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PARTNERING WITH ACADEMIA: INDIRECT INDICATORS OF SUCCESS

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Abstract

Industry stakeholders invest heavily in academic collaborations, making it essential to define success measures. Evaluating UIC helps focus efforts and allocate resources effectively, yet assessing knowledge value and partnership status is challenging due to their dynamic nature. These complexities hinder the establishment of rigid success criteria. To address this, we conducted semi-structured interviews with executives from global conglomerates across 13 industries. This diverse sample allowed us to examine direct and indirect metrics used by multinational companies to assess academic partnerships. We analyzed best practices and assessment frequencies, developing a comprehensive scheme of proxy indicators. This framework incorporates qualitative and quantitative measures, capturing both success factors and failure indicators. Our findings fill a gap in industry perspectives on UIC, offering an extensive, inductively derived scheme of proxy indicators. These reflect industry considerations regarding success, failure, and partnership evaluations. By expanding theoretical evidence and refining proxy measures, our research provides new insights into academic collaboration assessment.

Keywords

UIC, industry perspective, industry collaboration evaluation, evaluation scheme, success factors, failure indicators

Introduction

Being aware of the success measures and evaluations of university-business collaborations allows participants to focus their efforts, account for behavior, and manage the way the resources are allocated (Koppenjan 2008). Industry participants spend considerable amounts on academic collaborations (Perkmann et al. 2011), and this expenditure necessitates to be justified. Therefore, it is important for businesses to be able to assess the state of their partnerships and collaborations. The aptitude to quantify the value attained through collaborative activities, proves to be difficult even when the worth is evident (Perkmann et al. 2011).

Recent studies (Al-Ashaab et al. 2011; Albats et al. 2018; Mora-Valentin et al. 2004; Rossi & Rosli 2014) provide some success factors for the evaluation of the university industry alliances, which whilst valuable, do not exhibit any specific metrics (Perkmann et al. 2011). The latest endeavor by Frølund and Riedel (2018) explicitly elaborates on five vital best practices for academic collaborations, taking the rarely addressed industry perspective. While contributing significantly to the systemization and support of setting up an efficient collaboration network for the industry (Frølund & Riedel 2018), the literature nonetheless lacks proxy indicators which would allow researchers and managers to account and measure for benefits outside of the direct project outputs (Perkmann et al. 2011).

Understandably, success measures are likely to differ greatly from stakeholder to stakeholder, as a collaborative environment entails multifaceted perspectives of the participants due to contrasting disciplinary approaches and organizational bias (Head 2008a). Such a cultural divide poses challenges not only in the decision making process but also in the success and the assessment of a collaboration's performance (Rajalo & Vadi 2017). It is vital to recognize that all institutions differ by their strategy, goals, areas of research, industry etc. Hence, to derive the suitable KPIs (key-performance-indicators) for the success of UIC, case-specific metrics need to be applied from a broad set of metrics, which would allow the evaluation to be best tailored to the collaborative activities at hand (Rossi & Rosli, 2015).

Due to a lack of literature investigating the industry perspective regarding success measures of university relations (Perkmann et al. 2011; Skute et al. 2019; Albats et al. 2018), our research seeks to explore and develop a scheme of proxy indicators for evaluating the effectiveness and success of an organization's academic collaborations. We address this with our research question - what proxy measurements of success can businesses utilize to assess their collaborative partnerships with academia?

Through semi-structured interviews, we inductively examine the existing direct and indirect measurements which large multi-national companies utilize to determine success of their UIC partnerships. Taking into consideration the absorptive capacity, economies of scale, and the Schumpeterian hypothesis (Tsai 2009; Fontana et al. 2006; Laursen & Salter 2004; López et al. 2015) - investigating what indicators of success specifically the larger enterprises consider in terms of UIC partnerships, is deemed fit. Proxy indicators for business to assess UIC is derived through qualitative and quantitative measurements, where the success factors and failure indicators are considered. An important role is attributed to the frequency as well the internal hierarchy at which the varying levels of evaluations take place. This research seeks to address the literature gap of the underrepresented industry perspective in UIC in terms of how success can be facilitated in academic partnerships. Moreover, this paper presents a novel scheme of proxy indicators of success shaped through success factors, failure indicators, qualitative and quantitative indicators. These are further appropriated with the corresponding stages of collaboration development. This interconnection allows for this scheme to be applied as a tool for other industries or academic institutions to advise and facilitate success within their partnerships.

Relevance of the chosen topic

The participation of the industry in UIC constitutes an utmost vital part of the triple helix model (Etzkowitz & Leydesdorff 2000). Hence, the widespread recognition of the importance of relations between industry and academia has led to prolific attention across academia (Perkmann et al., 2013; Galán-Muros et al. 2017), industry (López et al. 2015), and policy makers (Ponds et al. 2010; Lehmann & Menter 2016) in recent years. The policy makers have been traditionally addressing the area with top-down tactics (Mowery & Sampat 2001). The research which specifically focused on the industry perspective and participation in UIC has primarily addressed the benefit industry partners may gain, broad (Mora-Valentin et al. 2004) and micro (Albats et al. 2018) level contextual and organizational success factors, performance of research focused centers supported by industry and government (Gibson et al. 2019) and more recently elaborating on best practice examples of strategic industry approaches to UIC (Frølund & Riedel 2018).

The ever-changing developments and advancements of new technologies triggers the industry participants to evaluate and comprehend their shortcomings in the resources and capabilities which naturally, innovative technological developments and commercialization require (Hamel, G., Prahalad, C.K. 1994; O'Regan et al. 2006). Hence, the industry is progressively seeking innovative solutions by engaging with the intellectual resources of a university (Dealtry et al. 2005). From a strategic perspective of the industry, where strategic refers to maintaining alignment with business goals - in order to leverage UI partnerships efficiently there are five main best practices which enable the potential for success. As outlined by Frølund and Riedel (2018), it is important to (1) initially define the focus areas for research in alignment with business goals, such that top-down and bottom-up approaches are balanced (Eichmeier & Storim 2018). Furthermore, it is vital to continue considering the strategic business goals when it comes to the (2) collaborative partner selection and (3) collaboration format. The criteria for the selection of a suitable collaborative partner should be based on the chosen collaboration format, which in turn is derived from the anticipated strategic needs of the company. A dedicated (4) internal governing body and processes which oversee and manage the collaborative process are of importance as well. Once in place, the academic collaborations need to be (5) continuously evaluated and monitored. The meaning of success and how it is evaluated will vary among different stakeholders. Nevertheless, the formulation of various evaluation metrics is possible via the emerging added value (Head 2008) throughout the four stages of an alliance – inputs, in process activities, outputs, and outcomes (Brown 2007; Perkmann et al. 2011). Differences between UIC participants can be portrayed as the antagonist and eliminating them can be thought to facilitate a successful

