

Assessing the relationship between organizational communication and university-industry
collaboration: A quantitative examination of university strategic plans

by

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B.S., Kansas State University, 2009

M.S., Kansas State University, 2013

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Leadership Communication
Staley School of Leadership

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2026

Abstract

University-industry collaboration has become an increasingly important component of universities' missions as institutions face growing expectations to demonstrate measurable returns on public investment and contribute to regional and national competitiveness (Boyer, 1996; Kellogg Commission, 1999; Etzkowitz & Leydesdorff, 2000). At the same time, rising financial pressures have encouraged universities to diversify revenue streams and strengthen partnerships with the private sector in order to remain relevant to key stakeholders and sustain their research and educational enterprises. Prior research on university-industry collaboration has largely focused on structural and organizational conditions of universities, such as research capacity, disciplinary orientation, and institutional resources (Perkmann et al., 2013; Rybníček & Königsguber, 2018; Ankrah & AL-Tabbaa, 2015). Comparatively little empirical work has examined how universities communicate institutional priorities related to industry engagement and whether those communications shape patterns of collaboration activity. Building on the University-Business Collaboration Ecosystem Framework (Galán-Muros & Davey, 2017), this dissertation examines whether organizational communication about university-industry collaboration moderates the relationship between organizational conditions and industry-sponsored research activity among R1 and R2 universities in the United States.

Drawing on perspectives from constitutive approaches in organizational communication theory, the study treats university strategic plans as artifacts through which institutions communicatively create and ultimately articulate priorities, frame organizational identity, and signal commitment to external engagement. A total of 303 strategic plans were collected and analyzed using text-mining techniques to measure the prevalence and institutionalization of communication related to university-industry collaboration. Organizational communication

supporting university-industry collaboration was then operationalized through a composite measure combining normalized frequencies of relevant language, the average maturity score derived from automated rubric-based classification of industry-related passages, and the temporal relevance of the strategic plan. Ordinary least squares regression models were used to examine the relationships between organizational conditions and industry-sponsored research, and moderation analyses were conducted to assess whether organizational communication conditioned these relationships.

Results indicate that several organizational conditions were significantly associated with industry-sponsored research activity, consistent with prior literature on university-industry collaboration (Perkmann et al., 2013; Boardman & Ponomariov, 2009; Bekkers & Bodas Freitas, 2008). Organizational communication supporting collaboration was also positively associated with industry-sponsored research. However, the moderation analyses generally did not provide evidence that organizational communication significantly altered the relationships between organizational conditions and collaboration outcomes. These findings suggest that while institutional communication may signal priorities related to industry engagement, structural characteristics of universities remain the primary drivers of industry-sponsored research activity.

This study contributes to research on university-industry collaboration by introducing a novel approach for measuring institutional communication using strategic plan text and by empirically examining the role of organizational communication within a large cross-institutional sample. The findings highlight the continued importance of structural institutional factors while suggesting that strategic plans may be an imperfect proxy for organizational communication about industry collaboration and that communication alone, without corresponding structural capacity or institutional commitment, does not substantially influence collaboration outcomes.

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Acknowledgements

To my major professor, Dr. Tim Steffensmeier: I'm so grateful to have gone through this experience with you. This dissertation has been a learning process for both of us, and I'm deeply appreciative of the way you approached it as a true partnership. While our research interests were not perfectly aligned from the beginning, it has been incredibly rewarding to see them come together over time in ways that have strengthened this work and shaped a meaningful intersection in our professional pursuits.

To my committee members Dr. Peter Dorhout, Dr. Mary Tolar, and Dr. Andy Wefald: You each brought a unique and important perspective to this committee, and I am so grateful for your support, insight, and investment in this work. You were committed from the beginning, and your guidance strengthened both the research and my development as a scholar and practitioner.

To Kent Glasscock: Just when my dreams of getting a PhD had faded, you challenged me to make it happen. You promised to do everything you could to support it, and you never wavered. Your personal, unfettered commitment to my growth and career has been one of the greatest fortunes of my life. It was an honor to work on your team for over a decade and a half.

To my work families, past and present: You have covered for me countless times over the last eight years, catching everything that was about to fall off the back of the wagon. Thank you for creating the space for me to succeed, often without recognition and always with generosity.

To my OSU colleagues: You have been an extraordinary support system in the final stretch of this journey. Your flexibility, encouragement, and willingness to step in where needed made it possible for me to bring this work across the finish line. I am deeply grateful.

To my UBC colleagues: This work reflects a much broader community of practice. Thank you for the conversations, the ideas, and the shared commitment to advancing university-industry collaboration. Your engagement informed this research in ways both direct and indirect, and I'm grateful to be part of such a thoughtful and globally connected community.

Kachi, Kiley, RJ, Roberta, Russell, Susan, and Saya: I would be hard-pressed to find a more positive and encouraging group for this journey. From colleagues, acquaintances, and strangers to some of my very best friends, "The Great Eight" turned this process into an act of collective leadership, lifting each other up every step of the way. Despite graduating years ahead of me, Roberta Maldonado Franzen, the ultimate cheerleader, has been pulling me forward every semester. And RJ Youngblood, going through the final push of this process alongside you made it all the more meaningful. I truly could not have done this alone. Thank you for dragging me across the finish line.

To my parents, Ann and Mark Spexarth: Perseverance and hard work are values you instilled in me from an early age, and without them, I would not be here. You created so much opportunity in my life and built a foundation for everything that followed. Regardless of how foreign this path was to all of us, your pride and quiet strength have meant more than I can fully express.

To my siblings and their spouses: My first friends and lifelong constants. We are so lucky to have each other. Thank you for the laughter, the grounding, and the reminders of what matters most along the way.

To my in-laws, Dena, Craig, Whitney, and Neil: To say I hit the in-law jackpot is an understatement. You have always treated me as one of your own and celebrated every milestone

along the way. Your interest in the mundane, your encouragement, and your unwavering support have meant so much. I am incredibly grateful for your love.

To Blake: This endeavor has been the ultimate disruption to our lives. Twelve of our seventeen years together have been a constant balancing act of work, school, and everything in between. I'm not sure you ever agreed to this, but nonetheless, you created space for me to succeed in every possible way. You picked up new hobbies to entertain yourself, cooked thousands of meals, and never once made me feel like this work was an inconvenience, even though it almost always was. Your patience, your constant concern for my wellbeing, and your love has been my lifeblood. I love you, and I'm so looking forward to what comes next, together.

Dedication

To my parents, Ann and Mark, and to Blake, for the foundation you built and the support that carried me through.

Chapter 1 - Introduction

Universities have traditionally pursued missions centered on research and teaching, while also engaging in activities that connect academic knowledge to society through service, outreach, and public engagement (Boyer, 1996; Kellogg Commission, 1999; Etzkowitz & Leydesdorff, 2000). In recent decades, universities have also faced increasing expectations to translate research into economic and societal impact through activities such as commercialization, entrepreneurship, and economic development (Benneworth & Fitjar, 2019; Etzkowitz & Henry, 2003; Rasmussen et al., 2006). Some scholars describe these developments as an emerging “fourth mission”, while others view them as an expansion of existing research and engagement activities. Growing external pressures have pushed for universities to demonstrate measurable returns on public investment and contribute directly to regional and national competitiveness (Ambos et al., 2008). Policymakers and the public now expect universities to collaborate with industry, accelerate innovation, develop talent pipelines, and translate research into economic and societal benefits.

Meanwhile, rising costs have also pushed universities to diversify their revenue streams and reduce their reliance on public funds. In response, many universities have sought ways to strengthen their collaborations with the private sector in order to remain relevant to key stakeholders and to secure additional resources to support the university’s primary missions. These efforts have included the expansion or formalization of institutional structures, policies, and units, such as technology transfer offices and industry liaison roles, to strengthen collaboration with industry partners. Recent research suggests that these organizational choices matter: Universities exert substantial influence over their innovation outcomes through institutional policies, incentive structures, organizational infrastructure, and cultural norms that

shape whether and how faculty pursue commercialization and entrepreneurship with industry (Clark et al., 2020). Organizational communication, including how institutions articulate priorities and expectations in strategic planning processes, may therefore play an important role in signaling the legitimacy and importance of industry collaboration within the university.

Universities have also attempted to encourage collaboration and foster a culture of engagement through communication from administrators, academic leaders, and industry engagement staff (Boardman & Ponomariov, 2009; Perkmann et al., 2013; Orazbayeva et al., 2019). Academic leaders often signal the importance of university-business collaboration (UBC) through strategic plans, internal communications, and incentive structures designed to foster a culture of engagement. In doing so, academic leaders play a central role in communicating institutional priorities and shaping how collaboration is understood and enacted across the organization. Evidence from high-performing research universities suggests that this leadership signaling, consistent messaging, and purposeful engagement with external partners are critical to cultivate institution-wide norms that support industry collaboration (Clark et al., 2020).

However, scholars also note that communication alone rarely alters faculty behavior unless it is accompanied by supportive institutional policies and incentive structures, such as recognition of industry engagement in promotion and tenure criteria, seed funding for applied research, or mechanisms that facilitate collaboration with external partners (Bouwma-Gearhart et al., 2021). These dynamics are explored further in the literature review, which examines the organizational and structural factors that shape faculty participation in UBC.

Reflecting this growing emphasis, the scholarly literature on UBC has expanded over time to encompass a wide range of collaborative activities and influencing factors (Perkmann et al., 2013; Ankrah & AL-Tabbaa, 2015; Galán-Muros & Davey, 2017; Rybníček &

Königsgruber, 2018; Orazbayeva et al., 2019). Collectively, this body of work conceptualizes multi-dimensional phenomena shaped by individual motivations, institutional determinants, external forces, and the diverse forms of engagement between higher education and industry. Among the most influential studies is Perkmann et al. (2013), who examined forms of academic engagement practices and policies and categorized them into activities such as contract research, collaborative research, consulting, and commercialization. Their work further emphasizes how individual and organizational conditions jointly shape engagement decisions. In this dissertation, academic engagement is understood as faculty and institutional interactions with external partners, encompassing a broad range of activities. Within this broader category, UBC represents a more specific domain focused on interactions between universities and industry partners, particularly in the context of research, knowledge exchange, and commercialization. This framing distinguishes UBC from the broader concept of outreach, which in many universities, particularly land-grant universities, includes a wider set of public engagement activities such as community partnerships, extension services, and public service. More recently, Galán-Muros and Davey (2017) introduced a holistic UBC Ecosystem Framework that positions collaboration as a system influenced by internal conditions, strategic relationships, and external environments. Their model encompasses eight forms of UBC, including curriculum development and delivery, student mobility, lifelong learning, professional mobility, research and development, commercialization, entrepreneurship, and governance. The current dissertation focused specifically on the research and development dimension of UBC, operationalized through industry-sponsored research activity, while recognizing that this represents one component of a broader ecosystem of university–industry engagement.

Statement of the Problem

Despite this growing body of research, much of the existing literature has concentrated on the presence, type, or frequency of collaboration (Perkmann et al., 2013; Ankrah & AL-Tabbaa, 2015; D'Este & Patel, 2007) rather than on the organizational processes that support or shape UBC activities. In particular, organizational communication has received relatively little attention as a factor that may affect institutional conditions leading to collaborative research outcomes. Universities routinely communicate their priorities, expectations, and opportunities for industry engagement through strategic messaging, administrative directives, and internal coordination mechanisms. In complex and decentralized organizations such as research universities, these communicative practices help signal institutional priorities, coordinate activity across organizational units, and shape shared understandings of strategic goals. Nevertheless, less is known about how these communication practices shape institutional readiness for UBC or influence the extent to which research collaborations with industry are pursued and realized.

Understanding this relationship has become increasingly important as universities adapt to competitive research environments, constrained budgets, and heightened expectations from the government, industry, and the public. Organizational communication may therefore represent an important, yet understudied, component of institutional capacity for collaboration. However, universities lack clear empirical guidance on how communication structures and practices may influence the extent to which institutional conditions lead to collaborative research outcomes. The current dissertation addresses this gap by examining the relationship between organizational communication about industry collaboration and the outcomes of the UBC process, specifically regarding industry-sponsored research activity.

Purpose of the Study

This study examined the relationship between institutional conditions and UBC process activities and assessed whether organizational communication moderates that relationship among higher education institutions. Institutions of interest were classified as R1 (“Research 1: Very High Research Spending and Doctorate Production”) and R2 (“Research 2: High Spending and Doctorate Production”) by the Carnegie Classification of Institutions of Higher Education (2025). R1 institutions spend at least \$50 million on research and development and award at least 70 research doctorates per year; R2 institutions spend at least \$5 million on research and development and award at least 20 doctorates (Carnegie Classification of Institutions of Higher Education, 2025). Drawing on organizational communication theory (Putnam & Nicotera, 2009; Mumby, 2013) and the UBC Ecosystem framework (Galán-Muros & Davey, 2017; McCoy, 2018), this study investigated how organizational conditions, including the nature of higher education institutions, institutional size, and classification or ranking, relate to university-industry research collaboration activities, and whether organizational communication strengthens these relationships. Utilizing organizational communication paradigms and institutional theory, this research explored communicative approaches to advancing UBC. By utilizing quantitative institutional data and quantitative content analysis of university strategic plans across multiple institutions, the current study sought to contribute to a more nuanced understanding of the organizational processes that support UBC and to inform both scholarship and practice in higher education economic engagement.

The study and its results will be used to engage a national higher education university-industry engagement community of professionals and higher education administrators to increase understanding of the relationships between components of the UBC ecosystem. Over time,

engagements with the university-industry engagement community through the research design and dissemination of research findings may lead to “future forming” (Gergen, 2015) to co-create new practices and shared knowledge on how to engage industry at the university.

Research Questions

Though prior research has established that organizational conditions are associated with collaboration with industry (Perkmann et al., 2013; Ankrah & AL-Tabbaa, 2015; Boardman & Ponomariov, 2009), less is known about how communication processes shape these relationships, particularly in research-oriented collaborations. Drawing on the UBC framework and organizational communication theory, this study addressed the following research question:

1. What is the relationship between organizational conditions and organizational communication toward university-business research collaboration process activities among higher education institutions?

To further examine the relationship between organizational conditions and organizational communication, the study tested the following hypotheses:

H₁: After accounting for covariation, organizational communication will significantly moderate the relationship between UBC organizational conditions and university-industry research process activities, such that the strength of the association between each organizational condition and industry-sponsored research will vary depending on the level of organizational communication. UBC organizational conditions include the nature of the higher education institution (public or private status, urban density, and percentage of STEM doctoral degrees), institutional size, and institutional classification or ranking.

H_{1a}: Organizational communication will significantly moderate the relationship between urban density and industry-sponsored research.

H_{1b}: Organizational communication will significantly moderate the relationship between STEM doctoral orientation and industry-sponsored research.

H_{1c}: Organizational communication will significantly moderate the relationship between institutional size and industry-sponsored research.

H_{1d}: Organizational communication will significantly moderate the relationship between public/private status and industry-sponsored research.

H_{1e}: Organizational communication will significantly moderate the relationship between institutional classification or ranking and industry-sponsored research.

H₂: Organizational conditions will be significantly associated with university-industry research process activities, independent of organizational communication.

Together, these hypotheses allowed for examination of both the direct influence of institutional conditions on research collaboration and the extent to which organizational communication strengthens or alters those relationships.

Conceptual Framework

This study builds on the UBC Ecosystem Framework (Galán-Muros & Davey, 2017), as adapted by McCoy (2018), and analyzed how these components, including organizational conditions, moderating mechanisms, mediators, and processes, relate to one another. The UBC Ecosystem Framework treats collaboration as shaped by interacting with UBC conditions, moderating mechanisms, mediators, and processes, rather than viewing it as a series of isolated transactions between universities and industry partners. When examining research and practice gaps within the UBC Ecosystem Framework, Orazbayeva et al. (2019) identify a persistent gap

between external stakeholders' expectations about the growing importance of university-industry collaboration and the current level of institutional capacity supporting collaborative research and industry partnerships.

Using the UBC Ecosystem Framework for Higher Education Institutions (HEIs), this study explored the relationship between UBC organizational conditions (e.g., the nature, size, and classification or ranking of HEIs); UBC moderating activities (communication); and UBC process activities (research activities). Within the UBC framework, organizational conditions refer to the relatively stable organizational conditions that shape the environment in which collaboration occurs. Prior studies suggest that these characteristics influence universities' capacity for and orientation toward collaboration with industry, particularly in research-intensive contexts (Perkmann et al., 2013; Boardman & Ponomarev, 2009; D'Este & Patel, 2007).

The central contribution of this study is its treatment of organizational communication as a moderating variable within the UBC ecosystem. Organizational communication is conceptualized as the internal structures, practices, and messaging that universities utilize to signal priorities, coordinate engagement activities, and support collaboration with industry partners. While communication is frequently referenced in the UBC literature (Galán-Muros & Davey, 2017; Orazbayeva et al., 2019; Perkmann et al., 2013), it has rarely been examined empirically as a mechanism that conditions collaborative outcomes.

UBC process activities represent the observable forms of collaboration that emerge within the UBC ecosystem, including the interactions among organizational conditions and moderating mechanisms. This study focused on university-industry research collaboration process activities, including externally sponsored research and related research engagement outcomes, as the outcome variable. These activities are widely used indicators of research-

focused UBC and are central to institutional strategies related to innovation and economic development. For the conceptual model guiding this study, organizational conditions were expected to influence UBC research process activities directly. Organizational communication was hypothesized to moderate this relationship by strengthening or weakening the extent to which institutional conditions are translated into research collaboration outcomes. In other words, institutions with similar organizational conditions or contexts may experience different levels of research collaboration depending on how intensely industry collaboration priorities are communicated internally. This conceptual framing positions organizational communication as an active organizational mechanism that shapes engagement processes, aligning with institutional theory and organizational communication scholarship that emphasize the role of communication in constructing meaning, coordinating action, and enabling organizational change. A visual representation of this conceptual framework is presented in Chapter 2.

Significance of the Study

This dissertation contributes to both scholarship and practice in UBC and economic engagement. It advances the UBC literature by analyzing organizational communication as a moderating mechanism within the UBC ecosystem. By positioning organizational communication as an active organizational mechanism rather than as a background condition, this study broadens both UBC scholarship and organizational communication research in higher education. Additionally, the current dissertation contributes to organizational communication scholarship by examining communication at the institutional level across multiple organizations. While organizational communication research has traditionally focused on interpersonal processes, internal organizational dynamics, or single organizational contexts, scholars have increasingly called for methodological expansion and greater attention to diverse levels of

analysis and research approaches (Stephens, 2017; Stephens, 2018; Walter & Meluch, 2019). By comparing organizational communication practices across a national sample of research-intensive universities, this dissertation offers a broader empirical perspective on how communication structures and practices relate to organizational outcomes. Additionally, it introduces a new scale for measuring institutional organizational communication supporting UBC, which can be applied and tested using other communication artifacts.

From a practical standpoint, the findings of this study are relevant to university leaders, academic administrators, and industry engagement professionals who are responsible for designing and implementing strategies to advance research collaboration with industry. Universities invest substantial resources in organizational units, such as technology transfer offices, industry liaison roles, and innovation initiatives; however, they often lack evidence-based guidance on how communication practices may support or constrain these efforts (Association of Public and Land-Grant Universities, 2021; Day, 2025; Siegel et al., 1999). This dissertation offers insights that may inform leadership approaches, internal messaging, and coordination strategies aimed at strengthening university-industry research partnerships.

Finally, this study is relevant for policymakers and external stakeholders who increasingly expect universities to demonstrate economic and societal impacts. As public funding for higher education remains under scrutiny, understanding the organizational mechanisms that foster effective industry collaboration can guide policy debates on research funding, innovation, and regional economic growth. Recognizing communication as a key factor influencing UBC outcomes, this research adds depth to our understanding of how universities adapt to external pressures and opportunities.

