously?
5. What role do you have in the projects/relationships?

II. Experience

Discuss first involvement with industry/commercialization

University:

1. Why did you get engaged?
2. How was first contact made?
3. What happened?

Industry:

1. How did you first get involved with universities?
2. How was first contact made?
3. What happened?

III. Individual relationships

Relationship (various relationships; focus on individual relationship when answering questions)

1. Briefly describe what kind of relationship you are engaged in
2. How long has it been running (e.g. several projects or one project, length of time)
3. How many people are involved on both sides?
4. How much is involved (how important for you)?

Relationship development

1. Can you identify different stages/phases of the relationship; did the relationship change over time) [if yes, use those phases to discuss the following questions]
2. Please explain the change.
3. How do the phases differ?

Phase 1

1. How did the relationship come about?
2. What was important for the relationship success at this stage?
3. What would you say is success at this stage? How would you define it?
4. What agreement did you have (written or tacit); please comments on agreement development.

For each following phase discussed by interviewee

1. What characterizes this stage?
2. What was important for the relationship success at this stage?
3. What would you say is success at this stage? How would you define it?

Dissolution

1. Do you have experience with a relationship ending? If yes, why did it happen and what do you think makes a 'good' ending?

IV. Other

Background – institution specific

1. University: How does the University encourage industry engagement?
2. Industry: How does the organization manage outside research?

IV. Clarifying and probing questions

Interviewers were asked to seek clarifications and ask for specific examples in relation to the individual university-industry relationships mentioned throughout the interview.