collaborative environment. On the contrary, managing these differences creates opportunities which in turn become the source of innovation, progress, and success within UIC (Frølund & Riedel 2018). Moreover, the different outlooks and point of views of the participating stakeholders working together can further contribute to exploration (Lester & Piore 2004; Perkmann et al. 2011) and new thinking (Head 2008). While the extensive differences between Industry and Academia are a crucial reason to stimulate and foster such interactions (Silva & Rossi 2018; Rosli et al. 2018), it leads to challenging perceptions of UIC. As found by Silva et al. (2021), negative practical implications arise, driven by the negative correlation between the perceived challenges and perceived benefits. As derived by Ryu (2014), optimistic perceptions of potential benefits are pivotal in the ultimate success of the collaboration at hand. More so, the likelihood of repeat engagement in future UIC are positively correlated with the perceived benefits (Ryu 2014). Given such perceptions, Silva et al. (2021) demonstrate that it is paramount for the collaborators themselves to cultivate positive affective evaluations of the undertaken collaborations in order to disconnect the established negative correlation between the perceived challenges and negative affective evaluations mentioned above.

Analysis of recent research and publications

Value co-creation has been conceptualized across service logic (Gummesson et al. 2014) and service dominant logic (Vargo & Lusch 2008), leading to a range of definitions as well as levels of perspectives on this phenomenon and a prolific stream of research. Drawing on Grönroos (2011) and the service logic, in a joint sphere of a firm acting as a value facilitator, and the customer being the value creator, opportunities exist for value to be cooperatively co-created. The processes of a service provider together with those of a customer flow by means of mutual influence, thereby developing a fused, dialogical process permitting the cross operation and cross participation (Grönroos 2011; Grönroos & Voima 2013). These joint collaborative activities between actors involved in direct interaction, create unique value for participating parties and beyond (Gummesson et al. 2014; Lusch & Vargo 2016; Grönroos 2011). The service dominant logic furthermore implies that all involved parties whether firms, customers or others are service-providing, moreover value co-creating, hence all exchange can be also considered in the context of business-to-business (B2B) (Vargo & Lusch 2011) in addition to main research on VCC within the business context relating to business-to-customer (B2C) (Payne et al. 2008). Consequently, in the context of B2B, value can be co-created by organizations with a wide variety of stakeholders (Sarker et al. 2012). For the purpose of this study, the focus lies on co-creating value through resource integration in university-industry interactions and carrying benefits throughout the triple helix (Etzkowitz & Leydesdorff 2000; Moreno de Castro et al. 2016; Roser et al. 2013).

As value can only be captured once its created or co-created, it is vital to comprehend the numerous stages within the UIC development, through which, the participating stakeholders are able to create, co-create and capture value. Therefore, by being able to continuously evaluate and monitor UIC, the value, whether created or co-created, can be efficiently captured to the maximum potential. The initial stages of the UIC partnership process will see the academic stakeholders create a vast proportion of value, which is in turn captured by the industry stakeholders (Chen et al. 2019). These proportions are dynamic, where the creation and capture of value becomes comparable across the stakeholders, given that the partnership process and engagement is longer term. As derived by Chen et al. (2019), the mechanisms of VCC process within the scope of UIC are aggregated into three aspects, seen through the shared vision between partners, the production of genuine products for the public, as well as respect for the field of expertise of each stakeholder.

The above-mentioned interplay and importance of value creation, co-creation, and its subsequent capture, can help to understand the complex nature of undertaking evaluations of UIC, while allowing to explore the collaborative boundaries from the industrial point of view.

Purpose of the article

The purpose of this study is to investigate how businesses can assess the effectiveness of collaborations with academia through indirect indicators of success. By exploring industry perspectives, the research aims to derive a comprehensive scheme of proxy measures that reflect both qualitative and quantitative dimensions of university–industry partnerships. The specific objectives of the study are to:

- Examine the criteria and processes multinational firms use to assess academic collaborations.
- Identify success factors, qualitative and quantitative indicators, and failure signals in UIC.
- Develop a structured framework that aligns these indicators with stages of collaboration development.

Research sample

The research targeted senior executives from 20 major global conglomerates across 13 industries *(Table 1)*, explicitly those with strategic oversight of their organizations' collaboration with academic institutions. These participants were selected for their potential to provide detailed insights into the strategic management and evaluation processes of university-industry collaborations (UIC). Given the scale and scope of these large organizations, they represent a crucial subset of firms for examining UIC dynamics, as organization size and strategic orientation significantly influence the formulation of UIC approaches (Santoro & Chakrabarti, 1999) and the likelihood of forming academic partnerships (Fontana et al., 2006).

These conglomerates' extensive knowledge bases and resources amplify their capacity to engage in and derive innovative applications from UIC. Typically, the larger the organization, the more robust its absorptive capacity, which enhances its ability to internalize and apply new knowledge effectively (Melnychuk et al., 2021). This attribute makes large organizations particularly valuable for studying the range of evaluation characteristics and performance indicators that define successful academic collaborations. By focusing on this specific group, the study leverages the depth and variety of strategic interactions available within these impactful enterprises to extract generalized and relevant insights about the mechanisms and outcomes of UICs.

Table 1: Overview of study participants.

Interviewee Code	Industry Classification	Count of Participants
A100, R100	Automotive	2
B100, Q100, G100, I100, V100	Chemicals/Pharma	5
C100, F100	Defence	2
D100	Oilfield services & equipment	1
E100	Electronics	1
J100	Telecommunications	1
K100	Information Technology & Services	1
M100, N100	Industrial Automation	2
O100	Electrical & Electronic Manufacturing	1
P100	Computer Software	1
S100	Mechanical/Industrial Engineering	1
T100	Semiconductors	1
W100	Social Media	1
Total	**13 Industries**	**20 Participants**

Research data collection and analysis

Primary data were gathered via semi-structured interviews with senior executives from 20 major global conglomerates engaged in strategic collaborations with academic institutions. These participants, chosen based on their authoritative roles with complete strategic oversight of their respective company's university collaboration engagement and strategy, were identified through publicly available information. Ethical clearance was secured prior to the interactions, and informed consent was obtained for the voluntary, online interviews that averaged 60 minutes each (Gioia et al., 2013).