Methodological Framework

This study used quantitative methods, including a regression-based moderation analysis, to examine how proposed UBC variables, including organizational conditions (e.g., institutional size, classification, and ranking), moderating activities (organizational communication), and process activities (industry-sponsored research), were related. A regression-based moderation analysis evaluates both direct and conditional relationships among organizational conditions, organizational communication, and UBC process activities. This analytic approach allows for the examination of both direct relationships and moderating effects. Extant sources of data from R1 and R2 institutions designated by the Carnegie Classification of Institutions of Higher Education (2025) as having very high or high research activity were used to perform the analysis. The study used a cross-sectional, observational design, with the institution as the unit of analysis. This dissertation fills gaps in the literature on UBC and advances understanding of the organizational mechanisms that support university-industry research collaboration. While previous research on organizational communication focused on assessing communication within a single organization (Putnam & Nicotera, 2009; Mumby, 2013; Keyton, 2011), this analysis compared organizational communication at multiple universities as a predictor of UBC process activities. Prior research has also largely been qualitative in nature (Felin et al., 2015; Flanagan, 1954; Weick, 1995) and has focused on deeply understanding the multitude of communications within a single or small set of organizations (Hall & Lulich, 2021; Weick, 1995) rather than assessing the extent to which organizational communication within universities more broadly impacts industry-sponsored research outcomes. While these studies provide valuable insight into how communication operates within organizations, they have not generally examined communication as a measurable construct across institutions. This dissertation extends prior work by applying a quantitative,

multi-institutional approach, drawing on content analysis methods to operationalize organizational communication at scale (Rourke & Anderson, 2004).

To date, university strategic plans have been used as proxies to measure organizational communication or structural commitment variables related to interdisciplinary research and innovativeness at the university level (Barringer et al., 2020; Hall & Lulich, 2021; Harris, 2010; Leahey et al., 2019; Stutphen et al., 2019). Building on this work, the current study integrated textual and quantitative data from publicly available institutional documents to operationalize organizational communication in relation to UBC. The integration of textual and quantitative data to measure organizational communication supporting UBC represents a new advancement in the literature. Because existing measures do not capture organizational communication specifically related to UBC at the institutional level, this study developed and applied a new composite measure of organizational communication. Textual data were analyzed using computational text analysis methods to facilitate systematic coding; details on scale development and validation are provided in Chapter 3. Relevant organizational conditions were included as covariates to account for alternative explanations and to isolate the moderating role of organizational communication. Although the chosen analysis does not support causal inference, the temporal ordering of variables strengthens the interpretation of observed associations. This dissertation provides a broader understanding of how universities respond differently to increasing environmental pressures, including intensified competition for research funding, constrained public resources, and heightened expectations for contributions to economic development and innovation. In doing so, the current work also contributes to scholarship examining how organizational processes and institutional characteristics shape strategic responses within higher education (Bastedo, 2012; Powell & Colyvas, 2008).

Engaged Scholarship Orientation

This dissertation is grounded in an engaged scholarship orientation that emphasizes the joint creation of knowledge between researchers and communities of practice. Engaged scholarship is described as a collaborative and problem-centered approach to inquiry that incorporates the perspectives of multiple stakeholders to produce knowledge that is both academically robust and practically useful (Barge & Craig, 2009; Van de Ven, 2007). Instead of viewing research as an activity conducted independently of practice, this approach acknowledges that complex organizational and societal challenges are most effectively understood through continuous interaction between scholars and practitioners.

The research problem examined in the current study did not emerge in isolation. It represents the product of sustained engagement with a national and international community of academic and practitioner leaders working at the intersection of universities, industry, and regional economic development. In these contexts, a common challenge has been how institutions articulate, prioritize, and operationalize university-industry collaboration to produce meaningful outcomes and impact. This dissertation reflected on shared problem space—drawing on years of dialogue, observation, and professional practice—to develop research questions that responded to issues actively encountered in the field. Engagement in this study is reflected not only in the origin of the research problem but also in the design and execution of the research process. In developing the coding framework for organizational communication supporting university-industry collaboration, dozens of colleagues and collaborators from across a network of academic and practitioner communities were involved to assess the clarity, face validity, and practical relevance of the coding scheme. Feedback was solicited on the selection of UBC terms, the interpretation of strategic plan language, and the distinctions between aspirational and

institutionalized forms of engagement. These interactions informed the refinement of the codebook and helped ensure that the operationalization of key constructs accurately reflects how university-industry collaboration is understood and practiced.

Beyond the formal coding process, this dissertation has been shaped through ongoing conversations with practitioners and scholar-practitioners across various institutional, regional, and national contexts. These exchanges informed how research questions were shaped, how findings were interpreted, and how practical implications were developed. In this way, the dissertation reflects an iterative process of sensemaking where insights from practice and analysis mutually inform each other. Although the study did not use participatory methods to collect or analyze quantitative data, it was nonetheless grounded in a broader engagement process that situated scholarship within a community of inquiry and application. This approach aligns with perspectives on engaged scholarship that emphasize problem formulation, reflexivity, and knowledge circulation as key dimensions of engagement, rather than limiting engagement to the co-production of data alone (Bechara & Van de Ven, 2007; Van de Ven, 2007). It also reflects models of community-engaged research, in which scholarly inquiry contributes to ongoing dialogue and gradual shifts in practice and discourse (Nelson & Dodd, 2017). In this dissertation, engagement was expressed through the integration of practitioner perspectives into the research design, the analysis of institutional artifacts that emerged from multi-stakeholder processes, and the intentional orientation of findings toward use by external communities.

This work represents an effort to “close the loop” between research and practice. The conceptualization of the study, the development of its measures, and the interpretation of its results are all shaped by active participation with a community of economic engagement practitioners and academic collaborators. At the same time, the study upholds a commitment to

methodological rigor, transparency, and analytical independence, ensuring that the findings are empirically grounded and replicable. An additional contribution of this study to engaged scholarship is the development of the organizational communication measure itself. The coding framework and composite communication scale were designed not only as analytical tools for this dissertation but also to be foundational for future research and practice. By operationalizing how universities communicate industry engagement priorities, the organizational communication measure offers a structured way to compare institutional artifacts across different contexts and over time. This establishes a shared language that scholars and practitioners can use to assess the consistency between stated priorities and organizational activities. In this way, the measure functions as a boundary-spanning tool that supports ongoing dialogue, evaluation, and refinement of engagement strategies within and across institutions.

Finally, the knowledge gained from this research can re-engage and inform the communities where the research problem originated. Findings will be shared through academic publications, practitioner-focused outlets, conferences, and other venues that involve university and industry stakeholders. In doing so, this dissertation contributes not only to scholarly understanding of university-industry collaboration but also to the ongoing development of practices, strategies, and shared frameworks within the broader university-industry engagement community.

Definition of Terms

Key terms used throughout this study are defined as follows:

1. **Higher education institutions (HEIs):** HEIs are degree-granting colleges and universities in the United States that engage in research, teaching, and public service.

In this study, the term refers specifically to institutions classified as R1 or R2 by the

- Carnegie Classification of Institutions of Higher Education (2025), based on research activity levels.
2. **Industry:** Industry refers to domestic or foreign for-profit organizations (National Center for Science and Engineering Statistics, 2024). This definition frames UBC research process activities throughout the study.
 3. **Collaboration:** Collaboration is “a process in which a group of autonomous stakeholders of an issue domain engage in an interactive process, using shared rules, norms, and structures to act or decide on issues related to that domain” (Wood & Gray, 1991, p. 437). This definition frames collaborative relationships between universities and industry partners.
 4. **Organizational communication:** Organizational communication represents the formal structures, practices, and messaging at the institutional level through which HEIs express priorities, coordinate activities, and support engagement with external partners. For this study, organizational communication encompasses publicly available institutional strategic plan documents that reflect organizational intent and strategic focus, excluding interpersonal, informal, or unit-level communication processes.
 5. **University-business collaboration (UBC):** UBC represents formal and informal relationships between HEIs and industry partners that involve joint activities, resource sharing, or common goals. Here, UBC specifically refers to research-focused collaboration, including industry-sponsored research and related research engagement process activities. The terms university-industry collaboration and university-business collaboration are used interchangeably in the literature to describe partnerships

between higher education institutions and private-sector organizations. Consistent with this broader usage, this study treats university-industry collaboration and UBC as equivalent constructs.

6. **Organizational conditions:** These are institutional characteristics or context that influence the environment where UBC takes place. These conditions include the nature, size, and classification or ranking of HEIs.
7. **Industry-sponsored research collaboration:** Formal research partnerships between HEIs and industry partners that involve joint or contract research activities represent industry-sponsored research collaboration. This includes research funding provided by private-sector organizations to HEIs, leading to research expenditures recorded by the institution and reported to the National Science Foundation Higher Education Research and Development (HERD) Survey.
8. **Strategic plans:** Strategic plans are public-facing institutional documents that outline priorities, goals, and future directions for HEIs. This analysis treats strategic plans as organizational communication artifacts that both mirror and shape institutional commitments to UBC.
9. **UBC process activities:** These are observable forms of interaction between universities and industry partners that arise from organizational conditions and moderating mechanisms. The current research operationalizes UBC process activities as industry-sponsored research collaboration.

Assumptions, Limitations, and Delimitations

Several assumptions guide this study, which is subject to limitations and delimitations that shape the interpretation and scope of its findings. First, this study assumes that publicly

available institutional data and documents accurately reflect organizational communication, priorities, and structures related to UBC. It further assumes that extant national datasets used in the analysis are reliable, consistently measured, and reported across institutions and communities, making them appropriate for examining institutional-level variables. Additionally, the study assumes that organizational communication expressed through co-created institutional documents is meaningful for understanding how universities signal priorities and advance activities. However, such communication may not fully capture informal or interpersonal communication processes.

A limitation of the research is the cross-sectional nature of the study. Because the analysis was not longitudinal, the study cannot determine how UBC process activities change over time as organizational communication, leadership, or institutional culture change. Additionally, because industry partnerships can take substantial time to develop before yielding outcomes such as research agreements, changes in organizational communication may not be immediately reflected in measurable research collaboration outcomes; accordingly, these changes may not be represented in the national data collected.

This dissertation was observational and therefore cannot not establish causality. While the analysis examined associations and moderating relationships among institutional conditions, organizational communication, and UBC process activities, it could not establish causal directionality. Therefore, this dissertation did not aim to make generalizable claims about the correlation between institutional conditions, organizational communication, and UBC process outcomes. Unobserved institutional factors not included in this study may also be related to both communication practices and collaboration outcomes.

Another limitation relates to measurement. Organization communication is operationalized using institutional-level textual and quantitative indicators, which may not fully capture variation in communication practices within institutions or the perspectives of the individual faculty, staff, or industry partners. Similarly, measures of UBC were drawn from extant datasets and reflect reported outcomes rather than the full range of collaborative activity.

This study was deliberately delimited to HEIs classified as R1 or R2 by the Carnegie Classification of Institutions of Higher Education (2025). The focus on research-intensive institutions reflects the study's emphasis on research-oriented UBC and limits generalizability to institutions with lower levels of research activity. The study is further delimited to research-focused forms of UBC and does not examine other types of collaboration, such as student hiring, curriculum development, workforce training, colocation, philanthropic investments, or non-research services. Organizational communication was also examined at the institutional level and therefore does not include interpersonal or unit-level communication processes or documents. These delimitations were intended to focus the scope of the inquiry and to support systematic, comparative analysis across institutions utilizing the most consistently reported institutional data. Findings from this study may inform future research that examines organizational communication and UBC longitudinally, across additional institution types or collaboration types, or using alternative methodological approaches.

Chapter 2 - Literature Review

The role of universities has evolved from early institutions in 1,000 AD, which primarily focused on teaching with limited external engagement, to a second generation of universities, beginning in the nineteenth century, which incorporated research as a central mission (Etzkowitz, 2003). By the late nineteenth and early twentieth centuries, some universities began to adopt broader societal and economic roles (Davey, 2017). For example, the U.S. land-grant university system, established through the Morrill Act of 1862 and later expanded through agricultural experiment stations and extension programs, explicitly linked university research and education to regional economic development.

This literature review is organized around three major bodies of scholarship that inform the study of university-business collaboration (UBC): (1) historical and conceptual models of university missions and evolution, which contextualize UBC within broader shifts in higher education's societal role; (2) theoretical frameworks and empirical research on UBC itself, including types of collaboration and analyses of antecedents and outcomes; and (3) organizational and communication perspectives, which explore how internal university structures, cultures, and communication practices enable or limit industry engagement.

The review draws on peer-reviewed journal articles, foundational theoretical works, and relevant policy and practitioner reports identified through database searches using Google Scholar and Kansas State University library resources, as well as backward citation tracing. Priority was given to frequently cited works, recent empirical studies, and literature directly addressing university-industry collaboration and organizational communication. Collectively, this literature helps clarify both the strategic drivers and institutional complexities that predict universities' partnerships with industry. One of the most influential conceptual models

explaining the evolving relationship between universities, industry, and government is the Triple Helix framework.

Triple Helix Relationship Between University, Industry, and Government

With universities increasingly seen as important actors in innovation systems, the “triple helix” relationships between university, industry, and government have become a pillar of innovation strategies in the late twentieth century (Etzkowitz & Leydesdorff, 1997).

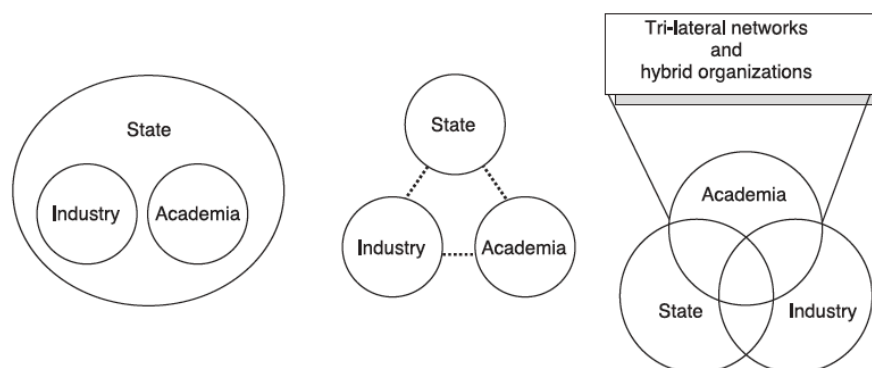
Socioeconomic, political, and financial crises have led to a decline in manufacturing industries in the United States from the mid-1970s through the early 2000s, impacting the transition of the economy from an industrial to a knowledge-based society. The pressures generated by the global financial crisis in 2008 heightened the significance of regional development and the interconnected roles of universities, industry, and government (Farinha & Ferreira, 2013; Potts, 2010). The competitiveness of companies, the stability of policy decisions, and the ability of universities to transfer knowledge to both industry and government became essential elements of economic development. Often initiated by policymakers, changes in expectations and missions for universities have led to shifts in institutional structures and the knowledge infrastructure (Perkmann et al., 2013). In the last decade, funders have intensified their expectations of science to drive innovation and make demonstrable contributions to the economy and society (Perkmann et al., 2021).

The triple helix model explores the blurring of traditional academic boundaries between industry and governmental institutions and the university’s new position in a knowledge-based economy. Placing the university in a leading innovative role equal to that of industry and government, the triple helix suggests that integrating elements from the university, industry, and government can drive innovation and economic development through new ways of producing,

transferring, and applying knowledge (Ranga et al., 2013). The triple helix model builds on a previous linear, one-way flow of knowledge model of engagement between university, industry, and government (Bush, 1945; Godin, 2006), by incorporating recursive and interactive factors.

Conversely, as shown in Figure 2, the triple helix suggests that knowledge flows in multiple directions and that the relationship between universities, industry, and government operates across overlapping spheres (Etzkowitz & Leydesdorff, 2000). Like the three strands of DNA, universities, industry, and government twist and interact to form a knowledge infrastructure; their roles may overlap or remain distinct but need not be wholly integrated or entirely separated (Leydesdorff, 2005). The model has multidimensional, complex dynamics, with internal transformations within each sphere, two-way influences between the helices, and interactions among the three spheres and their effects on society (Etzkowitz & Leydesdorff, 1998). Although the triple helix model has been applied across many national innovation systems, the structure of higher education institutions (HEIs) and their relationships with industry vary substantially across countries. Differences in governance structures, funding models, and institutional missions shape how university-industry collaboration develops within specific national contexts.

Figure 2.1. Evolution of the Triple Helix



Note. Etzkowitz (2003).

Efficacy of the Triple Helix in U.S. Contexts

While the triple helix framework provides a useful lens for understanding innovation systems globally, the structure of university-industry collaboration varies across national higher education systems. Because this dissertation examines research universities in the United States (U.S.), it is important to consider how the U.S. institutional context shapes patterns of collaboration and engagement. In U.S. public HEIs, multiple exogenous and endogenous factors may affect the triple helix (Ranga et al., 2013). One example, The Strategy for American Innovation, was launched under the Obama Administration as a successor to the Recovery Act (Executive Office of the President, 2011). This initiative aimed to strengthen the nation's innovation capacity by fostering competitive markets that spurred entrepreneurship, laying the foundational conditions for innovation and catalyzing breakthroughs in areas of national priority. Notably, the strategy highlighted the Federal Government's role in shaping an innovation ecosystem that links universities, industry, and government:

The American innovation ecosystem requires not only the risk-taking and vision of the entrepreneur and the ability of the corporation to scale these innovations, but also the foundational “building blocks” of innovation in which the Federal Government invests... For instance, Federally funded research at universities and Federal laboratories creates a stream of new insights and technological breakthroughs, some of which will ultimately be commercialized by the private sector. These investments also prepare the next generation of scientists and engineers, many of whom will pursue careers in private companies... Although the Federal Government's role of creating the right “rules of the road” and investing in the building blocks of long-term economic growth is less visible

than that of the entrepreneur, it is critical to America's economic future. (National Economic Council and Office of Science and Technology Policy, 2015, pp. 14–15)

This articulation underscores the importance of federal investments in research, talent development, and regulatory frameworks, which serve as the essential “infrastructure” enabling universities and industry to fulfill their respective roles within the triple helix model.

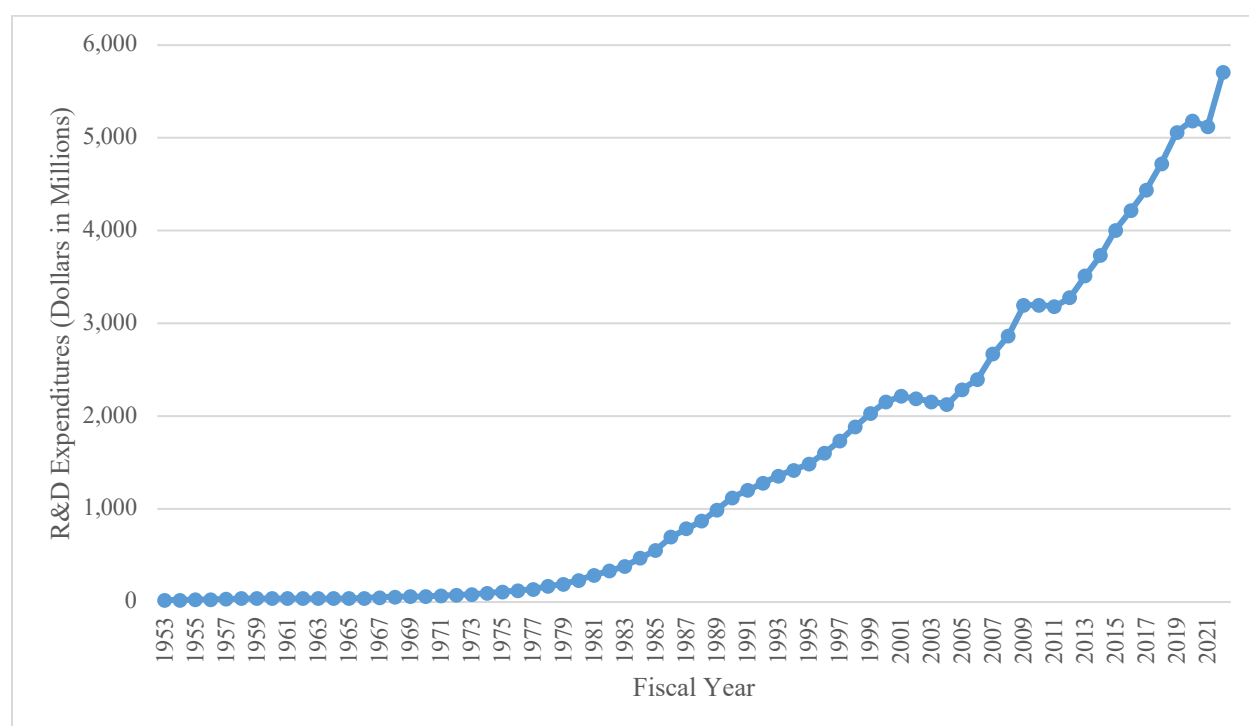
Similarly, another government-led initiative that impacted the triple helix included changes to intellectual property (IP) regimes, namely the Bayh-Dole Act of 1980, which established a uniform policy for intellectual property developed through federally funded research (AUTM, 2025). The policy enabled small businesses and non-profit organizations, including universities, to retain ownership of those innovations and encouraged universities to collaborate with commercial partners to promote the utilization of inventions developed using federal funding. It also created the expectation that universities protect the inventions they develop and give licensing preference to small businesses. This expectation was significant because it repositioned universities as proactive managers of IP rather than as passive knowledge generators, while directing the benefits of federally funded research toward small businesses and connecting higher education more directly to entrepreneurship, regional development, and broader economic competitiveness.

Since the Bayh-Dole Act, numerous other federal policies and initiatives have been enacted to reform the patenting process and encourage entrepreneurship and commercialization of research outputs (Mowery et al., 2004; Sampat, 2006; Etzkowitz, 2003). This exogenous factor prompted HEIs to become new, more significant sources of technology generation and transfer, formalizing and consolidating this process with the creation of technology transfer offices at institutions charged with protecting and deploying university-developed IP. Like

federal impetus, state governments have also played a significant role in influencing IP regimes and accelerating the expansion of technology transfer in higher education, including the growth and professionalization of university technology transfer offices and commercialization activities (Mowery et al., 2004; Sampat, 2006; Siegel et al., 2003; Siegel & Wright, 2015).

Complementing the roles of government and universities, the private sector has also influenced the triple helix, especially in transforming the technological foundations of economic growth. The triple helix is based on the recognition of a shift from an industrial society to a knowledge-based society. As this shift has taken place, industry has increasingly relied on universities' research infrastructure to achieve its research and development (R&D) goals. This activity has indirectly shifted some of their costs to the state and federal governments, which provide much of public university funding (Slaughter & Leslie, 1997). As shown in Figure 2.2, from 1953 to 2022, higher education R&D expenditures from business sources grew from tens of millions to several billion dollars annually, reflecting an increase of more than two orders of magnitude.

Figure 2.2. Higher Education R&D Expenditures by Business: FYs 1953–2022



Note. National Center for Science and Engineering Statistics, National Science Foundation, Higher Education Research and Development Survey (HERD) (2024).

Businesses provide only around 6% of academic research funding, but this share has increased by approximately 28% between 2010 and 2018 alone (National Science Foundation). Federal funding for academic research has been relatively flat over the last decade, while state and local governments' investments in academic R&D have steadily declined. Evolving trends in academic R&D funding sources further exemplify the critical role that universities play in innovation and development within the triple helix. Between federal investments in academic R&D through programs like the Strategy for American Innovation, increased private-sector investment, and changes in IP regimes, multiple exogenous factors have shaped collaboration among universities, industry, and government in the triple helix. While these factors have enhanced the university's role in advancing innovation within the triple helix, they can also have

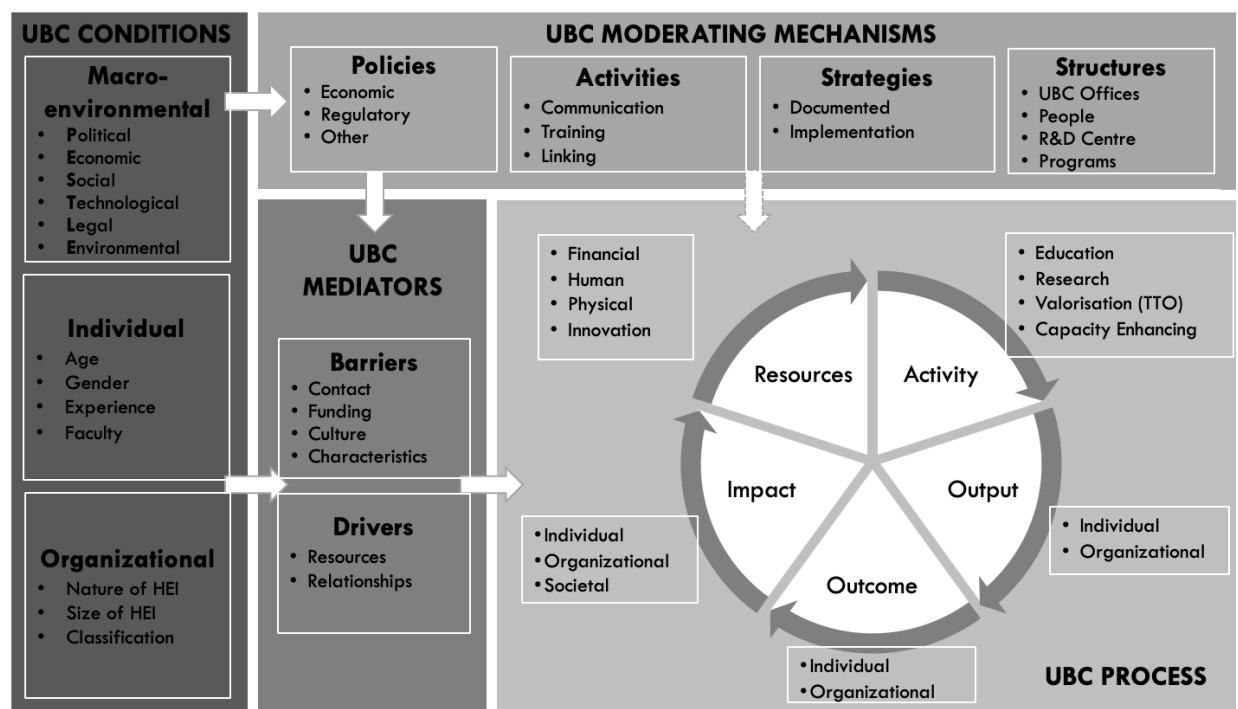
inverse effects. For instance, changing IP regimes, particularly the passing of the Bayh-Dole Act and universities' more aggressive protection and commercialization of IP, can also create barriers for collaboration. Hall (2001) describes common instances of failed research collaboration negotiations due to IP issues that create insurmountable obstacles, stemming from disagreements over IP ownership and publishing rights.

Building on the triple helix model, academic research assessing the nature of university-industry collaboration has expanded considerably (Perkmann et al., 2013; Ankrah & AL-Tabbaa, 2015; Galán-Muros & Davey, 2017; Rybníček & Königsguber, 2018). Although there has been growth in university-industry-related publications, there remain various gaps and deficiencies in the literature. First, much of the existing research has focused on technology commercialization, with other forms of interaction left underexplored (Galán-Muros & Davey, 2017). Second, there is a lack of published literature on university-industry collaboration that focuses on the U.S. context (McCoy, 2018), evidenced by significant publications from institutions in Europe and Australia. To develop a comprehensive framework for UBC, Davey et al. (2011) performed an exhaustive study of the state of cooperation between universities and companies in Europe to review indicators used in the context of UBC. Through this work, the researchers defined UBC as all types of direct and indirect collaborative interactions between HEIs and any public or private organization for mutual benefit. The goal of Davey's study was to develop a monitoring tool using existing indicators. Still, given the complexity and variability of UBC activities, the authors found a single tool insufficient.

Perkmann et al. (2011) attempted a similar analysis, drawing from existing research on university-industry relations to develop a success map as a tool for assessing university-industry alliances. They used measures that were both prospective and retrospective, as well as subjective

and objective, to distinguish between inputs, in-process activities, outputs, and impacts. Later work by Galán-Muros and Davey (2017) aimed to fill gaps in the literature surrounding an integrated conceptual framework for the UBC ecosystem, highlighting the essential processes, supporting mechanisms, circumstances, contexts, and interrelations. Later, studies tried to build on this framework, including McCoy (2018). As shown in Figure 2.3, McCoy refined the UBC framework and expanded the work to be within the U.S. context and beyond knowledge transfer activities. McCoy introduced philanthropy into the framework through conditional process analysis and created a model for future studies on the mediating and moderating effects of various UBC ecosystem components.

Figure 2.3. Adapted UBC Ecosystem Framework for Higher Education



Note. McCoy (2018); adapted from Galán-Muros and Davey (2017).

Although there is ample empirical evidence that UBC occurs across all three missions of higher education, questions remain about the applicability and explanatory power of the triple helix model and its associated theoretical frameworks in the U.S. context. Compared to European

contexts, differences in UBC are impacted by diverse institutional types and organizational formats (public versus private, and research-intensive versus comprehensive versus polytechnics); also of concern are varying institutional ages, funding structures, regulatory regimes, and stakeholder cultures. These contextual differences call for greater attention to how U.S. universities have interpreted and operationalized the idea of economic engagement.

In response, many U.S. institutions, especially public and land-grant universities, have sought to define their own approaches to engagement, often framing engagement as a mission-aligned responsibility. These efforts have led to a proliferation of national initiatives, organizational frameworks, and institutional strategies that reflect a broader interpretation of collaboration beyond the boundaries of the triple helix. The following section examines key trends in university-industry collaboration in the United States, highlighting how engagement has evolved as a strategic priority and an institutional practice.

University-Industry Collaboration Trends

Not long after Etzkowitz and Leydesdorff (1997) published their triple helix model of innovation, university leaders in the U.S., particularly those at state and land-grant universities, vocally adopted this third mission and framed it as an engagement function, striving to become productively involved with their communities (Kellogg Commission, 1999; Mowery et al., 2004; Perkmann et al., 2013). Based on findings from their national listening tour, the Kellogg Commission (1999) outlined parameters for what it deemed an “engaged institution”, including a commitment to sharing, reciprocity, and mutual respect for what partners bring to the table. In more recent years, the Association of Public and Land-Grant Universities (APLU) and the University Economic Development Association (UEDA) have advanced this work by developing an economic engagement framework, further defining university economic development and

engagement in higher education as: “proactive institutional engagement, with partners and stakeholders, in sustainable growth of the competitive capacities that contribute to the advancement of society through the realization of individual, firm, community, and regional-to-global economic and social potential” (APLU & UEDA, 2015, pg. 4). This APLU and UEDA-developed framework also includes a standard set of principles and a taxonomy of programs. Today, multiple associations, foundations, and organizations recognize and celebrate universities that deliver on this third mission.

Federal agencies have also intensified their efforts to drive university-industry research collaboration. For example, in 1973, the National Science Foundation (NSF) created the Industry-University Cooperative Research Centers (IUCRC) program to accelerate the impact of basic research through collaborations among the public, private, and academic sectors. After launching several other complementary programs in the decades that followed, NSF established a new Directorate for Technology, Innovation, and Partnerships (TIP) in 2022. To date, TIP supports a portfolio of programs and initiatives designed to advance use-inspired and translational research, accelerate critical and emerging technologies, expand the geography of American innovation, and build a competition-ready workforce, including efforts to support research translation, startup formation, and the evaluation of technology outcomes (<https://www.nsf.gov/tip/about-tip>).

Organizational Level Factors for UBC

As described previously, much of the literature on university-industry collaboration examines innovation systems at national or sectoral levels, focusing on how universities, industry, and government interact within broader economic and policy environments. However, collaboration ultimately occurs within individual institutions whose organizational structures,

resources, and strategic priorities shape how broader dynamics are translated into practice. As a result, understanding institutional-level factors is essential for explaining variation in university-industry collaboration outcomes.

As a highly complex phenomenon, UBC has been studied through various components of the UBC framework, including both organizational and individual-level factors. Institutional or organizational factors impacting UBC have historically received less attention, primarily because individual and scientific discipline level variables have been found to explain a significant portion of the variance in UBC (Abreu & Grinevich 2013; Bekkers & Freitas 2008; Boardman & Ponomarinov 2009; Perkmann et al. 2013; Schartinger et al. 2002; Thune et al., 2016). For instance, factors such as faculty members' prior industry experience, disciplinary norms regarding commercialization, and personal motivations, such as career advancement or access to funding, have been shown to significantly influence UBC engagement. Yet, growing evidence suggests that the organizational context, how a university is structured, governed, and positioned, also plays a significant role in shaping UBC outcomes (Perkmann et al., 2013; Ankrah & AL-Tabbaa, 2015; Boardman & Ponomarinov, 2009; Rybnicek & Königgruber, 2018). For example, faculty engagement may be influenced not only by personal experience or disciplinary norms, but also by the institutional environment in which they operate, including available infrastructure, leadership priorities, and incentive structures. This perspective expands the analytical lens beyond the individual, highlighting how institutional strategies, policies, and cultures can actively enable or constrain collaboration.

There is evidence of organizational-level influences on collaboration (Abreu & Grinevich, 2013; Bekkers & Freitas, 2008; Boardman & Ponomarinov, 2009; Perkmann et al., 2013; Schartinger et al., 2002; Thune et al., 2016). Particularly, decisions to strengthen specific

disciplines and institutional policies and activities that support external engagement are associated with university-industry collaboration (Abreu & Grinevich, 2013; Huisman et al., 2015). For example, Abreu and Grinevich (2013) found that UK universities expanding entrepreneurship education and business schools partnered more with industry, while Huisman et al. (2015) describe how Dutch universities' policies to incentivize applied research and SME collaboration deepened external engagement. Additionally, total research expenditures, institution size, presence of technical disciplines, and high degrees of specialization were all positively associated with industry investment in universities (Hewitt-Dundas, 2012; Perkmann et al., 2011; Thune et al., 2016).

To better understand how institutional structures and strategies influence collaboration, it is useful to examine how organizational-level drivers and barriers operate within the broader UBC ecosystem. Within the UBC framework, multiple studies have also been done to understand what drives and inhibits university-business cooperation. In a study of academics across 33 European countries, Galán-Muros (2015) analyzed an extensive set of drivers and barriers across seven UBC activities (curriculum design and delivery, lifelong learning, student mobility, professional mobility, R&D, commercialization of R&D, and entrepreneurship). Galán-Muros concluded that there was wide variation in how UBC activities were affected by barriers, with neither barriers nor drivers influencing all activities in the same way, and that while the identified drivers tended to significantly enhance university-business cooperation, defined broadly as joint research, commercialization efforts, student mobility, and other structured engagements, the identified barriers had more diverse effects. Barriers were most constraining for research and commercialization activities but had minimal impact on educational forms of

cooperation. Notably, the study found that in the absence of perceived drivers, academics often chose not to engage with industry, even when formal barriers were minimal or absent.

At the organizational level, researchers have identified institutional nature, including type, size, and classification or prestige of an institution, as contextual characteristics that can positively or negatively influence UBC. Cooperation with industry partners was more common among institutions with a greater emphasis on applied knowledge, both because of their faculty makeup and a higher likelihood of more developed tech transfer policies (Perkmann, 2012; Renault, 2006). Proximity to industry partners also affected collaborative research with universities, with shorter distances providing easier, cheaper opportunities to collaborate (Mansfield & Lee, 1996). Studies on the relationship between institutional size and UBC are relatively limited and present mixed findings (Van Geenhuizen, 2010; Rossi & Rosli, 2013; Mansfield & Lee, 1996). Institutional size is typically operationalized using indicators such as the faculty population or existing research expenditures. Some studies suggest that smaller institutions tend to collaborate more with industry partners, whereas larger institutions receive greater public funding and are more likely to collaborate internationally (Katz, 2000; Rossi & Rosli, 2013; Van Geenhuizen, 2010). Classification or prestige has also been shown to influence UBC, with higher-ranked institutions often receiving greater corporate investment and public visibility (McCoy, 2018; Perkmann et al., 2011).

Additional limited factors for UBC include perceived or real barriers to collaboration. Organizational culture differences, such as differences in motivation, time orientation, and market orientation, have served as barriers to university-industry relationships (Plewa et al., 2006). Additionally, while trust and commitment, shared goals, common motivations, and ongoing relations between partners have all been shown to reduce barriers and mitigate

orientation, internal structures, bureaucracy, and academics' individualistic ways of working have also been identified as factors that hinder collaboration (Bruneel et al., 2010; D'Este & Patel, 2007).

Organizational Communication

While prior scholarship has identified a range of structural institutional characteristics associated with university-industry collaboration (Bekkers & Bodas Freitas, 2008; D'Este & Patel, 2007), less attention has been given to the internal communicative processes through which universities articulate priorities, coordinate activities, and signal expectations regarding collaboration with industry. Organizational communication may therefore represent an important mechanism through which institutional strategies and conditions influence collaboration outcomes.

Organizations have been described as “processes which create, maintain, and dissolve social collectives, that these processes constitute the work of organizing, and that the ways in which these processes are continuously executed are the organization” (Weick 1965, p. 1). Like the ways economics, psychology, or sociology might explain organizational processes, communication can be a distinct way to describe and explain organizations (Deetz, 1994b; Pearce, 1989; Putnam & Nicotera, 2009). Treating communication as an explanatory factor reflects a communicative approach to studying organizations, which emphasizes that organizational priorities and actions are constructed and coordinated through communication, rather than determined solely by structural characteristics such as size, resources, or institutional type. Communication theory informs the “ways to explain the production of social structures, psychological states, member categories, difference, knowledge, power, and so forth rather than being conceptualized as simply one phenomenon among these others in organizational life”

(Deetz & Eger, 2014, p. 29). Communication is tailored to multiple organizational functions, including socializing, structuring, and controlling, as well as negotiating and coordinating activities (McPhee & Zaug, 2008). It can be formal or informal, planned or unplanned, verbal or nonverbal, written or visual, and in-person or mediated.

The field of organizational communication began in the 1940s in the United States to address concerns about organizing people in work settings more effectively and efficiently (Keyton, 2017). Over the next few decades, research focused on organizational production and on improving organizational life until the 1980s, when the field shifted toward a constitutive role for communication. The constitutive turn attempted to understand how knowledge was socially constructed by participants within organizations and between organizations in society. This shift was significant because it moved beyond seeing communication as a tool for transmitting information and instead positioned it as the very process through which organizations are created, maintained, and changed, addressing questions of meaning, identity, and power that earlier models had largely ignored. Research topics within organizational communication included superior-subordinate relationships, organizational culture, cross-cultural communication, communication skills, communication networks, and socially constructed power (Allen et al., 1993). Finally, during the 1990s, the field continued to widen with the integration of critical theories, which explored how communication can oppress and liberate organizational members and how change can be accomplished through communicative action.

Organizational communication theory has evolved significantly over the last several decades into a multi-theoretical plurality of research directions. Scholars have debated over the paradigm, including contestations between critical, interpretive, and post-positivist perspectives (Putnam & Pacanowsky, 1983; Mumby, 2013; Ashcraft et al., 2009). However, while the

divergences between these theories are debated, the field is more recently known for acknowledging and even integrating diverse philosophical and theoretical perspectives. Organizational communication is most often situated in three ways: as a phenomenon, as a self-described community of people, and as a way to describe and explain organizations (Deetz, 2001). Early theorists viewed organizational communication as a means of improving organizational life and production, treating communication as a mechanical process, and the organization as a container (Axley, 1984; Keyton, 2017). This traditional view of communication utilized a post-positivist approach that upheld the tenets of naturalism, falsification, transformational models, and emergent objectivity (Corman, 2005). Later, the introduction of an interpretive approach and development of organizational culture theories challenged the functionalist paradigm and advanced more social constructionism-based inquiry (Allen, 2005; Pacanowsky & O'Donnell-Trujillo, 1982; Putnam, 1983). While early scholars tended to use quantitative research methods, researchers have shifted preferences to qualitative methods with the interpretive turn in the 1980s (Putnam & Pacanowsky, 1983; Stephens, 2016; Wert-Gray et al., 1991). The qualitative shift in research methods during the 1980s and 1990s encouraged quantitative-based scholars to move beyond reliance on student subjects, contributing to broader efforts to study more diverse populations and enhance ecological validity and generalizability. In subsequent decades, this trend was further reinforced by critiques of WEIRD (Western, Educated, Industrialized, Rich, and Democratic) samples, which highlighted the overrepresentation of narrow populations in social science research, as well as by advances in technology that made diverse sampling approaches feasible (Henrich et al., 2010). Despite differences in perspectives on the best way to investigate organizational communication, scholars agree that organizing is the medium and the emergent accomplishment of communication

processes. Organizational communication scholars have also stressed the need for academic work to address contemporary issues and bolster a collective conversation that can contribute to a better world (Ashcraft, 2014).

Organizational Communication in UBC

Universities are widely considered by policymakers, international organizations, and scholars to be essential contributors to economic growth and competitiveness in knowledge-based societies, where intellectual capital, research, and innovation are central to value creation. As such, universities are being asked not only to educate and conduct research, but also to generate practical knowledge and actively transfer that knowledge into the broader economic system (Gassol, 2007). While there are serious debates about whether the university's increasing role in economic productivity undermines its traditional role as an unbiased generator of knowledge (Mirowski & Sent, 2008; Slaughter & Leslie, 1997; Washburn, 2005), this study, which investigated how universities use organizational communication to support and signal industry collaboration, assumes that knowledge transfer to the private sector can be positive for both universities and society. In other words, when managed carefully and appropriately, such engagement can expand applied research opportunities, generate new resources, enhance societal impact, and reinforce institutional relevance, all without compromising the integrity of the core research mission of the university.