The interview protocol was meticulously designed to extract comprehensive insights in a single session to maximize efficiency and minimize the need for follow-up interviews. Discussions probed deeply into the structures and strategies of university-industry collaborations (UIC). Participants provided insights into supporting mechanisms, modes of conduct, collaboration models, and multifaceted evaluation processes. Interview questions specifically focused on the criteria that define successful collaborations, encompassing the scope of evaluations, key performance indicators (KPIs), and strategic partnership assessments.

The recorded content was transcribed and affirmed by the participants to ensure accuracy. Analysis of the transcripts was conducted using NVivo12 software, following the structured approach outlined by Gioia et al. (2013). This qualitative analytic methodology facilitated the organization, coding, and categorization of the data into first-order concepts, second-order themes, and aggregated dimensions, revealing intricate patterns and relationships.

This rigorous analytical process distilled extensive executive insights into a comprehensive set of theoretical constructs that describe the strategic dynamics of managing UICs. The analysis achieved theoretical saturation (Glaser & Strauss, 1967), which was validated by an independent expert and the research authors, establishing a strong foundation for developing the subsequent evaluation framework discussed in this paper.

This framework articulates both qualitative and quantitative performance indicators, tailored to different phases of the collaboration lifecycle, from inception through to final outcomes. It portrays the critical success factors and potential failure indicators, providing a detailed, strategic view of industry standards and practices in UIC assessments. This structured analytical model, enriched with executive insights from leading global entities, offers an authoritative perspective on the effectiveness of UICs and introduces the evaluation scheme delineated in the following section.

Results

The analysis first presents novel data obtained from study participants pertaining to the general frequency and process of evaluation. This provides insights into the overarching methods and processes that are undertaken by the industry. Later, the paper discusses how the industry establishes effective academic partner evaluations, supported by corresponding quotes. Building on this, the analysis gives insights on the underrepresented industry perspective, specifically what the industry is seeking and how they determine their evaluation scheme. Given that the findings reveal that there is no 'one size fits all' evaluation per company or partnership, a scheme of proxy measures was developed and is subsequently discussed, including success factors, failure indicators, and qualitative and quantitative evaluation metrics. Finally, the results are considered in relation to stages of collaboration development, visualizing their interconnected relationship.

1. Frequency and process of evaluations

Evaluating University-Industry (U-I) collaborations of a firm is undertaken at various rates of recurrence, and at different levels – the project level and the partnership level. Although the project and partnership levels are interconnected, it's crucial to relate the two through engaging specialists who can translate the project results into context. This allows for an understanding of results, their evaluation, and most importantly, leads to the overall monitoring of the partnership. Participant S100 explains that their organization conducts an annual review for most of their partnerships, where they combine the types of work that have been done. This isn't just about presenting project results; it involves engagement with specialists who can contextualize the work so that it becomes comprehensive for those comparing different partnerships.

To ensure that evaluation becomes a regular practice, it's necessary to set suitable milestones well in advance. Participant N100 emphasizes the importance of setting milestones, possibly including them in contracts, which also provides a good opportunity to conduct lessons learned sessions. According to N100, lessons learned are a cultural aspect, and without plans for such sessions or proper KPIs to evaluate, they are likely to be overlooked.

Continuous presence and ongoing check-ins are advocated by Participant K100 to facilitate engagement and ensure that any barriers or problems are promptly and efficiently addressed. K100 highlights that this practice helps to surface and swiftly resolve any problems that may arise in the collaboration. Without regular feedback loops and active steering groups, these problems might remain hidden due to participants not encountering them directly, or because department heads try to resolve issues internally without broader communication.

Although the frequency of evaluations varies depending on the partnership and project at hand, Participant K100 believes in the importance of having a feedback loop as often as possible to foster effective collaboration.

Finally, evaluations should be continuous, and this includes well-planned and organized final reporting. Participant A100 outlines that project must submit a formal final report, followed by an interview to assess the success of the projects. Additionally, alliances are evaluated continuously, not based on a punitive approach but rather in a merit-based competitive proposal selection process that occurs annually. This method ensures ongoing assessment and adjustment where necessary, fostering improvement and accountability in U-I partnerships.

2. Establishing effective evaluations of U-I partnerships – aims contingency

Collaborations are not all the same, and the success of collaboratively engaging with Higher Education Institutions (HEIs) will be measured and perceived based on the originally established short-term aims and long-term goals. Participant K100 highlights that the nature of collaborations varies greatly depending on the objectives set by the company. For instance, if a company aims to enhance its technical recognition and share of voice within a specific field, the success metrics can include the number of invited talks at conferences or publications in top journals before and after the collaboration. This makes it relatively straightforward to measure the impact over time by tracking these specific metrics.

The intricacy of evaluations lies in determining the deliverables which are based on the aims sought within a collaboration. However, the concrete boundaries of these aims might not be clearly defined initially. According to K100, specific aims might develop and become clearer as the collaboration progresses. For example, the focus might shift from increasing share of voice to assimilating the development of a particular technology or improving gender diversity and hiring in a certain region. Each of these objectives requires its own unique set of measurements.

It is evident from K100's explanations that evaluations, Key Performance Indicators (KPIs), and measurements cannot adopt a 'one size fits all' approach. They must depend on the established or evolving aims and goals of the collaboration. Value add-ons that develop during the collaboration also add dynamism to the evaluation metrics, undermining the utility of general metrics. K100 underscores that overly general metrics could lead to disappointments, as optimizing one facet may deoptimize others.

Participant W100 echoes the challenges in formalizing concrete evaluation criteria and measurements. They state that despite having a framework for evaluation, it is seldom utilized because the focus is often on preventing bad outcomes, functioning more as an insurance policy than a proactive tool. Furthermore, evaluating thousands of individual interactions, projects, and engagements within a partnership may not always be worthwhile or feasible due to the immense effort and resources required. W100 elaborates that in cases where there are numerous small engagements, spending millions on evaluation is not justifiable, suggesting that understanding the overall benefits of partnerships with HEIs and focusing on eliminating collaboration barriers may be more beneficial. Scheme of Proxy Indicators of Successful Partnerships

3. Scheme of Proxy Indicators of Successful Partnership

In this section, the four areas which constitute the scheme of proxy indicators are presented below. Given the interviewees responses the data obtained was analyzed and connected to create a scheme comprising of success factors, failure, qualitative, and quantitative indicators. The results presented here are providing exhaustive lists of what and how the industry consider to be success factors when collaborating with academia, the failure indicators which could signal when the collaboration could fail, and specific qualitative and quantitative evaluation metrics that the industry uses to evaluate their partnership with an academic institution. Each area of the scheme is thoroughly discussed, and the connections are outlined in the sections below.