Multiple studies have also been done within the UBC framework to understand what drives and inhibits university-business cooperation. In a survey of academics in 33 European countries, Galán-Muros (2016) analyzed an extensive set of drivers and barriers across 7 UBC activities (curriculum design and delivery, lifelong learning, student mobility, professional mobility, R&D, commercialization of R&D, and entrepreneurship). Galán-Muros concluded that

there was wide variation in how UBC activities were affected by barriers, with neither barriers nor drivers affecting all activities in the same way. While the identified drivers, including resource availability and relationship quality, were found to be positively associated with all seven forms of UBC, with multiple driver variables demonstrating statistically significant effects across the regression models (Galán-Muros, 2016), while the identified barriers also presented more diverse and activity-specific effects. Resource-related drivers included access to scientific knowledge, research facilities, human capital, and opportunities to address societal challenges; relationship drivers included mutual trust, commitment, shared goals, prior collaboration experience, and partner flexibility. These factors were particularly important for research and commercialization activities, which tend to be higher-risk and more complex. In contrast, barriers such as funding gaps, organizational bureaucracy, cultural misalignment, and insufficient incentives were found to significantly inhibit research and commercialization but were minimally correlated with education-related forms of cooperation such as curriculum design, lifelong learning, and student mobility. These findings also highlight an important asymmetry: While barriers may inhibit certain types of UBC, their absence alone does not guarantee collaboration. Faculty often choose not to engage with industry unless there are compelling drivers in place, such as access to resources, mutual trust, or shared goals, even when structural barriers are low.

Examining UBC from a communicative perspective provides an opportunity to explain how communication affects research collaboration with industry partners and, particularly, how communication can serve as a barrier or driver of UBC. Internal communications within a university are vast and range from formal documents such as mission statements and strategic plans to informal exchanges, like casual conversations. They range from verbal communications,

such as town hall meetings, to nonverbal communications, such as written press releases, or visual communications via collocated industry collaborators in a university research park. Universities are also organizationally complex, often characterized by distributed governance, layered structures, and loosely coupled systems (Kezar & Lester, 2009; Weick, 1976). Faculty members are usually most directly involved in industry research collaboration activities and often navigate these complex structures semi-autonomously. Therefore, how communication flows to and between faculty members—through central administration, department chairs, research offices, or peer networks—is critical to consider in understanding the university’s propensity to collaborate with the private sector. Communication functions not only as an informational conduit but also as a formative force, shaping how collaboration is perceived, valued, and practiced (Kuhn, 2008; Taylor & Van Every, 2000). When communication signals alignment with industry goals, articulates clear engagement opportunities, and fosters trust, it can act as a driver. Conversely, when communication is inconsistent, siloed, or fails to acknowledge the work of boundary-spanning faculty, it can become a barrier to effective collaboration (Ankrah & Al-Tabbaa, 2015; Friedman & Silberman, 2003).

The current study examined the broader landscape of universities and communications within HEIs to understand the relationship between communication and university-industry collaboration. Data were collected on the messages and characteristics of industry-collaboration-focused communications in university strategic plans at research-intensive universities in the US., as well as on UBC process activities, to determine how communications related to collaborative research activity levels. Using data from university strategic plans, this research examined how differences in communication across universities might explain variations in their levels of industry research collaboration. This research examined HEIs as organizations at the

macro level, treating them as entities and exploring how communication predicts measures of university behavior. While this research primarily embraces a post-positivist approach, it also considered more interpretive, constitutive approaches to understanding how communication constitutes organizing within a university.

Constitutive Turn in Organizational Communication

In the late 20th century, the organizational communication field adopted an interpretive view, shifting from a functionalist view of communication as a tool for control and social coordination to a focus on how meaning is created and negotiated in organizational life (Mumby, 2014; Putnam & Pacanowsky, 1983). This interpretive shift laid the foundation for constructionist perspectives, which view organizations as socially constructed realities rather than as objective entities. Constructionism emphasizes that knowledge, identities, and structures are produced through communicative interaction. However, as Deetz and Eger (2014) note, constructionism is not always consistently practiced; scholars often adopt constructionist language while still treating organizational features as stable or given. Historically, scholarly work has relied on a social constructionist approach that emphasizes products of communication—shared meetings, norms, and identities—over the dynamic processes through which they are co-constructed (Hawes, 1974). The constitutive turn in organizational communication builds on constructionism but makes a more explicit ontological claim: Communication does not merely reflect or construct organizations; it constitutes them. This means that organizations do not exist independently of communication; they are enacted through communicative processes, including texts, discourse, and interaction (Brummans et al., 2014; Taylor & Van Every, 2000). Constitutive approaches, such as the Communicative Constitution

of Organizations (CCO) framework (Putnam & Nicotera, 2009), explore how organizational features, such as roles, boundaries, and authority, emerge from communication.

Although the constitutive view of communication has existed for over 3 decades, the most significant progress in developing this perspective has occurred over the last 20 years (Sotirin, 2014). Recent process-oriented work focuses on the tensions, complexities, and conditions that shape communicative constitution, including how and when co-construction unfolds (Deetz & Eger, 2014). This perspective moves beyond static accounts to examine the generativity of communication as an ongoing organizing force.

The CCO field of inquiry emphasizes organizations as constituted through an inductive weaving together of communicative practices through interactions (Brummans et al., 2014). This ontological lens explores questions by focusing on the role of communications in producing and reproducing organizations. Many of the studies in this area have focused on specific communicatively constituted products, such as roles, rules, decision-making processes, routines, authority structures, and organizational identities, and how these products become stabilized and taken up as organizational “facts”. In contrast, recent scholars have adopted relational constructionism perspectives to understand the unfolding, situated moments when communicative co-construction takes place, including the relational dynamics, contextual conditions, and micro-level practices through which organizing emerges (Brummans et al., 2014). Whereas earlier CCO work often analyzed stable communicative “products”, such as roles or rules, relational constructionism highlights the interactional processes that enable those products, emphasizing the fluid, contested, and co-created nature of organizational life.

Building on these earlier turns, the collaborative turn in organizational communication builds on the constitutive view of communication, reflecting a growing emphasis on multi-

stakeholder engagement, dialogue, and collective sensemaking; this emphasis is in response to the increasing complexity of “meta-problems” (Koschmann et al., 2011), such as global crises and systemic challenges, that require inclusive, participatory forms of organizing.

Communication is thus viewed not only as constitutive, but also as an ethical and strategic resource for shared problem-solving and organizational transformation (Deetz & Putnam, 2001). Furthermore, Koschmann et al. (2011) suggest that the collaborative turn is due to increased complex “meta problems”, global interdependence, and growing numbers of stakeholders. A recognition of the collaborative turn has spurred organizational scholars to consider engaged scholarship approaches to co-construct future theory and research with members of external communities (Deetz, 2008). As outlined in Chapter 1, this dissertation is informed by an engaged scholarship orientation, as the research topic emerged from sustained practitioner engagement, and practitioner viewpoints helped shape the coding framework and interpret the findings. Although the study did not adopt a fully co-creative research design, it includes aspects of dialogic interaction between academic and practitioner communities.

These theoretical turns represent a cumulative evolution in the field: from understanding meaning making (interpretive), to recognizing the social construction of reality (constructionist), to theorizing communication as the very site of organizing (constitutive), to advocating communication as a tool for collaborative, democratic engagement (collaborative). This study aligns most closely with the constitutive and collaborative turns, examining how internal communication practices within universities contribute to their capacity to engage meaningfully with industry partners. In doing so, it extends CCO theory by emphasizing the role of internal boundary-spanning communication in shaping external-facing collaboration. This theoretical positioning also intersects with broader methodological debates in the field, particularly

questions on how best to study communication practices that are simultaneously situated and generalizable.

While an increasing number of scholars investigate organizational communication by zooming in on individual members' accounts of situations, there is also a recognition that we should not overlook the generalizing effects of practices across organizations (Brummans et al., 2014). Quantitative and positivist approaches that seek to generalize effects have been criticized for not adequately illuminating social construction that varies over time and space; however, most quantitative scholars today can be characterized as post-positivists (Miller et al., 2000; Phillips, 1987, 1990). Recognizing the flaws in classic positivism, post-positivism acknowledges social construction. However, it also assumes that knowledge can be gained through searches for consistent, patterned ways, as well as for causal relationships which are regularly "reified" and treated as objective among components of the social world (Miller, 2000).

Constitutive Approaches to Organizational Communication in UBC

As noted earlier, higher education is different from most organizations in that there is less formal authority dictating day-to-day activities than in many other types of organizations, particularly for research faculty. As part of their responsibilities, research faculty are expected to identify and secure research funding to sustain their research activities; however, it is not explicitly specified from which sources those funds should be obtained. For new faculty especially, mentorship from more experienced faculty and communication with departmental, college, and university leadership, as well as with peers at other institutions, all play an important role in navigating the complex responsibilities associated with engaging in UBC, including evaluating partnership opportunities, managing expectations, and aligning engagement with their research and career goals (Bercovitz & Feldman, 2008; Owen-Smith and Powell, 2001;

Perkmann et al., 2013; Stuart & Ding, 2006). Based on their life experiences, new faculty also bring a unique perspective to these conversations, often bringing new ideas and opportunities to the organization. Over time, these discussions help shape and reconstitute the organization's shared understandings, values, and expectations about industry engagement. In this way, communication between faculty and institutional actors is not merely informational; it plays a constitutive role in producing the university's culture around collaboration. These ongoing interactions define which industry relationships are desirable, legitimate, or strategically important within a given academic unit or institution. Thus, a constitutive approach to organizational communication offers a robust framework for understanding how faculty decisions and institutional norms around UBC are shaped by communication and continually made and remade through it.

Summary of the Literature Review

Long before the formalization of Galán-Muros and Davey's (2017) UBC ecosystem framework, researchers have investigated the multifaceted factors that influence UBC. As a highly complex phenomenon, UBC and its related research have examined various components of the UBC framework, both at the organizational and individual levels (Davey et al., 2011; Galán-Muros & Davey, 2017; Perkmann et al., 2011). Multiple studies have explored relationships between ecosystem variables, but most have focused on direct linear relationships while overlooking more complex models that account for mediating and moderating interactions (Galán-Muros, 2015). Studies have shown that age, gender, experience working with industry, and discipline or academic department all have direct relationships with UBC process activities, including education, research, technology transfer, and capacity building (D'Este & Perkmann, 2010; Galán-Muros, 2015; Plewa et al., 2006). Other studies have explored how UBC

moderating mechanisms, including policies, activities, strategies, and structures, and UBC mediators, including barriers and drivers, directly relate to UBC process activities (Bruneel et al., 2010; D’Este & Patel, 2007; Davey et al., 2011; Orazbayeva et al., 2019). Yet, few have examined how broader institutional conditions shape the effectiveness of these mechanisms (Boardman & Ponomariov, 2009).

Despite the richness of this literature, several conceptual and methodological gaps remain. While the UBC framework has been widely used to identify key factors and categorize collaborative activities, there has been limited empirical work testing more dynamic relationships within the framework, particularly regarding organizational-level conditions and communication practices. Moreover, few studies have systematically analyzed how universities signal and structure their collaborative intent through public-facing strategic documents.

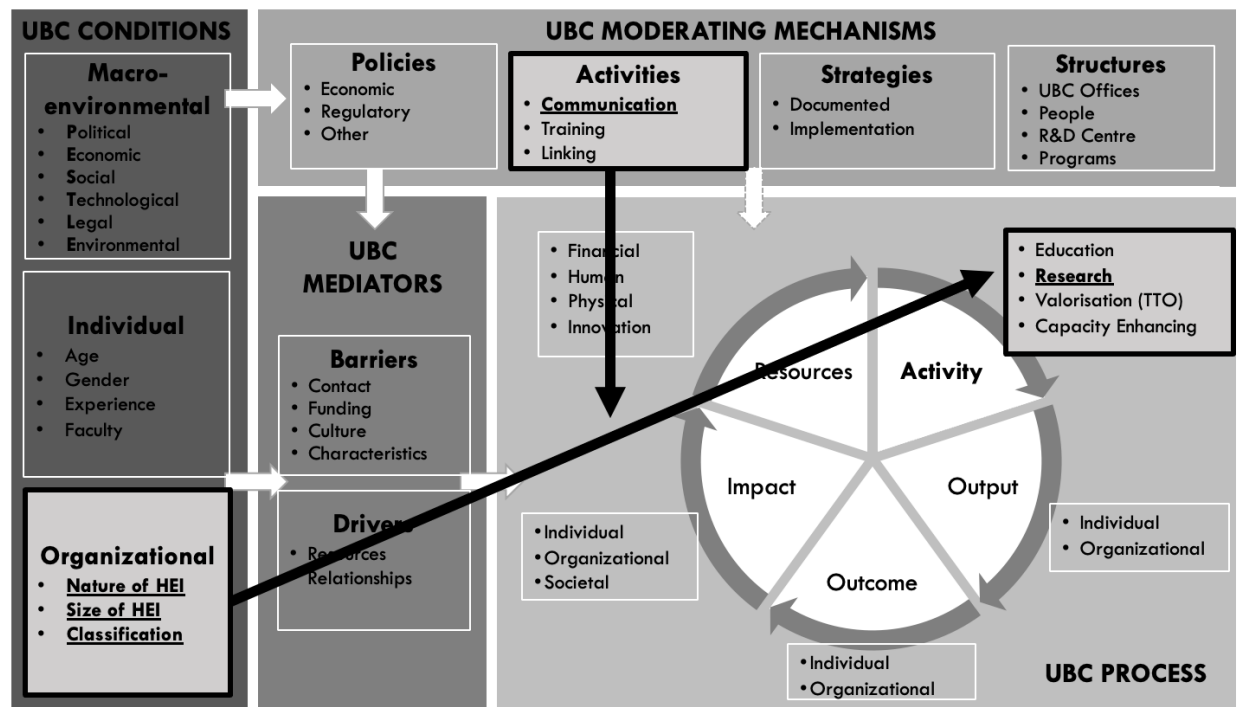
To address these gaps, this dissertation applied a constitutive and collaborative lens to examine how organizational communication, as captured in strategic plans, is associated with UBC. By analyzing the full population of R1 and R2 universities and modeling interactions among UBC conditions, moderators, and outcomes, this research advances both theoretical and practical understanding of how institutional context shapes collaboration. The next chapter outlines the methodology for operationalizing these constructs and testing their relationships.

Chapter 3 - Methodology

Using the University-Business Collaboration (UBC) Ecosystem Framework for higher education (McCoy, 2018; adapted from Galán-Muros & Davey, 2017), this dissertation explored the relationship between UBC Organizational Conditions, UBC Moderating Activities, and UBC Process Activities. The full framework is presented in Figure 2.3, while Figure 3.1 illustrates the subset of variables and relationships operationalized in this study. Previous quantitative studies of UBC have mainly used direct-effects models that assess linear relationships between organizational conditions and collaboration outcomes (Boardman & Ponomariov, 2009; D'Este & Patel, 2007; Rossi & Rosli, 2013). Although these approaches have helped identify broad correlates of collaboration, they assumed that organizational conditions had uniform effects across institutions. In this dissertation, organizational communication is conceptualized as one such mechanism that may condition how organizational conditions translate into research collaboration outcomes. The historic assumption contradicts both organizational communication theory and the UBC Ecosystem Framework, which highlight that organizational conditions are activated, amplified, or constrained through internal mechanisms rather than operating independently. Consequently, models that do not account for conditional relationships risk obscuring meaningful variation across institutions. Greater clarity about these variations can help explain why similar institutions experience different collaboration outcomes and can contribute to more context-sensitive theoretical models of university-industry collaboration. This study addressed this limitation by using a moderation analysis to explicitly test whether organizational communication conditions the relationship between organizational conditions and university-industry collaboration outcomes.

UBC organizational conditions assessed in this study included the nature, size, and classification of the higher education institution (HEI). Organizational communication supporting industry collaboration served as a UBC moderating activity. Industry-sponsored research served as the outcome variable for measuring UBC process activities.

Figure 3.1. Operationalization of the UBC Ecosystem Framework for This Study

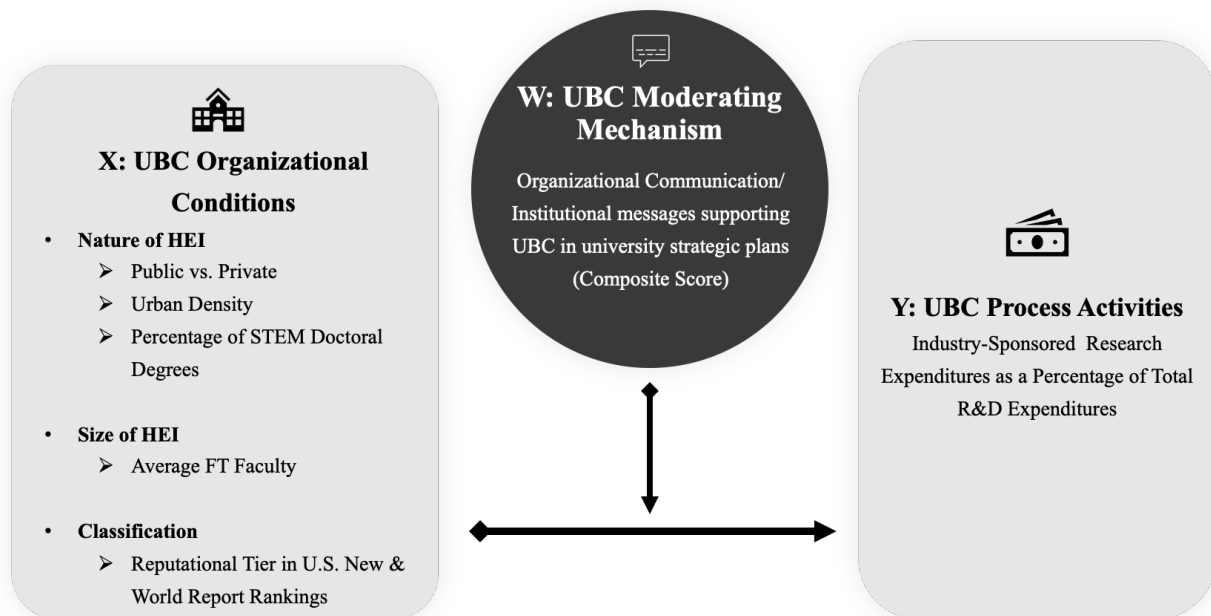


Note. Adapted from McCoy (2018) and Galán-Muros and Davey (2017). Highlighted elements and directional relationships represent variables and associations examined in this study.

One hypothesis of this dissertation was developed from prior studies by McCoy (2018) and Galán-Muros and Davey (2017) and was informed by the professional experience of the candidate. The hypothesis proposes that organizational UBC conditions, including the nature, size, and classification of the HEI, will be positively related to university-business research collaboration outcomes, and that this relationship will be conditioned by the level of organizational communication that supports UBC activities. As shown in Figure 3.2, a

moderation analysis was used to investigate the relationships between the UBC variables proposed in this model.

Figure 3.2. Moderation Analysis Conceptual Diagram



Note. This figure represents the moderation of the effect of organizational communication messages supporting industry collaboration on industry-sponsored research funding by organizational conditions as a conceptual diagram.

A quantitative, cross-sectional design was used to address the research question guiding this dissertation: What is the relationship between organizational conditions and organizational communication toward university-business research collaboration process activities among HEIs? As noted earlier, this approach allowed the study to move beyond estimating average effects and to examine whether similar organizational conditions produce different outcomes under varying levels of organizational communication. Such conditional relationships are theoretically consistent with constitutive and institutional perspectives, which emphasize that organizational structures and contexts are activated through communicative processes.

Moderation analysis was therefore employed to examine whether the strength or direction of these relationships varies across levels of organizational communication.