3.1 Success Factors for University-Industry Partnerships

Collaboration success stories of how an idea originated from one collaboration can ultimately affect the organizations' strategy, research direction, or even products. These individual instances are qualitative measures of success, however, numerous such 'success stories can ultimately strengthen and influence an academic collaboration program. There are hence a number of critical success factors which qualitatively indicate the probable effectiveness and success of academic collaborations. In addition to indicating the probable success, they are factors, on which the achievement of specified objectives depends. For the purpose of this research, the overall objective being pursued is the effectiveness and success of academic partnerships. Table 2 highlights the extent of Success factors for University-Industry Partnerships as identified by the study participants - expressing the causal relationship they exhibit on success. The critical success factors furthermore correspond to precursors and processes of UIC partnerships (*Figure 1*) and are organized by the overarching theme: *Alignment*, *Interaction*, and *Commitment*, with subsequent sub indicators, described with a defining quote. Corresponding quote source is specified in brackets.

Table 2: Success factors for U-I Partnerships.

Success Factors		**Definition**	**Defining Quote**
Alignment	Goals	Mutual alignment on goals	*"...mutual alignment, internal people and external people interested in achieving the same goal."* (P100)
	Culture	Collaborators who have industry experience	*"Collaboration works better when you are collaborating with an organization that share the same culture and principle around innovation."* (K100)
	IP	Cooperative and not competitive on IP	"*If the university comes at it from the idea that we're going to get rich by getting royalties off of patents, they're going to argue very hard for IP, they're not going to give you good terms, and things aren't going to work well. If they realize, if we're cooperative on IP, they're going to spend a lot more research money here on campus."* (A100)
	Model Acceptance	Willingness to embrace the industry collaboration model	*"... the willingness of the University to embrace our model. If we were going to a new school to do an alliance, we're not starting from a clean sheet of paper."* (A100)
	Personal Fit	Sharing a common belief, ability to work intra-team.	*"...it's about interaction with people I'm going to be working with for maybe three of five years. Do I get on with these people? Do they resonate? Are they motivated? And do they see the similar goals and share the same aspirations? Because if I'm pushing the elephant up the stairs all the time that's not what I want to be doing for long. Yeah, there's a scientific part as well, which is going to be important of course. But it come second to, what's the team on the other side, do we get on with them? Are the engaged? Are they going to get on with the teams at our side? Do we share a common belief?"* (Q100).
	Understanding Competencies	Alignment on partner-specific competencies	*"...make sure that everybody understands what kinds of things university researchers are good at and where their work can best contribute, which is very different from where companies can best contribute, so finding ways of making sure that the fuzzy middle ground isn't where people land" (P100)*
Participation	Interaction Patterns	Continuous communication and status reporting.	*"... If things don't go well, you don't change the whole system, through good communication and being fair and open and transparent, you can get to where you need to be."* (B100)
	Proactivity	Partner inclusivity	*"...they think of us and they include us, we become part of that, their sort of family. Those are good indicators for us. Just as are we in their minds that they include others?"* (W100)
	Involvement	Co-location, healthy dialogue, knowledge sharing.	*"... one of the things that's really important is the engagement of the researcher or researchers that we're working with... sometimes you can tell quite early on if they are keen maybe to co-locate for part of the time or they need to speak to us."* (J100)

Commitment	Institutional Partnerships	Institutional Framework Agreements	*"I do think it's a lot institutional, and our strategic relationships are with the institutions… the institutions themselves have that track record of supporting professors in the areas we care about and intervening when there are problems. And also facilitating full agreements into things. So that's where our primary commitment is. For instance, if a professor leaves an institution the project does not follow the professor. Our allegiance is also to the institution."* (G100)
	Senior Management	Commitment of senior management	*"… it is about the people that are involved and about commitment from the senior levels of the university as well."* (C100)

3.2 Success Factors for University-Industry Partnerships Qualitative Indicators of Successful University-Industry Partnerships: Qualitative measurements are an invaluable part of assessing the effectiveness and success of partnerships in general, and UIC specifically (Perkmann et al. 2010). Deliverables and other quantitative indicators are not immediately available as their development is time-dependent, hence being aware of a variety of qualitative indicators is vital. As T100 explains:

"To some extent, the setting up of a new direction or the setting up of a new partnership tends to be more qualitative than quantitative, because sometimes it takes years for something to develop, so it's not as quantitative, but we wish it would be."

Objective evaluation of the ROI (return on investment) is difficult to achieve, as it is an aspect under constant evolution, being fueled and dictated by the goals and importantly the reason why the collaboration is taking place. As these are not the same, the quantitative evaluation aspect proves to be tough in its objectiveness. As K100 details:

"This evaluation of the return of investment, it is something that is in constant evolution. And it is relatively very difficult to evaluate in an objective way. It depends on the goals that you put behind, and on the reason why you're doing the research collaboration. And these goals are not the same." (K100)

Caution is advised with regards to selecting collaboration partnerships based just on the quantitative aspect of how good an institution is, or the apparent likely fit, as determined by people who not directly involved in the said collaborations. Qualitative, proxy indicators such as interpersonal relations play a very important role establishing whether a partnership will efficiently yield results. As S100 details the importance of qualitative indicators:

"… I've seen plenty of them; sometimes they work, sometimes they don't. They don't work because those criteria are met, they work quite often because the people want to work together; you have an alignment of goals. Now, on a personal basis, as well as am organizational basis."

Table 3 highlights the extent of Qualitative indicators for success within University-Industry Partnerships as identified by the study participants. They are organized by the overarching theme: *Engagement*, *Interpersonal Relations*, and *Perception*, with subsequent sub-indicators, described with a defining quote. The qualitative indicators correspond to precursors, processes and outcomes of UIC partnerships (*Figure 1*).

Table 3: Qualitative Indicators of U-I Partnerships

Qualitative Indicator		**Definition**	**Defining Quote**
Engagement	Level of engagement	Degree of qualitative partnership engagement	*"…we have a scale from zero to five, qualitatively, of becoming acquainted, having regular discussions, actively collaborating on publications or projects. …it's an exponentially increasing scale,*

			so we track whether or not engagement has improved or has gone backward." (P100)
	Effort and Impulse	Integrity	*"We'd much prefer a partner that told us that things are going sideways, rather than one that pretends everything's fine when it isn't. … And we see what people do and we see how much they want to talk to us. So people take the money and then don't want to talk to us. That's fine. That's okay. We didn't say you had to, but you're not going to get any more, all right? It's throwing the sort of seeds out there a little bit and seeing what germinates."* (W100)
Interpersonal Relations	Ease of cooperation	Willingness to sustain a two-way conversation.	*"You know the definition of the word collaboration, right? How it is that we work together. If the collaborative partner is a person that is willing to listen, discuss, and decide, it tends to be a very successful one, and then it's not a metric. You know, right? How good is the collaboration? We can ask ourselves that, but there's basically that willingness to have a two-way conversation, and this is challenging."* (T100) *"Qualitatively, are they cooperative? Are we having problems with them? Are we arguing with them? Are we debating about who are inventors?"* (A100)
	Relationship building	Experience based interpersonal relationship building.	*"From a qualitative point of view, it's a narrative that goes with it of, "We've done this, and because of this we now know this. So it shows us that we should do this, or we can't do this, or we need to stop doing that.*" (J100) *"You communicate, you learn something from them, you bring, you exchange ideas, they learn from you learn from them. And this is how it evolves. And it's very difficult to materialize this in numbers."* (D100)
Perception	Reputation	Perceived reputation among the stakeholders.	*"…it's very important for us also to understand how we are perceived externally when we do collaborations" (K100)*
	Satisfaction	Feeling/perception of the participants of this partnership.	*There is of course also an evaluation of more or less soft facts. I mean how satisfied are the collaborators on both sides on the collaboration, on the interactions…How did they feel in this collaboration? … was it something where you had the impression that both parties more or less worked independently from each other on these kinds of topics. (I100)* *"There is of course a lot of this kind of what's the overall feeling, vibrance of the collaboration. I would say that's really, is it lively? Is it more than transactional?"* (O100)

3.3 Quantitative Indicators of University-Industry Partnerships: Table 4 highlights the extent of Quantitative measurements within University-Industry Partnerships as identified by the study participants. They are organized by the overarching theme: Financials, Interactions, IP, and Academic Metrics, with subsequent sub-measurements, described with a defining quote. The quantitative indicators correspond to outcomes of UIC partnerships (Table 4).

Table 4: Quantitative Indicators of U-I Partnerships

Quantitative Indicator		**Definition**	**Defining Quote**
Financials	Budget	Financial proportions	*"We will look at finance; where the money is coming from, how the money is spent, what it costs."* (S100)
	Donations	Tangible/intangible goods donated or lent	*"Amount of software donations."* (D100)
	Financial Strength	Derived margin	*"Financial strength of the project. The number of projects we're identifying. Ultimately the margin, the financial elements of those various projects through the lifetime."* (Q100)
	Funding Leveraging	Access to external funding programs	*"An aspect you look for things like are we winning funding, winning bids together."* (C100)
	Facilities	Access to special facilities	"*Availability of specialist facilities*." (J100)
	Spinoff Creation	Entrepreneurial contributions, whether financial or cognitive	*"...some of our investments have generated a new company, and that is also a very positive metric."* (T100)
	Talent Acquisition	Acquired or transferred talent for any term	*"...are we hiring talent out of that collaboration? Like I said at the beginning, some of the money goes towards students' education, or are we hiring?"* (T100).
Interactions	Lectures/Conferences	Educational Interactions	"*The number of lectures which we gave at the universities."* (D100)
	Communication Patterns	Frequency, level, and amount of communication	*"...if you're working with a university, we'd expect you should be speaking to them at least every other month. We'd expect you should be visiting them at least probably once a year. They ought to visit us at least once a year.*" (J100)
	Repeat Collaborations	Continuity of partnership, or creation of new projects with the same team	*"Would you collaborate with this academic again?"* (B100)
	Proposal Rates	Internal or external call for proposal for collaborative projects	*"We would look at is how many proposals came in, and how many were selected. So what's the conversion rate of proposal with a particular school versus the approval rate?"* (A100)
IP	Identified Risk	The derivation of outcomes which lead to change in direction of research from either side	*"Has the collaboration identified an area of risk that will stop us exploring that technology for a reason? ...* *You know, to take risks, and when you take risks, sometimes you find out that something was a really bad idea. It's*

			wonderful to know. The earlier you know that it's a bad idea, the better it is, so we are given credit for what we call showstoppers, something that we find in the technology that leads us to conclude that this is not a good path to move forward." (T100)
	Tech Transfer – Tech Translation	Advancement and absorption of technologies that facilitate impact across and outside of direct stakeholders	*"The highest level would be if those collaborations were materially influenced in academia and/or the industry and/or the company, so that would be evaluated through artifacts like adoption of technologies or significant pickup on research directions or potentially things like patents and what have you, as an indicator. Some of those have very fine-grained sub-evaluations associated with them. For example, tracking the degree of tech transfer or idea transfer. We actually have models of how that process tends to work, and we try to track progress through such a process."* (P100)
	Tech Transfer – Talent Acquisition	Open-source releases leading to external research advancement, resulting in talent who is already familiar with the particularities of internal technologies	*"Another KPI might be, we released some code and we've seen a year or two later that 15 of the top 30 labs working in a particular area, picked it up and started working on it. And so that KPI would be, and they published the paper, so we can track it because they published the paper that uses the technology, which means necessarily, there are PhD researchers and maybe some post-docs in those groups that know about our tech, which means I'm going to recruit them and there's a lower friction for them to annul."* (W100)
	Publications	Direct outcomes in form of literature	*"We have some kind of KPIs related to more or less the scientific outcomes mostly, so it can be number of publications."* (I100)
	IP Rights	Proportion of shared/non shared IP	*"How often do we take IP rights? That signifies value if something's developed and we're willing to pay for IP costs versus times when we're not."* (A100)
Academic Metrics	Research Metrics	Consideration of impactful research metrics, which describe and benchmark the scientific output of an institution/researcher	*"Reputation/excellence of the university and individual academics in the area of the work we want to collaborate in."* (J100)

3.4 *Collaboration Failure Indicators:* It is necessary to comprehend and be aware of the indicators which signal that a collaboration has indeed lost its momentum, or things have taken a turn. As indicated by the study participants, it's not necessarily that collaborations fail, but rather they exhibit varying

degrees of success. This is quite in line with the dynamism presented by the development of evaluation metrics, which themselves are intertwined with the anticipated aim/goal. In order to facilitate a higher percentage of perceived successful collaborations, there are some indicators which signal potential failure or derailment of a collaboration. The failure indicators exhibit qualitative proxy indicators of the collaboration downturn.