This analytic approach has been used in prior UBC research to examine how organizational mechanisms condition the effects of organizational conditions on collaboration outcomes (McCoy, 2018). Building on this work and prior UBC studies (Ćudić et al., 2022; Perkmann et al., 2013; Rybníček & Königsguber, 2018), the present study applied a similar moderation analysis to a broader population of research-intensive universities, focusing specifically on organizational communication as a conditioning mechanism rather than as a direct predictor. Analyses in the present study were conducted using regression-based moderation procedures to estimate interaction effects between organizational conditions and organizational communication, following established approaches to moderation analysis (Hayes, 2018). Analyses are conducted at the institutional level, with the university as the unit of analysis. All quantitative data were aggregated to reflect institution-wide activities, and document-based data were drawn from institutional-level strategic plans intended to represent organizational priorities and direction.

Population and Sample

The current study required both the use of extant secondary data on university-industry collaboration and new data collection on organizational communication measures at universities in the United States (U.S.). Measures for each variable and data collection methods are further defined in the following section. Since the study focused on industry-sponsored research as an outcome variable, only universities that were classified in two Carnegie Classification of Institutions of Higher Education (CCEIHE) classifications were considered: Doctoral University High Research Activity [R2] and Doctoral University Highest Research Activity [R1].

Institutional classification data were drawn from the 2025 Carnegie Classification of Institutions of Higher Education, which uses a 3-year average (2021–2023) or the most recent year (2023) of research expenditures and doctorate production to determine research activity levels. This ensured consistency with the study’s use of the National Science Foundation (NSF) Higher Education Research and Development (HERD) survey and Integrated Postsecondary Education Data System (IPEDS) data for explanatory variables and reflected the most current classification framework available at the time of analysis.

The 2025 CCIHE identified 326 institutions classified as either R1 or R2. A quantitative content analysis of these institutions’ strategic plans was used to collect primary data on organizational communication. Strategic plans are used here as intentional, public-facing communicative artifacts that both reflect and shape how institutions articulate priorities, including their stance on research, engagement, and external collaboration. From a constitutive communication perspective, such documents do not merely report strategy; they help enact and legitimize organizational direction. This rationale, including the inclusion criteria and operational definitions, will be further elaborated in the methodology section. Given the study’s goal of analyzing the entire population of R1 and R2 institutions, total population sampling was used. Strategic plans for all 326 institutions were sought through online searches and direct outreach to universities. While a representative sample of 162 institutions would be sufficient for generalizability at a 95% confidence level and 5% margin of error, using total population sampling eliminates the need for sampling error estimation. Additionally, a priori power analysis using G*Power software (Mayr et al., 2007) indicates that a sample of approximately 89 institutions is needed to achieve 80% power to detect a small effect size ($f = .15$) in a multiple regression model with up to 6 predictors. Therefore, the full sample of 303 institutions exceeded

both statistical and representational thresholds. The sample included 29% private and 71% public institutions, with institutional sizes ranging from 125 to 9,252 in average full-time faculty, and representation across diverse geographic contexts, providing broad coverage of research-intensive universities in the United States.

Variables, Data Sources, & Alignment to Research Questions

The variables in this study were organized to align with the research questions and hypotheses directly. This study includes three variable groups derived from the UBC ecosystem framework: UBC organizational conditions, moderating mechanisms, and process activities, which are further explained in this section. Organizational conditions (nature of the institution, institutional size, and classification or ranking) served as antecedent variables. Organizational communication functions as a moderating mechanism that may strengthen or weaken the relationship between these conditions and university-industry research process activities. Moderating variables are important in organizational research because they help explain when and under what conditions the relationships between institutional characteristics and outcomes are stronger or weaker. Rather than assuming that structural characteristics operate uniformly across organizations, moderation analysis allows researchers to explore how internal processes or contextual factors influence the way those characteristics translate into observable outcomes. In the context of university-industry collaboration, organizational communication may shape how institutional priorities, norms, and expectations activate structural conditions that support collaboration with industry partners. Industry-sponsored research, measured as a proportion of total research expenditures, served as the outcome variable. All models included the same set of institutional covariates to ensure comparability across analyses and to isolate the conditional role of organizational communication.

Sources of data included the 2025 CCIHE Research Activity Designations (R1/R2); the FY2024 NSF HERD survey; U.S. Census Bureau Gazetteer Files and 2019–2023 American Community Survey 5-Year Estimates; and the NCES IPEDS Completions (FY2021–FY2023) and Human Resources (FY2023) surveys. New data on organizational communication was collected by compiling strategic plans for U.S. HEIs that were active in FY2024. At the organizational level, researchers have identified the nature or type of the institution, its size, and its classification or prestige as contextual characteristics that can positively or negatively predict UBC (Huisman et al., 2015; Abreu & Grinevich, 2013; Thune et al., 2016; Perkmann et al., 2011).

Nature of HEI Variables

The variables used to represent the nature of HEIs, as conceptualized in the UBC Ecosystem Framework, serve as theoretically grounded proxies for structural institutional characteristics that shape universities' capacities and orientations toward collaboration with external partners. In this dissertation, the nature of the institution was operationalized through institutional governance structure, disciplinary orientation, and geographic context, which prior research suggests are related to opportunities for university-industry engagement (Abreu & Grinevich, 2013; D'Este & Patel, 2007). These measures do not capture the full complexity of organizational context, culture, or strategy; instead, they reflect structural and environmental characteristics that previous research has shown to be systematically associated with university-industry collaboration. Together, these indicators offer a simple and empirically justified way to represent institutional conditions that are relevant to research-focused collaboration with industry. Therefore, to capture the nature of HEIs, I examined whether universities were public or private not-for-profit institutions, the urban density of their main campus, and the percentage

of STEM doctoral degrees they produced. The presence of a medical school was considered a potential predictor. Although institutions with medical schools receive significantly higher total industry funding (garnering 377% more in total industry-sponsored research than non-medical schools), the difference in industry-sponsored research as a percentage of total research expenditures between institutions with and without medical schools is modest (an average 0.35% difference over the last 10 years) (NSF, 2024). Since the outcome variable was expressed as a percentage of industry-sponsored research, it was not included in the final model to avoid introducing a potentially confounding variable.

Public vs. Private Status

Public universities attract more industry-sponsored research overall due to their larger size, broader research portfolios, and that they are more likely to be classified as R1 and R2 (Mansfield & Lee, 1996; Cohen et al., 2002; Perkmann et al., 2013). However, private universities, on average, receive a higher percentage of their research funding from industry sources and a higher average total dollar amount per institution than public universities (R&D World, 2023). Factors such as research specialization, pay incentive structures, and institutional funding models may predict these differences (Belenzon & Schankerman, 2007). Public universities traditionally receive more significant and stable state and federal funding for operations and research than private institutions, reducing their historic reliance on industry funding. Public universities often place greater emphasis on basic research that benefits the public good and are more likely to receive federal grants than industry funding. Over the last 10 years (FY14–23), public universities' research portfolios have averaged 4.14% in industry funding, compared to 6.55% for private universities. However, over the last decade, public universities have received \$24 billion in investment, compared to \$18 billion for private

institutions (NSF, 2024). While public universities receive greater absolute levels of industry-sponsored research due to their scale and research breadth, private universities tend to exhibit higher proportions of industry funding relative to total research expenditures. Accordingly, public status was expected to be associated with lower proportional reliance on industry funding. However, this relationship was not assumed to be uniform across institutions; organizational communication was expected to condition how public or private status translated into research collaboration outcomes. These data were compiled from the FY2024 NSF HERD survey data.

Urban Density of HEI

The local context in which a university operates is an important consideration for understanding the extent to which universities collaborate with businesses. Particularly in the U.S., urban density, defined as the ratio of the total population of a city and its total area, boosts productivity and innovation, reduces travel needs, increases access to goods and services, encourages more efficient buildings and transportation forms, and allows broader sharing of amenities (Duranton & Puga, 2020). Density also facilitates the spread of information and ideas and provides greater access to larger pools of workers and jobs (Duranton, 2015). In terms of innovation activity, urban density is associated with a high elasticity of patenting, suggesting higher research productivity and greater concentration of research inputs in denser places (Carlino et al., 2007).

Proximity to industry partners also affects collaborative research with universities, with shorter distances providing easier, cheaper opportunities to collaborate (Mansfield & Lee, 1996). For universities, proximity to firms increases the reciprocal knowledge transfer benefits from academia through increased interactions and face-to-face connections that are necessary for the transmission of tacit knowledge and the generation and exchange of complex ideas (Breschi &

Lissoni, 2001, 980; van Oort et al., 2008). Even with the advent of modern communication technologies, differences in local contexts, time zones, culture, and language all continue to make distance work difficult to support (Morrison-Smith & Ruiz, 2020; Olson & Olson, 2000). Therefore, it was assumed the urban density near a university would present the same relationship with research collaborations between universities and businesses because of spatial proximity benefits (D'Este & Iammarino, 2010; D'Este, et al., 2013; Katz & Martin, 1997; Ponds et al., 2007).

Urban density was calculated as the ratio of total population to land area (in square miles) for the city or census-defined place where each university is located. This measure represents the conventional definition of urban density used in urban and regional research, calculated as total population divided by total land area (Ottensmann, 2021). Data were obtained from the U.S. Census Bureau's Gazetteer Files and the American Community Survey (ACS) 2019–2023 5-Year Estimates (released December 2024), providing the most recent contextual data available and the closest temporal alignment with the FY2024 HERD survey. Each institution was matched to the corresponding city or census-defined place reported in the Census data to calculate a consistent measure of local population density across the national sample of universities. Because urban density distributions are often highly skewed, the variable was log-transformed prior to analysis to improve normality and better satisfy linear regression assumptions. This transformation reduced skewness and improved model stability. Skewness is a concern because highly skewed data can violate linear regression assumptions, potentially causing biased or inefficient estimates; log transformation reduces skewness and enhances

interpretability in statistical analysis. The resulting variable captured the local spatial context of each university, reflecting proximity to industry and the concentration of research inputs.

Science, Technology, Engineering, and Mathematics (STEM) Doctoral Degrees

Academic discipline orientation has been shown to shape patterns of collaboration between individual faculty members and industry partners (Azagra-Caro, 2007; Boardman, 2008). Cooperation with industry partners is more common among institutions with a greater emphasis on applied knowledge, both because of their faculty makeup and their higher likelihood of having more developed technology transfer policies (Perkmann, 2012; Renault, 2006). Disciplinary affiliation also influences collaboration patterns; universities with “hard” technical or Science, Technology, Engineering, and Mathematics (STEM) disciplines, as well as more user-inspired or applied disciplines like business and media, are more likely to collaborate with industry (Abreau & Grinevich, 2013; Beise & Stahl, 1999; Lee, 1996; Hughes & Kitson, 2012; Meyer-Krahmer & Schmoch, 1998; Schartinger et al., 2002), particularly in collaborative and contract research. Thursby and Thursby (2011) suggest that these fields are where breakthroughs occur, thus requiring more tacit knowledge and actual collaboration rather than traditional mediated knowledge transfer. Alternatively, higher levels of industry collaboration in these fields may reflect differences in funding structures, as research in the social sciences and humanities often requires fewer financial resources (Perkmann et al., 2021).

Students play an important role in research productivity and annual research spending (Grunig, 1997; Rushton & Meltzer, 1981). The number of graduate students, especially those holding research assistantships in the sciences and engineering, positively affects research productivity by contributing directly to project-related research (Dundar & Lewis, 1998). Therefore, it was assumed that higher percentages of STEM doctoral degrees would be

correlated with higher levels of total research expenditures and with industry research as a percentage of total research. STEM intensity was operationalized as the percentage of STEM doctoral degrees awarded among all research doctoral degrees, serving as a proxy for each institution's disciplinary orientation. STEM doctoral degrees were identified using the NCES Classification of Instructional Programs (CIP) codes. Only degrees classified in IPEDS as "Doctor's Degree - Research/Scholarship" were included. STEM fields were identified at the two-digit CIP level using the NCES STEM CIP crosswalk and included disciplines such as engineering, computer science, biological sciences, and mathematics. To reduce year-to-year volatility while preserving temporal precedence relative to the FY2024 outcome measure, this variable was calculated as the average percentage of STEM doctoral degrees awarded across fiscal years 2021–2023. This measure served as a proxy for the institutional disciplinary orientation toward STEM-intensive and applied research fields.

Size of HEI Variable

Institutional size has received limited research attention regarding its influence on UBC, but there is some indication that smaller institutions tend to collaborate more with industry partners, while larger institutions receive greater public funding and are more likely to collaborate internationally (Katz, 2000; Rossi & Rosli, 2013; van Geenhuizen, 2010). According to Mansfield and Lee (1996), smaller universities with single R&D specialties related to local industries depend most heavily on industry-sponsored research. Based on this literature, it was expected that institutional size would be negatively associated with the proportion of industry-sponsored research. For this dissertation, institutional size was measured as the average number of full-time instructional, research, and public service faculty at each institution, as reported in the NCES IPEDS Human Resources survey across fiscal years 2021–2023. Averaging across

years reduces volatility and preserves temporal precedence relative to the FY2024 outcome variable. Because institutional faculty counts vary substantially across U.S. universities and are positively skewed, with a small number of very large universities having exceptionally large faculty counts, the variable was log-transformed prior to analysis to improve model fit and interpretability.

HEI Classification Variable

Classification or rankings of institutions were incorporated into the UBC framework by McCoy (2018) as an organizational factor affecting the UBC ecosystem. The CCIHE captures institutional research intensity and mission, while reputational rankings function as external signals of perceived quality and prestige. McCoy (2018) found that as institutions move up to higher classifications, perceptions of institutional excellence increase, and research and development (R&D) expenditures tend to rise. The study also found that corporate philanthropic investments increase alongside higher levels of R&D expenditures, suggesting that institutional classification and research capacity may shape external investments from industry partners. Several studies also suggest that faculty quality is positively correlated with industry engagement, especially for medical and biological sciences (Geuna & Nesta, 2006; Perkmann et al., 2011; Siegel et al., 2007).

College rankings emerged in the early 20th century, in the absence of standardized reporting from colleges and universities. They rose in popularity due to a transition to a more knowledge-intensive economy, the global pursuit of talent, the importance of higher education to the economy, and increasingly consumerist attitudes towards education (Hazelkorn, 2015). Although there is considerable skepticism that ranking systems accurately measure institutional

quality, sponsors of faculty research consult these evaluations and reputation when forming academic partnerships (Davis, 2016; Hazelkorn, 2014).

Researchers affiliated with lower-ranked academic departments tend to engage more frequently in consulting activities. In contrast, those in higher-ranked departments, particularly those with greater per capita industry research income, are more likely to participate in contract research regularly (Perkmann & D'Este, 2011). This suggests that departmental prestige and research funding structures may shape the nature and intensity of faculty engagement with industry. Therefore, higher institutional reputational standing is expected to correspond with higher levels of industry-sponsored research, reflecting reputational desirability and partner selection dynamics.

To assess each university's status relative to its peers, institutional reputation was operationalized using U.S. News and World Report National Universities rankings. Historical ranking data were compiled using an aggregated dataset of Top 150 National Universities rankings (Reiter, 2026), which consolidates published ranking information across years. Despite the existence of other potential rankings, the U.S. News and World Report rankings were selected because they capture reputational assessments independent of changes in quality and performance, encompass more U.S. universities included in the study, and remain the most prominent rankings in the U.S. (Bastedo & Bowman, 2010).

Rather than relying on precise ordinal positions, institutions were classified into reputational tiers based on the 3-year average of National Universities rankings (2021–2023). Institutions were categorized as Top 50, 51–100, 101–150, or not ranked in the top 150 during the observation period. The tiered approach captures meaningful differences in national reputational visibility while avoiding false precision associated with incomplete ranking

coverage. Averaging across years reduces volatility and reflects sustained reputational standing prior to the FY2024 outcome period. In the analytic models, this variable was treated as a multi-categorical predictor, with institutions not ranked in the top 150 serving as the reference group. Consistent with the theoretical framing of this dissertation, reputational status was treated as an antecedent organizational condition that may shape the baseline attractiveness of an institution to industry partners, while organizational communication was modeled as a moderating mechanism that conditions how reputational standing translates into observed levels of industry-sponsored research.

Organizational Communication Variable

Chapter two provided an overview of the literature related to organizational communication. Since no scale or measure of HEI organizational communication supporting UBC currently exists, a proxy variable was used to approximate it. To understand how a university communicates internally and externally about prioritized activities for the future, this dissertation focused on textual analysis of institutional documents, specifically university strategic plans. Strategic plans were chosen because they serve as an artifact of institutional planning processes and are a common deliberative practice for setting priorities, direction, and accountability (Hall & Lulich, 2021). In addition to signaling direction for a university, strategic plans articulate priorities and frame how internal and external stakeholders understand the university's goals and activities (Sutphen et al., 2019). Beyond their managerial function, strategic plans also operate as communicative texts that help construct and stabilize organizational meaning. Communication plays a central role in determining which issues come to matter strategically for organizations, as ideas become materialized and stabilized through discourse and documents (Bencherki et al., 2020). Scholarship in organizational communication

suggests that strategy documents are not merely records of past decisions; rather, they are organizational artifacts produced through internal discussions about priorities and direction that also shape how those priorities are understood and enacted within the institution (Spee & Jarzabkowski, 2011). Through iterative cycles of discussion and textual revision, these documents translate diverse perspectives into a more durable representation of institutional strategy, gradually acquiring authority as a reference point for future decision-making and coordination (Vaara et al., 2010). Strategic plans, therefore, function as both outputs and instruments of organizational sensemaking. They crystallize the institution's collective interpretations of what matters most while simultaneously communicating these priorities to internal and external audiences. In this way, strategic plans contribute to the construction of institutional identity, signaling values, aspirations, and areas of emphasis to stakeholders while guiding internal understanding of the university's mission and future direction.

It is important to recognize that this study did not aim to measure interpersonal communication practices, faculty attitudes, or the enactment of communication at the individual or unit level. Instead, it focused on organizational communication at the institutional level, as expressed through publicly available strategic documents that articulate priorities, commitments, and future directions. These documents are treated as organizational artifacts that signal and legitimize the institutional focus rather than as detailed accounts of lived communication experiences.

The priorities communicated in strategic plans can be reinforced by academic leaders and through peer conversations, gradually becoming embedded within an institution's culture. A previous study of efforts to drive interdisciplinary collaboration within universities showed that a significant approach to catalyzing organizational change is the role of administrative leaders in

developing and fostering a belief system in support of collaboration through the management of myths, symbols, and images (Harris, 2010). While senior leaders can introduce financial or structural changes, their most significant influence exists in creating a supportive environment and encouraging a culture of collaboration. This culture can be fostered by creating shared beliefs through language (Harris, 2010). Shared language facilitates socialization, as well as the establishment and communication of cultural signifiers (Barker & Galasinski, 2001). Language is also used by administrators to convey symbolic outcomes, even for those not directly involved in decision-making, thereby creating a sense of involvement or legitimacy (Edelman, 1985). For example, some faculty members or programs may receive tangible benefits, such as additional resources to support collaboration efforts. In contrast, others may be satisfied with non-material gestures, including praise, acknowledgement, or statements about the importance of collaboration to the university. The use of symbolic language can maintain control, morale, or buy-in by making more people feel included, even if only symbolically.

Academics are also conditioned and often take cues from their peers and professional networks (Perkmann et al., 2021); this aligns with micro-foundations theory, which emphasizes that organizational norms, strategies, and commitments emerge from the sensemaking, decisions, and actions of individual actors (Felin et al., 2015). Researchers' engagement with industry can signal and reinforce the institution's broader commitment to collaborative research and innovation (Felin et al., 2015; Weick, 1995). Faculty, graduate students, and postdocs develop their understanding of and responses to industry collaboration opportunities through ongoing communication with peers, department heads, and administrative leaders. These interactions can shape shared understandings, highlight emerging priorities, and surface perceived barriers or successes in university-industry collaboration. Over time, these grassroots insights and narratives

accumulate and are conveyed upward through formal mechanisms (e.g., committee reports, faculty senate input, strategic planning forums) and informal channels (e.g., conversations with deans or research officers).

As individual and collective perspectives are interpreted by university leadership, strategic planning committees, and consultants, they can influence the language, goals, and priorities articulated in institutional strategic plans. For example, repeated expressions of interest in applied research, concerns about shifts in federal research funding, or frustrations with institutional barriers to industry engagement may prompt leaders to institutionalize support structures, such as dedicated corporate engagement offices, revised incentive systems, or explicit goals in strategic documents. In this way, faculty sensemaking not only informs internal dialogue but also serves as a critical input into the university's evolving strategic vision.

Whether top-down or bottom-up, this organizational communication within an institution ultimately manifests as artifacts, such as strategic plans, presidential speeches, and mission and vision statements. Researchers have studied these public expressions of priorities for specific content, including interdisciplinarity, internationalization, organizational orientation, and innovativeness (Hall & Lulich, 2021), using quantitative content analysis, where communication content is categorized and classified. While strategic plans are aspirational by nature, they function as authoritative organizational texts that signal institutional priorities, allocate attention, and legitimate particular forms of action, making them appropriate indicators of institution-level organizational communication rather than direct measures of implementation.

Strategic Plan Collection for Organizational Communication Variable

To capture organizational communication supporting UBC, strategic plans for each university were collected. The population for this study included 323 R1 and R2 universities

based on the 2025 Carnegie Classification. Currently, there are 326 R1 and R2 universities; of these, 3 institutions have multiple IPEDS UnitIDs that are considered separate institutions in the Carnegie Classification, but they report their research expenditures to the NSF HERD survey as a single institution. Since research expenditures were the dependent variable in this dissertation, those institutions were analyzed as a single institution for this analysis. Strategic plans were collected for institutions where an institutional strategic plan could be identified that was active during the outcome variable period (FY2024). In many cases, the active, published plan in FY2024 was still the current active plan, while in others, where a more recent plan had replaced the previous one, an archived version was retrieved using the Wayback Machine. When a plan was not publicly available on the university's website or was only available in a web-only version and not easily downloadable, the university was contacted to obtain the plan or a PDF version to ensure a complete plan was captured. Strategic plans varied substantially in length, format, and accessibility. Some plans were distributed as downloadable PDF reports, while others were embedded within interactive web pages. For plans that existed only in web-format, and when the university did not respond to outreach to provide a complete PDF version, all pages associated with the strategic plan were downloaded, printed to PDF, and compiled into a consolidated PDF document to ensure the complete plan was captured for analysis.

PDF reports also varied in their underlying structure. Some files contained machine-readable text, while others were image-based or otherwise not easily readable by text-mining software. When necessary, these documents were processed using optical character recognition (OCR) to convert the files into machine-readable text. After preprocessing, each institution was represented by a single, consolidated strategic plan document that served as the input corpus for the dictionary-based text mining. A total of 298 strategic plans were obtained from university

websites, and an additional 5 were confirmed to have a web-only version available and were therefore obtained directly from the universities. Due to the large volume of textual data involved in this analysis, a two-stage automated analysis process was employed to ensure both scalability and conceptual alignment with the theoretical construct.

Dictionary-Based Text Mining of Strategic Plans

First, to measure the prevalence of organizational communication supporting university-industry collaboration, the strategic plan corpus was analyzed using a quantitative content analysis, specifically dictionary-based text mining procedures implemented in the R, conducted within the RStudio integrated development environment (Posit Team, 2026). A custom dictionary of keywords and phrases associated with university-industry collaboration was developed using the steps outlined by Rourke and Anderson (2004) to inform a theoretically valid coding protocol. First, the purpose of the coding was defined as measuring the intensity of organizational communication messages supporting industry collaboration and examining the moderating effects of communication on the relationship between UBC organizational conditions and UBC process activities. Next, behaviors representing the construct were identified through a literature review and direct observation of strategic plans to develop relevant and representative coding indicators, as well as the critical incident technique (Flanagan, 1954), which involved soliciting practitioners and academic administrators to describe relevant language. In this process, a sample of 20 diverse strategic plans from universities (roughly 5% of the total population) was reviewed to identify additional language revisions to include in the quantitative content analysis. This subsample, drawn to reflect institutional diversity, enabled the identification of emergent language and phrase patterns that might not have been captured in the initial keyword development from the literature and stakeholders. Because universities can be at

different stages in articulating and institutionalizing their UBC efforts, the coding scheme was used to identify not only the frequency of industry-related language, but also the maturity of collaboration strategies as reflected in contextual language. Maturity was assessed at the level of the specific statements within strategic plans, distinguishing between aspirational or developmental framing and language indicating established, embedded approaches to industry collaboration. For example, one strategic plan emphasized building on an existing legacy of industry engagement, with an objective stating they would: “Expand our collaborative research activities with industry through direct engagement at all levels, from industry-defined student projects to truly integrated activities designed to guide aspects of fundamental research and advance research outcomes to a commercially feasible endpoint” (Arizona State University, 2023, p. 5). In contrast, another plan framed industry engagement as an area requiring further development, noting that “the University needs to find ways to cultivate interaction between its faculty members, researchers, and students and their counterparts in the non-profit, corporate, and government sectors” (Princeton University, 2016, p. 20).

From this review, conceptual categories and indicators were established to capture organizational communication supporting university-industry collaboration. Indicators included the frequency of industry-related language, encompassing both explicit references (e.g., industry, business, corporate, private sector, and companies) and commonly used proxies for industry engagement identified in the UBC literature (e.g., applied or translational research, commercialization, technology transfer, entrepreneurship, and innovation partnerships). Because strategic plans often signal industry and research collaboration through broader innovation and engagement frames, general engagement terms (e.g., external engagement, partnerships, and outreach) were included only when their context clearly referenced collaboration with industry or

mechanisms that reasonably support industry-sponsored research activity. In addition to frequency, contextual language surrounding the industry-related references was analyzed to assess the maturity of institutional strategies, distinguishing between aspirational or developmental language and established, embedded approaches to industry collaboration. Finally, the age of each strategic plan was captured to account for the temporal relevance of communicated priorities. Together, these indicators were designed to measure not only the prevalence of industry-oriented communication but also how well universities expressed organizational commitment to research-focused collaboration with industry, aligning the communication measure conceptually with industry-sponsored research outcomes.

Draft coding guidelines describing the indicators, contextual inclusion rules, and maturity scoring procedures were developed and reviewed by over 20 practitioners and researchers with experience in university research administration, industry engagement, economic development, and technology transfer. Consistent with the engaged scholarship orientation of this dissertation, practitioner feedback was incorporated during the development of the coding framework. Feedback from these reviewers was used to clarify definitions, refine inclusion criteria, and finalize the coding categories and indicators to improve construct validity and interrater reliability. The coding scheme, including the UBC text-mining dictionary, is included in Appendix A.

R software (R Core Team, 2026) was used to perform automated text mining using the custom dictionary of university-industry collaboration keywords, with the procedures implemented through the RStudio integrated development environment (Posit Team, 2026). This procedure enabled the automated identification and extraction of statements within each strategic plan containing UBC-related language. Preliminary testing of the dictionary and extraction

procedures were conducted on a subset of 40 strategic plans. This subset, comprising roughly 12% of the total sample, was selected to represent a range of institutional types, including R1 and R2 universities and public and private institutions. The diversity of the sample allowed for refinement of the coding scheme across varied strategic language and organizational contexts. Based on the results of the preliminary tryouts, categories and indicators were adjusted as necessary. Indicators that were not being used were abandoned, unreliable indicators were reworded or discarded, and indicators that were conceptually misaligned were removed or manually reviewed for inclusion. After finalizing the dictionary and coding procedures, the automated extraction process was applied to the full sample of strategic plans. While many instances occurred within complete sentences, strategic plans frequently present priorities using bullet points, headings, or short phrases. Therefore, the extraction process was designed to capture the text segment containing the complete strategic sentiment containing the dictionary trigger, which could include a full narrative sentence or an entire bullet point containing the relevant language. In narrative sections, paragraphs were reconstructed from the original document layout and segmented into sentences using automated tokenization. In bullet-based sections, each bullet point was retained as a single unit rather than being divided into sentences to preserve the structure of the strategic commitment being communicated.

In addition to extracting the triggering text segment, the script also captured contextual language surrounding the extracted segment. Specifically, the automated procedure retrieved the text segment containing the triggering language along with the sentence immediately preceding and the sentence immediately following it, creating a three-sentence contextual window. When full sentences were not extractable because of the document format (e.g., bullet structures), a fallback procedure extracted a contextual window consisting of 40 words before and 40 words

after the extracted text segment. This produced a short contextual passage intended to preserve the surrounding meaning of the extracted statement for later maturity coding of those passages. Providing contextual text was important because strategic plans often communicate across multiple sentences, and while the sentences surrounding the trigger statement may not explicitly use UBC dictionary language, they may provide meaningful context that could inform the subsequent maturity-coding process to determine whether the language reflected aspirational intent, programmatic activity, or embedded institutional strategy. For each plan, the text mining procedure generated a dataset containing: (1) the extracted text segment containing the dictionary trigger, (2) the surrounding contextual passage to support maturity coding, and (3) metadata identifying the institution and location of the text within the plan.

The extracted statements were then reviewed through iterative manual checks of large samples of extracted passages, with several hundred passages examined at each stage to identify potential extraction errors, false positives, or formatting artifacts resulting from document layout issues. The statements were then used to calculate institution-level frequency measures by counting the number of extracted UBC-related statements from each plan and normalizing these counts by total plan word count. The sentence or text segment served as the primary unit of analysis for the frequency analysis because strategic plan language often communicates discrete institutional commitments or goals within sentence-level statements.

Large Language Model (LLM) Classifier for Maturity Coding

The extracted text segments containing industry-related language were evaluated using a large language model (LLM)-assisted classification system to assess the maturity of the language used to describe industry collaboration. The use of LLMs for qualitative coding has expanded rapidly as empirical evaluations have demonstrated performance comparable to, and even

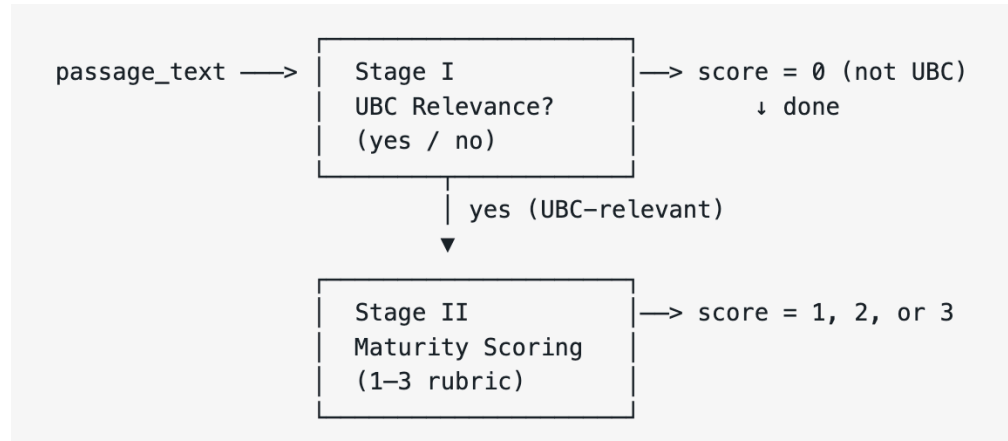
outperforming, human coders across a range of social science tasks (Törnberg, 2023). Recent studies show that LLM-based classifiers can achieve human-level intercoder agreement in text annotation, including tasks involving abstract constructs and complex labeling schemes (Lupo et al., 2023; Rytting et al., 2023). Evidence further suggests that LLM-assisted coding demonstrates acceptable agreement with human coders in both inductive and deductive frameworks while maintaining high internal consistency across repeated runs (Zhang et al., 2025). Relevant to this dissertation, performance improves when models are prompted using structured rubrics and detailed codebooks analogous to those provided to human coders (Lupo et al., 2023). Collectively, this literature supports the use of LLMs not as substitutes for theoretical interpretation, but as scalable, replicable decision-support tools that extend systematic content analysis to large textual datasets while remaining anchored in established coding frameworks. A recent study in a similar research area examining how promotion and tenure policies recognize and reward publicly engaged scholarship at Carnegie-classified community engagement institutions demonstrates the growing adoption of systematic, document-based coding approaches in higher education research, further situating structured classifiers within broader efforts to investigate institutionalization of collaborative academic practices (Pearl et al., 2025). Consistent with this approach, the current dissertation employed a structured, rubric-based Generative Pre-trained Transformer (GPT) model used as a classifier, calibrated against human-coded benchmarks and evaluated using established intercoder reliability metrics.

The maturity rubric and decision rules were developed by the author. The GPT-based classification pipeline and versioning framework were implemented and iteratively refined in collaboration with a technical consultant with expertise in AI-enabled administrative systems and data pipeline development in university research administration (John Sweet, Director of AI

Administrative Strategy and Implementation, Oregon State University Advantage), under the author’s conceptual direction. Candidate passages were first identified using keyword-based extraction, after which each passage was evaluated using a structured, rubric-based classification pipeline designed specifically for this study. Rather than relying on a continuous scale, maturity was operationalized as an ordinal construct reflecting increasing degrees of institutionalization.

While frequency captures how often universities reference industry collaboration, it does not capture how deeply those activities are embedded within institutional strategy. To assess this qualitative dimension, the contextual maturity of each extracted passage was evaluated using an AI-assisted classification approach. Each extracted passage was analyzed using a two-stage classification architecture designed to mirror the logic of the human coding process (see Figure 3.3).

Figure 3.3. Two-Stage Architecture for Maturity Coding of Organizational Communication



Note: This figure depicts the two-stage classification process used in this study to code organizational communication related to UBC.

The architecture followed a staged classification architecture to ensure consistency with the theoretical coding rubric (see Appendices B and C). In the first stage, passages were evaluated to determine whether they were relevant to university-industry collaboration. Passages

that referenced industry or external partners only incidentally, such as participation in a strategic planning process, were excluded from further analysis and assigned a score of zero. Passages identified as UBC-relevant were then evaluated in a second stage using a maturity rubric defining three levels of institutionalization:

1. **Level 1: Aspirational or Developmental (Score: 1).** Language emphasizes intentions, exploration, or future-oriented goals without evidence of established structures, sustained programs, or routinized practices. Examples include:
 - a. “The university seeks to build relationships with industry.”
 - b. “We aim to explore partnerships with corporate partners.”
2. **Level 2: Programmatic or Operational (Score: 2).** Language references existing programs, initiatives, offices, or activities that support industry engagement but are not positioned as fully institutionalized or central to the university’s strategy. Examples include:
 - a. “The university has launched a corporate affiliate program.”
 - b. “The technology transfer office supports licensing and commercialization activities.”
3. **Level 3: Strategic or Institutionalized (Score: 3).** Industry collaboration is positioned as embedded within institutional strategy; or, it is supported by governance structures, named leadership responsibility, policy integration, budgetary commitment, or institutional performance metrics; or, it is framed as an ongoing and integral component of the university’s mission or research enterprise. Language reflects organizational communication beyond standalone programs. Examples include:
 - a. “Industry partnerships are a core component of the university’s research strategy.”

- b. “Commercialization and industry-sponsored research are tracked through institutional performance metrics.”

Human-coded passages from 184 samples, coded by the author, were used as reference benchmarks to calibrate prompts, refine decision rules, and evaluate alignment between human and model-based classifications. Model architectures and prompt iterations were implemented and executed in collaboration with a technical consultant, with refinements guided by the author’s rubric and coding framework. Classifier reliability was assessed in two ways. First, run-to-run stability was evaluated by executing the model multiple times on identical inputs; agreement across runs was consistently high, indicating minimal stochastic variation. Second, model outputs were compared to human-coded benchmark data to assess construct alignment. Alternative architectures produced weaker performance, particularly in distinguishing intermediate maturity levels, and were therefore rejected. The final two-stage ordinal scoring approach was selected because it most closely matched human judgement, demonstrating 75.5% exact agreement with human-coded samples (Cohen’s $K = 0.665$), high run-to-run stability at 95.1% ($K = 0.931$), and outperformed alternative architectures in alignment with human-coded data. To improve reliability, the LLM-classifier functioned as a structured-decision-support tool rather than a substitute for theoretically grounded coding. Automated classification enabled systematic analysis at scale, while interpretive authority remained anchored in theory and human judgement. To enhance interpretability and guard against superficial classification, the model was required to generate a short textual justification for each assigned score. These justifications enabled post hoc inspection of model reasoning and supported alignment with the theoretical construct.

Final maturity scores were aggregated at the institutional level and averaged to incorporate into the communication composite score. This method balanced scalability with construct validity by combining theoretically grounded human judgment with a transparent, replicable LLM-based classifier. In this regard, the model was not treated as a substitute for theory or interpretation, but rather as a methodological tool that enabled systematic quantitative content analysis at scale. To support transparency, replicability, and future testing of this system, the complete AI-assisted coding pipeline, developed for this dissertation, in collaboration with a technical consultant, has been published in a public GitHub repository and is available for use and adaptation in future research (Robinson & Sweet, 2026). The prompt templates and rubric definitions applied in this study are also provided in Appendix B and C.

Composite Communication Score

Organizational communication supporting university-industry collaboration was conceptualized in this study as a multidimensional construct that not only indicates the presence of industry-related language but also the extent to which such communication is institutionalized and sustained over time. Frequency measured how often collaboration-related messages occur, while maturity reflected whether engagement was framed as aspirational or integrated into institutional strategy. The age of the strategic plan was incorporated to account for the temporal relevance of the communicated priorities, recognizing that signals conveyed through strategic plans may diminish in influence as documents become older and institutional priorities evolve. A multiplicative approach was used to create the composite measure, reflecting the theoretical assumption that these dimensions reinforce each other; frequent references that lack maturity or that appear in plans with limited temporal relevance are unlikely to have the same organizational

effect as communication that is frequent, well-institutionalized, and communicated through more current institutional planning documents.

A composite organizational communication score was calculated by multiplying the frequency of UBC-related content, the weighted average maturity score, and a temporal relevance weight derived from the age of the strategic plan. To account for the temporal relevance of communicated priorities, the age of each strategic plan was transformed into a decreasing temporal weight before being included in the composite score. The transformation assigned greater weight to more recent plans and progressively discounted older plans, reflecting the assumption that current planning documents more strongly signal institutional priorities. The transformation also ensured that the temporal variable remained positive so it could be used in a multiplicative index without producing zero values that would nullify the composite score. This temporal relevance weight was multiplied by the normalized frequency of UBC-related language and the average maturity score to construct the composite organizational communication score. This assumes a compounding effect of the variables, such that communication that is frequent, institutionally embedded, and communicated through more temporally relevant planning documents produces the strongest organizational signal. This composite variable was used as the moderating variable in the regression analysis, reflecting both the prevalence and depth of UBC-related communication within each institution. Since the coding scheme and analysis have been developed for this study, one limitation is the lack of empirical evidence for validity. Future studies could employ correlational analyses, group difference examinations, or experimental interventions to establish the test's validity (Messick, 1989).

Because no established institutional-level measure of organizational communication supporting university-industry collaboration previously existed, this study developed a composite

indicator grounded in prior UBC and organizational communication research. The measure is theory-driven rather than exploratory, with components chosen to represent conceptually distinct aspects of organizational signaling. Although further validation across different communication artifacts and temporal contexts is needed, the current approach offers a systematic and replicable method for measuring organizational communication at scale.

Research Activity Variable

Process activities between universities and industry take multiple forms, ranging from inter-organizational relationships, such as joint or contract research, to technology transfer and spin-off company formation (Bercovitz & Feldman, 2006; Bonaccorsi & Piccaluga, 1994; Carayol, 2003; Cohen et al., 2002; D'Este & Patel, 2007; Schartering et al., 2002). Among these activities, research collaboration is far more common than technology transfer or the formation of start-up companies (D'Este & Patel, 2007; Perkmann & Walsh, 2007). Research collaboration with industry takes multiple forms, including formal collaborative agreements that are often pre-competitive and subsidized by public funding, contract research that is directly commissioned by companies and is usually more applied, and consulting agreements that are also commissioned by industry partners to secure research or advisory services of individual faculty members (Perkmann, 2013). While all these research collaboration mechanisms are formalized through contracts, income generated by consulting agreements is often paid directly to individuals rather than to the university. In this dissertation, research collaboration is measured solely by industry-sponsored research expenditures reported at the institutional level, which primarily represent research collaboration and contract research activities, and does not include consulting agreements paid directly to faculty.

To capture the most institutionally relevant and consistently recorded aspect of university-industry process activities, industry-sponsored research expenditures reported in the FY2024 NSF HERD survey were selected as the outcome variable. These expenditures reflect institutional-level collaborative and contract research conducted with industry partners. The HERD Survey is an annual census of U.S. colleges and universities that have at least \$150,000 in separately accounted-for research and development (R&D) expenditures during the fiscal year. The survey collects comprehensive information on R&D expenditures by field of research, source of funds, and types of research, expenses, and headcounts of R&D personnel. This focus aligns with the dominant and measurable form of university-industry interaction. To ensure comparability across institutions with varying research intensities, industry-sponsored research was measured as a percentage of total institutional R&D expenditures, thereby controlling for differences in overall research capacity while maintaining the analytical emphasis on formalized, university-level research engagement with industry during FY2024. All variables, measures, and sources are listed in Table 3.1.