Table 5 highlights the extent of Failure indicators of University-Industry Partnerships as identified by the study participants. They are organized by the overarching theme: Behavioral, Misalignment, and Academic Metrics with subsequent sub indicators, described with a defining quote. The failure indicators correspond to precursors, processes and outcomes of UIC partnerships (Table 5).

Table 5: Failure Indicators of U-I Partnerships

Failure Indicator		**Definition**	**Defining Quote**
Behavioral	Aggressive entrepreneurial behavior	Thorough due diligence with regards to IP and entrepreneurial practices of the academic counterparts	*"We're now looking at schools that are going to be diligent to make sure that as they launch startups, that those startups are not going to cannibalize or cause problems with existing sponsored research… universities are betting so much on startups, they're leaving some wreckage in their wake. And the schools that proactive, we realize startups and existing sponsored research has to coexist peacefully, both schools are going to end up being the winners, and the schools that just blindly chase their startup dreams without watching the collateral damage, they're going to find money moving away from them."* (A100)
	Continuous Engagement	Sudden changes in delivery of contributions/deadlines not met	*"What we also need is constant engagement because I think this has been one of the other issues, is that where we lose a connection with a professor, and mostly it's because of our failure to have these regularly schedule meetings."* (E100)
	Inefficient Problem Solving	Escalation to management without appropriate efforts to mediate prior	*"… if the team members of the research talk to each other and don't find a solution, they escalate and then the principals…Which is also okay, but it's not my preferred mode of working because those guys down the line should have figured out a solution a bit more."* (N100)
	'Hit and run'	Acceptance of contributions, yet no willingness to reciprocate	*"Very, very rarely we get an academic who's completely non-responsive. I call them, take the money, and run people." (B100)* *"…of course, willing to take the money but will not work for the topic. We had this kind of collaboration in the past. You will never know… It's for sure an illusion that 100% of the collaborations will be successful at the end."* (I100)

	Motivation	Semi-unrelated results, lack of willingness and enthusiasm to contribute	*"if you have the impression that the collaborator doesn't really care for the research plan and the topics you have agreed on. He'll do something but more or less not related to the work you have agreed on and you get the impression that he presents some data to you but this is maybe always the same data but in a different format ... Or you have that impression this data is not really related to the topic you are looking at and it seems that this comes from another project..."* (I100)
Misalignment	Expectations	Failed to align or discuss details to an extent which would liaise appropriate expectations	*"I've seen engagements, for example, where people in the company did not meet the expectations of an academic partner. The root cause tended to be that there was too big a gap in interests and/or time horizon. You have to be very careful about figuring out who can engage respectively and making sure that everybody is on the same page about the expectations for the engagement.* (P100)
	Personal	Misconnection on a personal, scientific or any other level, leading to inability to work together	*"If they're all talking at each other, and one person just keeps banging on about one particular success metric, and another one keeps banging on about their success metric, that's a good indicator that something might not work here."* (S100)
	Objectives	Misalignment or lack of transparency regarding objectives of a partnership or project at hard	*"...it often it would stem from misalignment on the project almost from the beginning. Where we have really different objectives. And so that's where you're never able to get that win-win. I think also there have been some cases where there's been reluctance in sharing the output back to us, so that can be a challenge."* (G100)
	Strategic Partner – Oxymoron	Misleading use of the term strategic partnership to attain other objectives	*"They reach out and they say, we want you to be a strategic partner, they always use that phrase. ... We need you to write a support letter and ... we need your letter in three or four days...So it's like last minute hideously, and short deadline and no conversation. And the very fact, so it's such an oxymoron, the strategic partner, but we don't actually care about what your view is on the research topic that we're going to go and ask the 10 million, whatever currency, right? I know. It's laughable, but it happens every month or two."* (W100)
Academic Performance	No publications	Lack of scientific outputs and	*"If we see no publications coming out that raised a red flag. Because universities like to publish."* (G100)

		contribution in any form of literature	
	Proposal author leaves	The proposal author leaves the research group or project	*"... projects should rotate people. The person who writes the proposal with the professor, he or she needs to be engaged throughout the end. Whenever we see one person just leaving, say midway through, that just does not work."* (E100)
	Poor PhD Supervision	Lack of an engaged supervisory relationship, failure to lead the PhD research project – signifies the risks of encountering similar practices on larger scaled projects	*"It doesn't seem to be very good supervision at all, which is not good, which makes us kind of concerned about the quality of the research that's going on."* (J100)

4. Appropriation of the Scheme with Stages of Collaboration Development

The scheme discussed above exhibits the multi-faceted aspects of what the industry considers to be success factors, failure, qualitative, and quantitative indicators when collaborating with an academic institution. Due to the nature of the data sample, this scheme can most certainly be applied to other university industry collaborations where practitioners can directly utilize the factor/indicator from the scheme and apply it to their own case-scenario. Figure 1¸ as an incremental visualization, does not only combine the valuable insights provided by the quantitative, qualitative, failure indicators, and success factors, it moreover develops the derived scheme by facilitating the split between precursors, process, and outcome related indicators/factors. Precursors are those pre-hoc indicators and factors of success, process is as the name suggests, UIC process-related indicators/factors, and the outcomes are strictly post-hoc measurements. All the indicators/factors on the right-hand side of Figure 1 exhibit a unilateral connection to either precursor/process/outcomes, except "Reputation" which is connected to both, process, and outcomes of success, given the nature of what reputation is.

The 14 Precursors, channel into Alignment/Misalignment, Commitment, and Behavioral indicators, all while accumulating attributions from Success and Failure indicators. These are the critical indicators and are a cause of success and success facilitation – hereby failure prevention. The 10 Process indicators, channel into Interpersonal Relations, Participation, Engagement, Behavioral, Academic Performance, and Perception, all while accumulating attributions from Success, Failure, and Qualitative Indicators. The 23 Outcome indicators, channel into Behavioral, Academic Performance, Perception, Financials, Interaction, IP, and Academic Metrics, all while accumulating attributions from Quantitative, Qualitative, and Failure Indicators.