Table 3.1. Study Variables, Measures, and Sources

	Variable	Measure	Source of Data
Organizational UBC Conditions	Nature of HEI	Nominal: Public vs. Private status	NCES National Center for Education Statistics
	Nature of HEI	Ratio: Urban Density (Population per square mile - Census tract-level population and land area, aggregated to institution location)	U.S. Census Bureau's 2020 Gazetteer Files and American Community Survey 5-Year Estimates
	Nature of HEI	Ratio: Percentage of STEM Doctoral Degrees (Three-Year Average, FY2021–FY2023; Two-Digit CIP STEM Classification)	NCES National Center for Education Statistics
	Size of HEI	Ratio: Average Full-Time Instructional, Research, and Public Service Faculty (FY2021–FY2023)	NCES National Center for Education Statistics
	Classification	Multicategorical (Nominal): Reputational Tier (Top 50; 51–100; 101–150; Not Top 150; Three-Year Average 2021–2023)	U.S. News & World Report National University Rankings (Aggregated Dataset, Reiter, 2026)
UBC Moderating Mechanisms	Organizational Communication	Ratio: Communication Composite Score generated through quantitative content analysis of UBC elements within university strategic plans	University Strategic Plans
UBC Process Activities	Research Activity	Ratio: Industry-Sponsored Research Expenditures as a Percentage of Total R&D (FY2024)	National Science Foundation (NSF) Higher Education Research and Development (HERD) surveys

Method

For this study, as shown in Figure 3.2, the analysis assessed whether organizational communication increases or decreases the strength of (moderates) relationships between organizational conditions (nature, size, and classification) and university-industry research collaboration outcomes. Specifically, the study sought to determine whether the strength or

direction of the relationship between each organizational condition and industry-sponsored research varies as a function of organizational communication.

A regression-based moderation framework described by Hayes (2022), implemented using the PROCESS macro v5.0 (Hayes, 2022), was well-suited to this study's cross-sectional, institution-level design and its focus on interaction effects. Unlike structural equation modeling, which is often used to estimate latent constructs and complex causal pathways, this approach emphasizes simplicity and interpretability, which is suitable given the use of proxy measures and a new communication construct. PROCESS enables direct testing of theoretically specified moderation effects while accommodating both continuous and categorical predictors within a single regression framework. Although the analytic model treats organizational communication as a moderating mechanism, the cross-sectional design of the study does not support causal inference. The analyses explore conditional relationships that align with the proposed theoretical framework instead of establishing causality. While the temporal order is theoretically justified, it remains empirically limited, and results were interpreted with this understanding. The analysis therefore examined whether communication strengthens or weakens the association between structural capacity and industry-sponsored research.

Although the study did not directly involve human subjects, the research protocol was submitted to the Kansas State University Institutional Review Board (IRB) for review. The IRB determined that the study qualified for exempt status because it relied exclusively on publicly available documents and de-identified data (IRB Proposal #IRB13486). The official exemption determination letter is included as Appendix D.

As described earlier in this chapter, secondary sources of data were utilized to avoid replicating previous national data collections. Sources of extant secondary data included NCES

assessments, NSF HERD surveys, and other relevant data sources, as applicable. After collecting the datasets outlined in this chapter, the data sources were then reduced to provide the most relevant and robust dataset before analysis. Both descriptive and inferential statistics were used to summarize and organize the data. Moderation analyses were then used to determine if relationships existed between the variables. While the analysis did not seek to assess causal relationships between variables, it did purposefully incorporate time-sensitive designs to reduce endogeneity concerns (Barringer et al., 2020). To that end, the outcome variable was measured in Fiscal Year 2024, and explanatory variables were measured in the preceding time period to mitigate simultaneity bias.

Demonstrating Significance with Conditional Process Moderation Analysis

To understand the antecedents of university research collaboration with industry, this exploratory study used regression-based moderation analysis to comprehensively examine whether organizational communication conditions the relationship between organizational conditions and industry-sponsored research activity. Analysis was conducted using the PROCESS Macro v5.0 (Hayes, 2022) in SPSS. Specifically, Model 1 (moderation) tested whether organizational communication, measured via quantitative content analysis of university strategic plans, moderates the relationship between each organizational condition and industry-sponsored research. Organizational conditions included:

- The nature of the HEI, represented by public versus private status, urban density, and percentage of STEM doctoral degrees;
- Institution size, measured by the number of research faculty; and
- Institutional classification, based on U.S. News rankings

Each regression model included interaction terms between organizational communication and one of the organizational conditions (e.g., communication $\times$ ranking) to test moderation. Bootstrapped confidence intervals based on 5,000 resamples (recommended as a default by Hayes, 2022) were used to assess the significance of conditional effects and interaction terms. This resampling number strikes an appropriate balance between statistical accuracy and computational efficiency. Tests of significance for main and interaction effects included standard errors, p -values, and 95% bias-corrected bootstrap confidence intervals. If the p -value is less than .05, or the bootstrap confidence interval does not contain zero, the null hypothesis can be rejected in favor of the alternative hypothesis. Statistical significance of regression coefficients, R^2 , adjusted R^2 , and model comparison metrics (AIC and BIC) were used to assess model fit and evaluate the added explanatory power of interaction effects.

Assumption Testing and Diagnostics

Before analysis, diagnostic tests were conducted to assess the assumptions of linear regression. These include checks for linearity, normality of residuals, homoscedasticity, and multicollinearity. Outliers and influential observations were examined using Cook's Distance. To reduce multicollinearity and enhance interpretability, all continuous predictors included in interaction terms (e.g., institutional size, percentage of STEM doctoral degrees, and organizational communication) were mean-centered before creating interaction variables. Categorical variables such as public versus private status were dummy-coded and not centered. Mean-centering allows for interpretation of main effects at the moderator's mean and supports clearer analysis of conditional effects. Together, these diagnostic procedures help ensure that the observed interaction effects are not due to distributional anomalies or multicollinearity, thereby

enhancing confidence in interpreting the meaningful conditional relationships revealed by the analysis.

Chapter 4 - Results

This chapter presents the results of the statistical analysis examining the relationships among organizational conditions, organizational communication, and industry-sponsored research at R1 and R2 universities in the United States (U.S.). The outcome variable was the natural log of the proportion of total research expenditures derived from industry-sponsored research. Organizational condition variables included urban density, STEM doctoral share, faculty size, institutional ranking classification, and public/private status. Organizational communication was operationalized as a composite measure capturing university-business collaboration (UBC) communication frequency, language maturity, and plan age.

The analytic strategy involved hierarchical multiple regression models to examine (a) the direct effects of organizational conditions on industry-sponsored research and (b) the moderating role of organizational communication. Ordinary least squares (OLS) regression was used to analyze the relationship between organizational conditions and industry-sponsored research outcomes. Moderation analysis was then performed using the OLS regression and the PROCESS macro v5.0 (Hayes, 2022) for SPSS to assess whether organizational communication conditions the relationship between organizational conditions and collaboration activity. Before estimating the regression models, the study conducted descriptive statistics, diagnostic tests for distribution, and multicollinearity assessments to check assumptions and ensure model stability.

Sample Description

The initial study population consisted of 323 universities classified as R1 or R2 under the 2025 Carnegie Classifications. After accounting for institutions that reported consolidated HERD data and cases with missing variables, the final analytic sample included 302 universities with publicly available strategic plans and complete data across all modeled variables. Institutional

data were gathered from multiple sources, including the NSF HERD survey, IPEDS, the U.S. Census Bureau, the American Community Survey, and U.S. News & World Report. Organizational communication variables were derived from a quantitative content analysis of institutional strategic plans collected from university websites.

Industry-sponsored research served as the outcome variable used to measure university-industry collaboration. Consistent with prior research, this variable was expressed as the proportion of total university research expenditures funded by industry, as reported in the FY2024 HERD survey. Because the distribution of this variable was positively skewed, a natural logarithm transformation was applied before analysis to improve normality and meet the assumptions of linear regression.

Several explanatory variables were also transformed to enhance statistical properties and interpretability. Urban density, calculated as the ratio of population to land area for the municipality where each university was located, showed a significant positive skew. Consequently, a natural log transformation was applied to the urban density variable before including it in regression models.

Continuous predictors involved in interaction terms were mean centered before computing the interaction variables to reduce multicollinearity and enhance the interpretability of regression coefficients. Mean-centering allows the main effects of predictors to be interpreted at the average level of the moderator variable and is a recommended approach in moderation analysis (Hayes, 2018).

Organizational communication supporting university-industry collaboration was operationalized through a composite indicator derived from institutional strategic plans. Following the text mining and coding procedures described in Chapter 3, three components were

measured: (1) normalized frequency of collaboration-related language, (2) the average maturity score reflecting the institutionalization of collaboration language, and (3) the temporal relevance of the strategic plan. These components were multiplied to create a composite communication score that captured both the prevalence and embeddedness of collaboration-related communication within institutional strategy. The resulting communication variable was then mean centered before being used in regression models.

A small but notable portion of institutions in the sample did not have a publicly available strategic plan and did not respond to outreach requests. Of the 323 universities in the population, 20 institutions (6.2%) lacked an accessible strategic plan; 5 of these were public institutions, and 15 were private, despite the overall sample being predominantly public (230 of 323 institutions). Descriptively, institutions without strategic plans appeared somewhat different from the overall population: They exhibited higher average levels of industry-sponsored research (6.08% compared with 4.38% for the full sample), higher urban density (9.02 versus 8.21), greater STEM orientation (63.61% versus 42.07%), larger institutional size (mean faculty size 7.78 versus 7.13), and higher rankings on average (mean ranking 1.8 versus 0.91). Notably, half of these institutions were ranked within the top 50, and 16 of the 20 were within the top 150, suggesting that the absence of a publicly available strategic plan does not necessarily correspond with lower research intensity or institutional prominence. From an organizational communication standpoint, this is an interesting paradox that will be further unpacked in Chapter 5: Some institutions that are structurally strong in industry engagement simply choose not to signal those priorities through publicly accessible strategic planning documents.

Descriptive Statistics

Before conducting descriptive statistics for all variables in the study, the communication composite variable was created. Using the dictionary-based text mining procedure described in Chapter 3, a total of 3,870 coded passages were extracted from 267 strategic plans. Thirty-six strategic plans, or 12% of the sample, had no UBC passages extracted. Among institutions with UBC references, the number of extracted passages ranged from 1 to 174 per university, with a mean of 14 passages and a median of 8 passages extracted. References per 1,000 words were calculated to normalize the number of passages according to plan length, resulting in a mean of 2.5 passages per 1,000 words.

Next, each passage was evaluated using a two-stage coding process to determine UBC relevance and then maturity coding. Of the 3,870 passages extracted, the relevance stage analysis excluded 790 passages (20.4%), deeming them as not relevant to UBC. Examples of excluded passages included (with the initial extraction keyword underlined):

Improve our business plans and processes to increase efficiency and effectiveness in all aspects of the university operations. Develop and implement a continuous cycle of examining, updating, streamlining, and eliminating unnecessary business practices to ensure efficient and effective operations.

In some fields, such as computer science, Princeton now finds itself in regular competition with private sector firms that offer salaries far higher than are available in academia.

UCLA has evolved over the last 100 plus years from a young startup campus to one of the largest institutions of higher education in the world and a global leader in achieving educational and research outcomes.

A remaining 3,080 passages (79.6%) were coded as being substantively related to UBC and were advanced to the maturity coding stage. The mean number of passages per institution was 10.15. References per 1,000 words were calculated to normalize the number of passages by plan length, and the mean was 2.14 passages per 1,000 words. The distribution was moderately positively skewed but did not demonstrate extreme outliers requiring additional transformation. Across institutions, the distribution of passage counts indicated that most universities referenced UBC multiple times within their strategic plans, although the intensity varied substantially depending on the level of detail in the plan. Relevant passages were then scored for UBC maturity using a three-level rubric capturing the degree to which collaboration was framed as institutionalized within the strategic plan. Scores distinguished between aspirational language describing future intent (score 1), programmatic activity describing existing initiatives or organizational structures (score 2), and strategic institutionalization indicating governance, accountability mechanism(s), or explicit institutional priorities (score 3). Distributions for passage maturity scores are included in Table 4.1. Maturity score 2, indicating programmatic or operational engagement, was the modal category at 34.9%, suggesting that many institutions describe operational programs and initiatives related to industry engagement rather than purely aspirational or deeply institutionalized strategies.

After scoring all passages, institutional-level mean scores were calculated by averaging passage scores for each university. The mean institutional score ranges are also included in Table 4.1 and show a negatively skewed distribution, indicating that relatively few institutions communicate their UBC priorities using language that is institutionalized, nor describe embedded strategies, explicit governance, accountability, and/or policy integration, or have anchored UBC as a core identity. The mean institutional maturity score was 1.49, and the median

score was 1.67, indicating that most universities that include UBC language in their strategic plan frame UBC in aspirational or early programmatic terms rather than as a fully institutionalized priority. The mean institutional maturity score for each institution was then scaled and multiplied by temporal relevance (scaled age) and normalized frequency of UBC references to create the composite communication score.

Table 4.1. Distribution of Maturity Scores

	N	%
00	36	11.1%
1.00–1.99	185	57.3%
2.00–2.99	75	23.2%
3.00–3.99	7	2.2%
No Plan	20	6.2%

Descriptive statistics were then examined for all variables in the analysis and are presented in Table 4.2. As shown in the table, there was substantial variation across research universities in institutional characteristics, such as size, disciplinary orientation, geographic context, and the proportion of research funding derived from industry-sponsored research, indicating that universities operate in diverse structural and regional environments.

Table 4.2. Descriptive Statistics

	N	Min	Max	M	SD
Industry-sponsored research (ln)	323	-9.21	-0.18	-3.95	1.60
Public vs. Private	323	0.00	1.00	0.71	0.45
Institutional ranking	323	0.00	3.00	0.91	1.14
STEM doctoral share	323	0.00	1.00	0.42	0.28
Institutional size (ln)	322	4.83	9.13	7.13	0.82
Urban density (ln)	323	5.06	10.75	8.21	0.86
Organizational communication	303	-9.21	2.09	-1.31	3.08

Note. Public = 1.

To examine preliminary relationships among variables and assess potential multicollinearity concerns, Pearson correlation coefficients were calculated. The correlation matrix is presented in Table 4.3.

Table 4.3. Correlations

	N	1	2	3	4	5	6	7
1. Industry-sponsored research	323	--						
2. Public vs. private	323	-.051	--					
3. Institutional ranking	323	.227**	-.443**	--				
4. STEM doctoral share	323	.400**	-.040	.326**	--			
5. Institutional size	322	.323**	.030	.530**	.321**	--		
6. Urban density	323	-.010	-.362**	.275**	.029	.217**	--	
7. Organizational communication	303	.128*	.297**	-.105	.173**	.023	-.124*	--

Note. Values are Pearson correlation coefficients. * $p < .05$. ** $p < .01$.

Several patterns were exhibited. Industry-sponsored research activity (log-transformed) showed a positive association with both STEM doctoral share, $r(300) = .40, p < .001$; institutional size, $r(300) = .32, p < .001$; and ranking, $r(300) = .23, p < .001$; this suggests that universities with stronger STEM research capacity, larger research enterprises, and higher rankings tend to engage more extensively in industry-sponsored research. Industry research activity also showed a modest positive correlation with the organizational communication composite, $r(300) = .13, p = .026$. Negative, but not statistically significant, correlations were observed between industry-sponsored research and certain organizational conditions, including public versus private status and urban density. In addition to a positive correlation with industry-sponsored research, the communication composite also showed positive correlations with STEM doctoral share ($r[300] = .17, p = .003$) and public versus private status ($r[300] = .29, p < .001$).

Correlations among predictors were generally moderate and did not indicate problematic levels of multicollinearity. For example, STEM doctoral share and institutional size exhibited a positive correlation, $r(300) = .32, p < .001$, reflecting the tendency for larger research universities to produce greater numbers of doctoral graduates in STEM disciplines. However, the magnitude

of this relationship remains below thresholds typically associated with multicollinearity concerns. Ranking was moderately correlated with both institutional size ($r[300] = .53, p < .001$) and STEM doctoral share ($r[300] = .33, p < .001$), indicating some overlap among structural indicators of research capacity, though these were still below conventional thresholds of concern. These descriptive patterns provide preliminary evidence that organizational conditions may be more strongly associated with industry-sponsored research activity than organizational communication alone, motivating the subsequent regression analyses.

Robustness Checks

Diagnostic tests were conducted to assess whether the regression models satisfied the assumptions of ordinary least squares estimation. Residual diagnostics suggested that the normality assumption was reasonably met. The histogram of standardized residuals resembled a normal distribution, and the normal probability plot showed residuals close to the diagonal reference line. Visual inspection of standardized residual plots showed no clear pattern of heteroscedasticity. Residuals were randomly dispersed across predicted values, indicating that the assumption of homoscedasticity was likely met. Cook's distance values were examined to identify potentially influential observations. All values were well below the conventional threshold of 1.0 (with a maximum of .162), indicating that no individual cases had undue influence on the regression estimates. Variance inflation factor (VIF) values ranged from 1.04 to 2.07, indicating no evidence of problematic multicollinearity among predictors. All together, these diagnostics indicate that the regression assumptions were adequately met and that the reported results are unlikely to be artifacts of model misspecification or influential cases.

Baseline Regression Models

Baseline regression models were estimated to assess the relationship between the organizational conditions and industry-sponsored research activity prior to introducing the organizational communication variable. The baseline model included five predictors: percentage of STEM doctoral degrees, log-transformed institutional size (measured by the number of full-time faculty), public versus private institutional status, institutional ranking, and log-transformed urban density. The regression model was statistically significant, $F(5, 316) = 18.77, p < .001$, explaining approximately 22.9% of the variance in industry-sponsored research activity ($R^2 = .23$, adjusted $R^2 = .22$). As shown in Table 4.4, STEM doctoral share was a significant positive predictor of industry-sponsored research activity ($B = 2.002, t[316] = 6.47, p < .001$), indicating that institutions producing larger proportions of doctoral degrees in STEM fields tend to receive higher levels of industry-sponsored research funding. Institutional size was also positively associated with industry-sponsored research activity ($B = 0.524, t[316] = 4.18, p < .01$), suggesting that larger research enterprises are more likely to engage extensively in industry-funded research. Urban density exhibited a negative relationship with industry-sponsored research activity ($B = -0.255, t[316] = -2.46, p = .015$), indicating that institutions located in more densely populated environments may rely slightly less on industry-sponsored research funding. Institutional ranking and public versus private status did not demonstrate statistically significant relationships with the outcome variable once other organizational conditions were considered. Variance inflation factor values ranged from 1.17 to 2.05, indicating no evidence of problematic multicollinearity among predictors.

Table 4.4. Baseline OLS Regression Predicting Industry-Sponsored Research

Variable	B	SE	β	t	p
Constant	-3.607	.231		-15.632	<.001
STEM orientation (centered)	2.002	.309	.346	6.472	<.001
Institutional size (log, centered)	.524	.126	.269	4.178	<.001
Public vs. private	-.383	.219	-.109	-1.747	.082
Institutional ranking	-.063	.099	-.045	-.643	.521
Urban density (log, centered)	-.255	.104	-.134	-2.450	.015

Note. $n = 323$.

Organizational Communication Main Effects

To evaluate whether organizational communication supporting university-industry collaboration contributes independently to explaining industry-sponsored research activity, the communication composite variable was added to the regression model alongside the structural institutional predictors described above, and main effects were explored. The organizational communication variable reflects the interaction of three dimensions derived from institutional strategic plans: the normalized frequency of industry collaboration-related language, the maturity of that language, and the temporal relevance of the plan. By combining these elements multiplicatively, the measure captures not only the presence of industry-related communication but also the extent to which that communication reflects sustained institutional priorities.

The resulting regression model remained statistically significant, $F(6, 295) = 13.62$, $p < .001$, explaining 21.7% of the variance in industry-sponsored research ($R^2 = .217$, adjusted $R^2 = .201$). The inclusion of organizational communication did not substantially improve model fit and did not demonstrate a statistically significant independent relationship with industry-sponsored research activity, $B = .028$, $t(295) = 0.96$, $p = .336$. Importantly, the inclusion of the communication variable did not significantly affect the coefficients for the structural predictors.