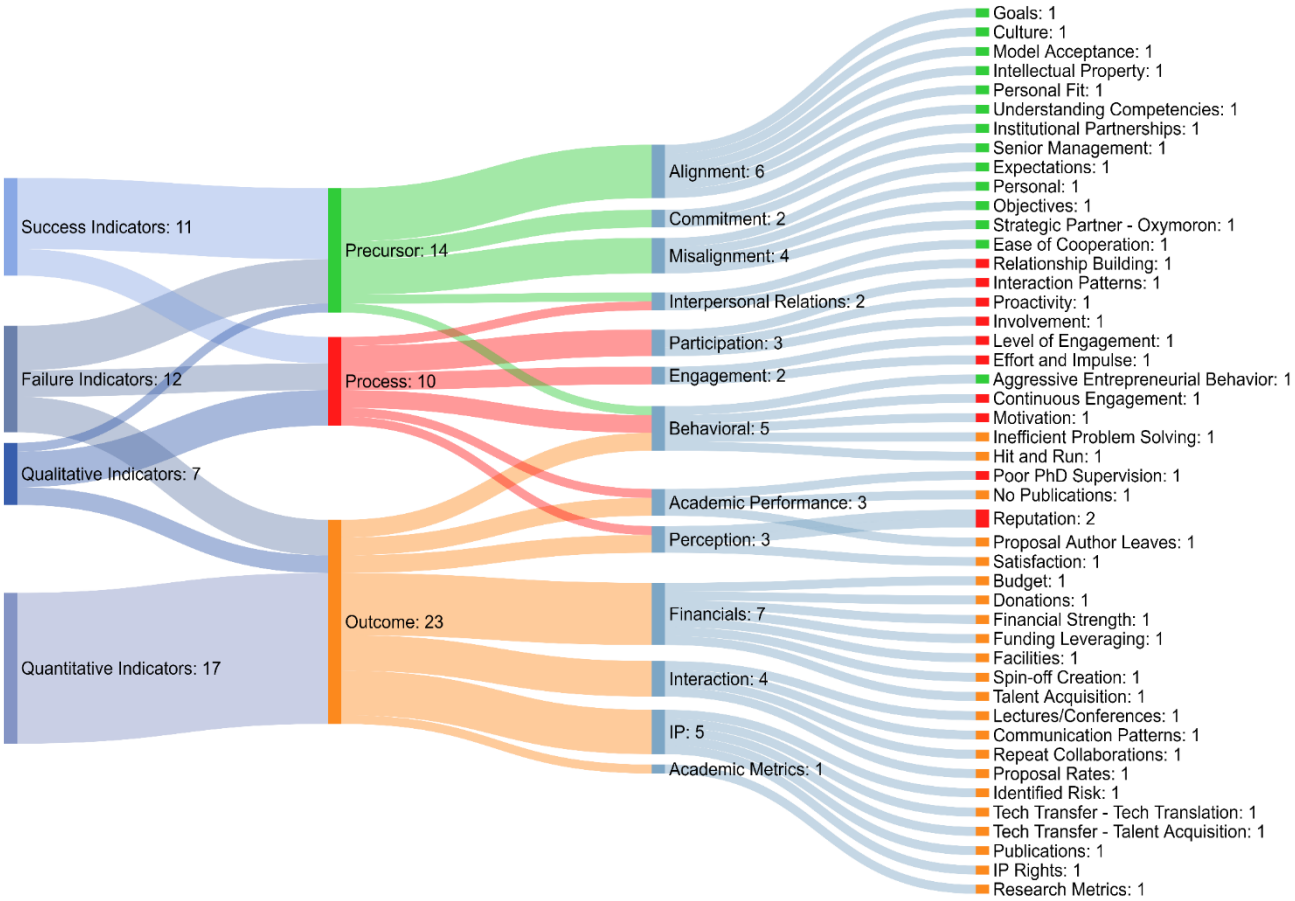

Fig. 1: Diagram depicting the interconnection of Success, Failure, Qualitative, and Quantitative Indicators through Precursors, Processes, and Outcomes of Successful UI collaborations.

Discussion

In recent years, industry participants have increased their focus in establishing strategic partnerships with academia. Nevertheless, the research remains limited in the understanding of how these partnerships can be efficiently evaluated, outside of the direct deliverables (Perkmann et al. 2011; Al-Ashaab et al. 2011). More so, there is limited understanding with regard to measurements that can be utilized to evaluate UIC success (Perkmann et al. 2011) and capture maximum potential co-created value. While Mora-Valentin et al. (2004) quantitatively identify those contextual and organizational factors which contribute to success of cooperative agreements between firms and research organizations. With our research, we build upon the previously derived variables: such as commitment, initialization, communication, trust, reputation and conflict (Mora-Valentin et al. 2004), and expand them through derivation of more granular proxy measurements of successful academic partnerships. We widen the theoretical and empirical evidence through qualitative analysis of the quantitative, qualitative, success and failure indicators, as identified by large enterprises (Table 1), while appropriating the indicators in accordance with the corresponding states of collaboration development (Figure 1). As all of our study participants are conglomerates/large enterprises with a strong global presence – their views and methods of UIC conduct represent the overall status quo of the field from the industry perspective.

Our findings are many-fold - we inductively confirm the latest research by Frølund and Riedel (2018) who explicitly elaborate on the systemization and support of setting up an efficient collaboration network for the industry. In line with Frølund and Riedel (2018), our study finds that defining the focus areas for research in alignment with business goals, such that top-down and bottom-up approaches are balanced (Eichmeier and Storim 2018) facilitates the foundation for partnership evaluation. Moreover, continuous evaluation and monitoring of the academic partnerships ensures maximization of value captured. According to Bailey and Koney (2000), “Alliances yield the greatest impact from evaluation if it [is] used to provide continuous assessment of the alliances process and content throughout all phases of development”. Understandably, the evaluation and meaning of success will differ among the stakeholders. Yet, the derivation of proxy evaluation indicators and/or metrics is

possible via the emerging added value (Head 2008) throughout the four stages of an alliance – inputs, in process activities, outputs, and outcomes (Brown 2007; Perkmann et al. 2011).

We have therefore identified an extensive scheme of quantitative, qualitative, success, and failure proxy indicators for the success of academic partnerships by industry. The scheme, albeit not exhaustive, it brings to light those quantitative and qualitative indicators which are of utmost importance – as perceived by the industry leaders. Moreover, the critical success factors and failure indicators enhance the extent of measurements by providing the valuable insights as to what really drives success and how to curb failure within UIC. A visualization of which indicators contribute as precursors, processes, or outcomes of success, explicitly depicts, intertwines, and translates the scheme into a usable tool. It can be therefore utilized and applied by other industry or academic institutions in evaluating their own collaborations. The valuable contribution lies in the fact that the identified indicators that are the proxy measurements of success, be that quantitative or qualitative. This is important in its nature – the indirectness of what is to be measured or considered, in order to maximize the potential for success.

Theoretical contributions

UIC and the triple helix of collaborations (Etzkowitz & Leydesdorff 2000) address industrial stakeholders whose participation is imperative, yet the existing research and literature is mainly focused on the academic perspective of collaborations. With these findings we address the exact gap of not only underrepresented industry perspective on UIC (Skute et al. 2019), but moreover derive an extensive scheme of inductively deduced and highly representative indicators of what the industry considers in terms of facilitating success of their academic partnerships. We widen the theoretical evidence through qualitative analysis of the quantitative, qualitative, success and failure indicators, as identified by large enterprises being the study participants. The granularity level of the proxy measurements of success addresses the gap by providing a novel contribution which ties into and builds on the phenomenon and prolific stream of research on value co-creation and importantly value capture. As value can only be captured once its created or co-created, it is vital to comprehend and be able to continuously evaluate and monitor UIC in order for the value, whether created or co-created, to efficiently captured to the maximum potential.

The additional theoretical contributions of our study find their significance in facilitating an environment for U-I partnerships to maintain and advance mutual benefit into the future. This is manifested in the derivation of the ability to continuously facilitate successful partnerships, curb failure, and enable the drivers for collaboration. Accordingly, this research has contributed to the UIC discipline via building on the relevant existing literature, establishing necessary linkages to the previously developed theoretical foundations, and moreover provided the missing insights into the industrial point of view onto UI collaborations.

Managerial implications

Evaluating the success of collaborations can be very intricate as it involves the examination and interpretation of deliverables (tangible or not) which are based on the aims and goals of the specific collaboration. Collaborations are not all the same, and the success of engaging with academia will be measured and perceived based on the originally established short-term aims and long-term goals. Yet, the distinct boundaries of the particular aims and goals may not be clearly understood or known from the initial establishment of the collaboration. It is possible, that aims, and goals can evolve, and take further shape as the collaboration is underway – hence, the evaluation factors of a successful collaboration can proportionally take shape.

It is clearly evident that discrete evaluations, KPIs and success measurements cannot be “one size fits all” and are strongly contingent on the aims and goals that were initially established and/or are continuously taking shape within the collaboration. There are many various value add-ons which develop once the collaboration is running (Head 2008), attributing dynamism to the evaluation metrics, and at the same time are limiting the strength of general metrics. Given the dynamic nature of collaborations and the necessity to tailor them to each collaborative interaction, the ability to derive specific and rigid success evaluation criteria and measurements is difficult and inefficient. Moreover, a collaboration may involve an innumerable number of precise interactions, unique projects, and intricate engagements. The efforts to evaluate each and every single one might not be worthwhile and efficient. On the contrary, comprehending the potential benefits a particular collaboration with HEIs entails and prioritizing the elimination collaboration barriers might be an approach worth considering for managers and practitioners, as seen in the study participants.

Although we provide quantitative metrics, which managers could consider in their process of tailoring

their evaluation processes and measuring outcomes – deliverables and other quantitative indicators are not immediately available as their development is time dependent. Managers and practitioners are hence encouraged to consider the qualitative - precursor, and process related metrics as seen in Figure 1, and described in detail in Tables 2-5. The presented figure allows a further insight and an interpretation, suitable for use as a toolbox for managers and practitioners to derive and setup those evaluations, they see fit in accordance with their aims/goals toward UIC. Given the separation by precursor, process, and outcome, our scheme of proxy measurements of success allows practitioners the prospect of effectively evaluating pre and post hoc academic partnerships.

It could be worthwhile to identify the collaborators/collaborations within UIC whom experience or perceive barriers and attempt to direct them towards a more positive view of the collaboration which could increase the perceived benefits of the UICs and ultimately, their overall success (Rosli et al. 2018). Not only is this vital from the managerial point of view, but collaborators themselves should adopt positive affective evaluations of their UIC which would disrupt the negative relationship between perceived challenges and negative affective evaluations, and increase the perceived benefits – ultimately, driving successful collaborations (Rosli et al. 2018).

Limitations and future directions

Our study presents an extensive quantitative and qualitative scheme of proxy measurements of successful academic partnerships as derived by the industry participants. Our study participants are spread across 13 industries and are all large enterprises with a global presence. Moreover, we have interviewed those participants who have strategic oversight of their respective company. Still, not every possibility and every indicator can be mentioned, due to the nature of UIC, dynamism of the evaluations, and their dependency on the desired outcome/aim of the collaborative interaction. The main limitation of our findings is hence seen through non-exhaustiveness of the identified indicators. Furthermore, the identified indicators are not all equal in their impact and importance. We tried to mitigate this by presenting figures which visualize the frequency of mentions of each indicator and measurement by the participants.

Conclusions

This study addresses a critical gap in understanding how industry stakeholders evaluate university–industry collaborations (UIC), moving beyond direct deliverables to capture broader, co-created value. Drawing from semi-structured interviews with senior executives from 20 multinational conglomerates across 13 industries, the research develops an extensive scheme of proxy indicators comprising success factors, failure indicators, and qualitative and quantitative measures aligned with different stages of collaboration development. Findings reveal that UIC evaluation is inherently dynamic, with metrics shaped by evolving short- and long-term objectives rather than a “one-size-fits-all” approach. Success factors center on alignment of goals, cultural fit, commitment, and proactive engagement, while failure indicators highlight misalignment, disengagement, and poor communication. Quantitative measures, such as financial leverage, IP outcomes, and talent acquisition, complement qualitative indicators like relationship quality, perceived reputation, and stakeholder satisfaction. The study’s framework positions these metrics within precursor, process, and outcome phases, offering a practical tool for tailoring evaluations to specific partnerships.

Theoretically, this work enriches the UIC literature by foregrounding the underrepresented industry perspective, integrating concepts of value co-creation and capture, and providing granular, inductively derived evaluation criteria. Managerially, it equips practitioners with a flexible, actionable evaluation model that emphasizes early alignment, continuous monitoring, and the mitigation of collaboration barriers. While comprehensive, the scheme is not exhaustive, reflecting the inherent variability of UIC contexts. Overall, the research advances both theory and practice by offering a nuanced, industry-driven blueprint for assessing and enhancing the success of academic partnerships, thereby maximizing mutual benefit and long-term value creation.

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