This suggests that the observed relationships between organizational conditions and industry-sponsored research remain robust even when communication-related measures are included. As shown in Table 4.5, the strongest predictors remained STEM doctoral share ($B = 1.957$, $t[295] = 5.78$, $p < .001$) and institutional size ($B = 0.485$, $t[295] = 3.58$, $p < .001$). Urban density continued to demonstrate a modest negative association with industry-sponsored research activity. These results indicate that although universities vary in the extent to which their strategic plans emphasize collaboration with industry, organizational conditions remain the primary predictors of industry-sponsored research engagement.

Table 4.5. Main Effects Model, Including Organizational Communication

Variable	B	SE	β	t	p
Constant	-3.640	.257		-14.144	<.001
Public vs. private	-.391	.244	-.106	-1.603	.110
Institutional ranking	-.041	.108	-.028	-.381	.703
STEM doctoral share (centered)	1.957	.340	.329	5.757	<.001
Institutional size (log, centered)	.485	.135	.240	3.584	<.001
Urban density (log, centered)	-.272	.112	-.136	-2.433	.016
Organizational communication (centered)	.028	.029	.053	.963	.336

Note. Dependent variable: log of industry-sponsored research expenditures. Centered variables were mean-centered prior to analysis. $n = 302$.

Moderation Analysis

As the final step of the analysis, multiple moderation analyses were conducted to evaluate whether organizational communication moderates or conditions the relationship between organizational conditions and industry-sponsored research activity. Moderation was tested using ordinary least squares (OLS) regression with interaction terms. Interaction variables were created

by multiplying the predictor variables by the organizational communication composite score. Consistent with recommended practices for moderation analysis, continuous predictors were mean centered prior to constructing interaction terms. The interaction terms were entered into the regression models alongside the corresponding main effects and control variables.

OLS regression served as the primary method for estimating the moderation models and identifying statistically significant interaction effects. For interaction terms that reached statistical significance or approached conventional thresholds of significance, additional analyses were conducted using the PROCESS macro (Version 5) for SPSS (Hayes, 2022); specifically, Model 1 for simple moderation, to probe and interpret the interaction effects. PROCESS estimates the same underlying OLS regression equation but provides automated calculations of conditional effects and simple slopes across values of the moderator. This procedure facilitated interpretation of the interaction terms by estimating the effect of the focal predictors at low, mean, and high levels of the organizational communication variable; outputs also supported visualization of the moderation relationships. Because PROCESS relies on the same OLS estimation framework as the manually specified regression models, the coefficient estimates remain consistent across approaches. The primary regression results are therefore reported from the OLS models, while PROCESS output was used to examine and visualize the conditional effects associated with significant interactions.

Tables 4.6 and 4.7 summarize each tested moderation model and its results. For models examining the interaction between organizational communication and other organizational conditions, no statistically significant interaction effects were found. The interaction between STEM capacity and organizational communication approached statistical significance ($p \approx .09$) but did not meet the typical threshold of $p < .05$. Although the negative interaction coefficient

was negative, indicating that higher levels of organizational communication might slightly weaken the relationship between STEM capacity and industry-sponsored research, the lack of statistical significance means these findings should be viewed cautiously. Overall, the moderation analyses provide only weak evidence that organizational communication is consistently related to the extent to which institutional factors influence UBC.

Table 4.6. Model Statistics

	STEM × Comm	Size × Comm	Urban × Comm	Ranking × Comm	Public × Comm
N	302	302	302	302	302
R ²	.224	.218	.219	.218	.217
F	12.14***	11.73***	11.77***	11.72***	11.67***

Note. Unstandardized coefficients (*B*) reported. **p* < .10. ***p* < .05. ****p* < .001.

Table 4.7. Summary of Moderation Tests

Interaction Tested	B	SE	β	t	<i>p</i>
STEM × Communication	-.176	.106	-.092	-1.670	.096
Institutional Size × Communication	-.024	.034	-.037	-0.717	.474
Urban Density × Communication	.027	.031	.046	0.869	.386
Ranking × Communication	.016	.023	.047	0.693	.489
Public × Communication	-.028	.059	-.038	-.470	.638

Note. *n* = 302

Hypothesis Testing Results

This dissertation tested five moderation hypotheses related to the role of organizational communication in conditioning the relationship between organizational conditions and industry-sponsored research, as well as one hypothesis concerning the independent influence of organizational conditions. Below are the results of the hypothesis testing.

H_{1a}. Organizational communication significantly moderates the relationship between urban density and industry-sponsored research. **Outcome:** This hypothesis was not

supported. The interaction between urban density and organizational communication was not statistically significant ($p > .10$).

H_{1b}. Organizational communication significantly moderates the relationship between STEM doctoral orientation and industry-sponsored research. **Outcome:** This hypothesis was not supported. The interaction between STEM doctoral orientation and organizational communication approached statistical significance ($B = -0.174, p = .090$) but did not reach the conventional significance threshold of $p < .05$.

H_{1c}. Organizational communication significantly moderates the relationship between institutional size and industry-sponsored research. **Outcome:** This hypothesis was not supported. The interaction between institutional size and organizational communication was not statistically significant ($p > .10$).

H_{1d}. Organizational communication significantly moderates the relationship between public/private status and industry-sponsored research. **Outcome:** This hypothesis was not supported. The interaction between institutional control and organizational communication was not statistically significant ($p > .10$).

H_{1e}. Organizational communication significantly moderates the relationship between institutional classification or ranking and industry-sponsored research. **Outcome:** This hypothesis was not supported. The interaction between institutional ranking and organizational communication was not statistically significant ($p > .10$).

H₂. Organizational conditions will be significantly associated with university-industry research process activities, independent of organizational communication. **Outcome:** This hypothesis was supported. Organizational conditions, particularly STEM doctoral orientation, institutional size and urban density, demonstrated statistically significant

relationships with industry-sponsored research activity independent of organizational communication.

Summary of Findings

This chapter presented the results of statistical analyses examining the relationships between organizational conditions, organizational communication supporting university-industry collaboration, and industry-sponsored research activity. Ordinary least squares regression and moderation analyses were used to evaluate whether organizational communication moderates the relationship between structural organizational conditions and industry-sponsored research outcomes.

The baseline regression model showed that several organizational conditions were associated with industry-sponsored research activity. The model was statistically significant, $F(5, 316) = 18.77, p < .001$, explaining about 22.9% of the variance in industry-sponsored research ($R^2 = .229$, adjusted $R^2 = .217$). STEM doctoral orientation and institutional size were the strongest predictors of industry-sponsored research activity. Institutions awarding a greater share of doctoral degrees in STEM fields, and those with larger research enterprises, tended to receive higher levels of industry-sponsored research funding. Urban density demonstrated a modest negative relationship with industry-sponsored research activity, while institutional ranking and governance structure did not exhibit statistically significant associations with the outcome variable once other structural factors were considered.

When the organizational communication composite variable was added to the regression model, the model remained statistically significant, $F(6, 295) = 13.62, p < .001$, explaining 21.7% of the variance in industry-sponsored research ($R^2 = .217$, adjusted $R^2 = .201$). However, organizational communication did not demonstrate a statistically significant independent

relationship with industry-sponsored research activity after controlling for covariates. The strongest predictors of industry-sponsored research activity remained STEM doctoral orientation and institutional size.

Moderation analyses were performed to determine whether organizational communication conditions the relationships between organizational conditions and industry-sponsored research outcomes. Interaction terms were estimated between organizational communication and each institutional characteristic included in the study: urban density, STEM doctoral orientation, institutional size, governance structure (public versus private), and institutional ranking. None of the interaction terms achieved statistical significance at the conventional threshold of $p < .05$. The interaction between STEM doctoral orientation and organizational communication approached statistical significance but did not meet conventional significance thresholds. All other interaction effects were clearly non-significant.

The overall results provide limited evidence that organizational communication supporting university-industry collaboration, as operationalized in this study, moderates the relationship between organizational conditions and industry-sponsored research activity. Instead, the findings suggest that organizational conditions, particularly STEM research orientation and institutional size, remain the primary predictors of industry-sponsored research engagement among research universities. While universities vary in the extent to which their strategic plans emphasize collaboration with industry, such communication does not, on its own, predict industry-sponsored research activity or significantly alter the relationships between organizational conditions and collaboration outcomes. These results refine the understanding of how organizational conditions relate to university-industry research activity and raise questions

about the role of communication as a signaling versus causal mechanism. These implications are explored in Chapter 5.

Chapter 5 - Discussion and Conclusion

As universities increasingly face expectations to contribute to economic development, technological innovation, and regional competitiveness, university-industry collaboration has become an important mechanism through which universities translate research into societal and economic impact. Collaboration with industry has become a more prominent part of university missions, and universities have also begun to communicate these priorities more explicitly through strategic planning and institutional messaging. Building on the University-Business Collaboration (UBC) Ecosystem Framework, this dissertation examined how organizational conditions within universities relate to industry-sponsored research activity across United States (U.S.) research institutions. In addition to testing these structural relationships, the study investigated whether organizational communication about industry engagement functions as a moderating mechanism that conditions how institutional characteristics translate into collaboration outcomes. Despite the growing emphasis on collaboration in strategic plans and institutional narratives, relatively little empirical research has examined whether such communication meaningfully influences collaboration outcomes.

This dissertation examined the role of organizational communication supporting university-industry collaboration within U.S. research universities. Drawing on the UBC Ecosystem framework (Galán-Muros & Davey, 2017), the study investigated whether communication about collaboration in institutional strategic plans moderates the relationship between institutional organizational conditions and industry-sponsored research activity. Organizational communication was operationalized through a composite measure based on the frequency, maturity, and temporal persistence of collaboration-related language in university strategic plans. Using a cross-sectional dataset of U.S. research universities, the analysis

employed ordinary least squares regression and moderation analysis using the PROCESS macro to examine the relationships between organizational conditions, organizational communication, and industry-sponsored research activity.

Summary of Key Findings

The findings indicate that organizational conditions remain the strongest predictors of industry-sponsored research activity among U.S. research universities. In the baseline regression model, Science, Technology, Engineering, and Mathematics (STEM) doctoral orientation and institutional size were positively associated with industry-sponsored research expenditures, suggesting that universities with greater scientific capacity and larger research enterprises are more likely to engage in industry-sponsored research. Urban density demonstrated a modest negative association with industry-sponsored research activity, while public versus private status approached statistical significance. Institutional ranking did not demonstrate a significant relationship with industry-sponsored research.

The analysis also examined whether organizational communication supporting university–industry collaboration contributes independently to explaining industry-sponsored research outcomes. When the communication composite variable was introduced into the regression model, it did not demonstrate a statistically significant independent association with industry-sponsored research activity. This finding suggests that organizational communication, as measured in strategic plans, does not substantially alter collaboration outcomes once organizational conditions are accounted for.

Moderation analyses were conducted to test whether organizational communication moderates the relationships between organizational conditions and industry-sponsored research activity. Across the interaction models, none of the hypothesized moderation effects reached

conventional levels of statistical significance. These results indicate that communication about collaboration in strategic plans does not significantly alter the relationships between organizational conditions and industry-sponsored research activity. One interaction between STEM doctoral orientation and organizational communication approached statistical significance, suggesting a potential pattern warranting further investigation; however, the interaction did not meet the threshold required to support the moderation hypothesis.

Overall, the findings suggest that organizational conditions are the primary determinants of industry-sponsored research activity among U.S. research universities. While universities vary in the extent to which they communicate collaboration priorities in strategic plans, this communication does not appear to substantially modify the relationships between organizational conditions and collaboration outcomes.

Interpretation of Findings

The findings of this study provide insight into how organizational conditions and organizational communication relate to university-industry collaboration outcomes. Interpreting these results requires considering both the organizational conditions that enable collaboration and the role of strategic communication in institutional planning and positioning. This section presents interpretations of the key findings and examines their implications from both scholarly and practical perspectives for institutions seeking to strengthen university-industry collaboration.

Structural Capacity as the Primary Driver of UBC

The primary finding of this dissertation was the direct relationship between organizational conditions and industry-sponsored research expenditures, namely STEM orientation and faculty size. This finding indicates that industry collaboration requires infrastructure. This result was expected, as prior literature has shown that STEM disciplines are

more likely to collaborate with industry because of their dependence on tacit knowledge and collaboration rather than on traditional mediated knowledge transfer (Thursby & Thursby, 2011). Graduate students also play an important role in research productivity and annual research spending, so higher percentages of graduate students, particularly those holding research assistantships, reflect greater capacity to engage with industry-sponsored research activities, and faculty may be inclined to seek industry partnerships to fund their graduate students. Additionally, lower funding needs in the social sciences and humanities may also play a role, as these fields may have less reliance on external industry funding to sustain research activity, resulting in lower levels of industry-sponsored research (Perkmann et al., 2021). This represented the largest single effect on the outcome variable.

Institution size was expected to have a negative effect on industry-sponsored research because the outcome variable measures industry funding as a share of total research expenditures, and larger institutions often receive substantial federal funding that can reduce the proportional contribution of industry support. However, the results indicated a significant positive effect instead. This suggests that capacity drives collaboration, and larger faculty sizes likely also translate to larger research administration capacity, industry engagement staff, and other supportive infrastructure that enables greater industry collaboration. Ultimately, universities collaborate with industry primarily because they have the scientific and organizational capacity to do so.

Urban density also demonstrated a significant relationship with industry-sponsored research; however, it was a small negative relationship. This was unexpected, and the negative coefficient for urban density suggests that universities in more densely populated areas may derive slightly smaller proportions of their research funding from industry sources. At first

glance, this may seem counterintuitive because urban regions often host large concentrations of firms and innovation activity. However, several potential explanations exist. First, universities in dense metropolitan environments may have greater access to federal research institutions, foundations, and government agencies, which can diversify their funding sources and reduce reliance on industry-sponsored research. Second, the type of industry research collaboration universities engage in often aligns with applied STEM sectors, and many of those sectors are historically associated with manufacturing corridors, engineering hubs, or technology parks that are not necessarily located in the most densely populated urban cores. For example, Research Triangle Park in North Carolina is a major innovation hub but is located outside a dense city center. These environments can still be innovative regions, but they may have lower population density while maintaining strong industrial ecosystems. Third, universities located in smaller metropolitan areas or regional innovation hubs may play a more central role in economic development, thereby strengthening institutional incentives to pursue industry partnerships. Thus, lower-density environments may encourage universities to function as regional innovation anchors.

In addition, multiple variables were insignificant or only marginally significant, namely, institutional governance structure (public versus private) and institutional ranking. The negative coefficient suggests that private universities generate slightly higher levels of industry-sponsored research than public universities, though the effect is only marginally significant. Several institutional dynamics could explain this pattern. Private universities often have stronger incentives to diversify revenue sources because they do not receive the same level of state support as public institutions, so industry funding may serve as a strategic revenue stream for those institutions. They may also have more flexible governance structures and fewer political

constraints on corporate partnerships, which may prevent public institutions from engaging in the same ways or at the same levels. At the same time, the fact that the governance structure was only marginally significant suggests that it is not a strong determinant of collaboration outcomes once other structural factors, such as research capacity, are considered. Triple Helix literature emphasizes that universities increasingly assume entrepreneurial roles regardless of their governance structure (Etzkowitz, 2003; Etzkowitz & Leydesdorff, 2000). Both public and private institutions participate in innovation ecosystems, though they may do so through different institutional pathways. The findings of this dissertation support the idea that disciplinary orientation and research capacity matter more than governance type alone.

The non-significant relationship between ranking and industry-sponsored research suggests that prestige does not necessarily translate into greater industry collaboration. Several dynamics could explain this. First, many highly ranked universities focus heavily on basic research and federal funding, particularly through agencies such as the NSF, the National Institutes of Health (NIH), and the Department of Energy (DOE). Industry funding often represents a smaller portion of their research portfolios. Second, industry collaboration may depend more on applied research capacity and disciplinary specialization than on general institutional prestige. Third, many of the highest-ranked institutions, including 10 of the top 50, did not have a publicly available strategic plan; therefore, this study may not have had sufficient information to distinguish between ranking tiers or to understand the organizational communication at those institutions. Finally, the relatively smaller scale of industry-sponsored research funding compared to federal grants may influence how faculty engage with industry partners. However, this study did not directly examine faculty decision-making or incentive structures, and additional research would be needed to better understand these dynamics. Faculty

at institutions may also still receive industry funding, but it might come through other channels. For example, philanthropic investments could ultimately give industry partners greater access to student talent or allow their brands to be associated with the institution, such as through naming rights for a building or center.

These results suggest that organizational conditions associated with research capacity (institutional size) , research orientation (STEM doctorates), and regional positioning (urban density) play a greater role in shaping industry-sponsored research activity than institutional prestige or governance structure alone. While public versus private status and urban density were modestly associated with industry collaboration outcomes, the strongest predictors remain structural indicators of research capacity, particularly STEM doctoral orientation and institutional size. These findings align with prior research emphasizing the importance of scientific infrastructure, disciplinary specialization, and regional innovation dynamics in shaping university-industry collaboration (Abreau & Grinevich, 2013; Beise & Stahl, 1999; D'Este & Iammarino, 2010; D'Este et al., 2013; Hughes & Kitson, 2012; Lee, 1996; Meyer-Krahmer & Schmoch, 1998; Schartinger et al., 2002).

Insignificance of Organizational Communication

Organizational communication was not a statistically significant predictor of industry-sponsored research activity after accounting for organizational conditions, and there may be multiple reasons for this. First, one limitation of this study is that organizational communication is difficult to measure quantitatively. Communication within universities occurs across multiple channels, including strategic plans, administrative guidance, leadership messaging, faculty incentives, informal networks, and everyday organizational practices. Strategic plans represent only one visible artifact of these broader communicative processes. While such documents signal

institutional priorities, they may not fully capture how those priorities are interpreted, reinforced, or enacted within departments, research centers, and faculty communities. The absence of widely validated quantitative measures of UBC organizational communication reflects this complexity. Unlike structural variables, such as institutional size or research expenditures, which can be measured through administrative data, communication processes are diffuse and embedded in organizational culture, making them difficult to operationalize in a consistent and comparable way across institutions.

The approach used in this study represents an initial attempt to systematically measure organizational communication about university-industry collaboration using institutional strategic plans as observable artifacts. While this method offers a scalable way to analyze communication across a large number of institutions, it likely captures only part of the broader communication environment that shapes collaboration behavior. For example, universities may communicate priorities related to industry engagement through internal funding programs, promotion and tenure policies, leadership speeches, partnership offices, or regional engagement initiatives that are not fully reflected in strategic planning documents.

Despite these challenges, developing more robust measures of organizational communication remains a worthwhile area for future research. Advancements in computational text analysis, natural language processing, and large-scale document analysis offer new opportunities to examine how universities communicate priorities across multiple organizational artifacts, including strategic plans, policy documents, public speeches, and administrative communications. Future studies could also combine textual analysis with survey-based measures of faculty perceptions or qualitative analyses of institutional practices to better capture how communication about collaboration is experienced within organizations. Such work could help

refine the measurement of organizational communication and further clarify its role in shaping university-industry collaboration outcomes.

There could also have been issues with how organizational communication was operationalized in this dissertation, including within the codebook, the extraction method, or the GPT classifier. Each of these areas could benefit from additional reliability testing. As an emerging method of automated coding, the script for the GPT classifier could be further refined, reimagined, or adapted to utilize newer foundational AI models as they are developed. While the organizational communication variable was measured as UBC frequency times maturity times temporal relevance, models were also tested using only frequency, as well as frequency times age and frequency times maturity, but none of these demonstrated statistical significance.

Strategic plans alone may not be the appropriate artifact to measure organizational communication. Other artifacts (or a combination of artifacts), such as faculty senate minutes, presidential speeches, university news stories, or college- or department-level plans, might provide a more comprehensive view of organizational communication at a university. This perspective is consistent with organizational communication scholarship, particularly constitutive communication (CCO), and strategy-as-practice approaches, which conceptualize communication as distributed across multiple texts, interactions, and sites of practice rather than contained within a single formal document (Putnam & Nicotera, 2009; Spee & Jarzabkowski, 2011). From this perspective, organizational meaning and action emerge through an ongoing flow of communication that includes formal plans, informal conversations, governance processes, and external messaging. Focusing exclusively on strategic plans may therefore capture only one layer of this broader communicative system.

Finally, it may be that strategic plans function more as sensemaking artifacts, priority signaling, and legitimacy narratives. Research from strategy-as-practice and discourse perspectives suggests that strategic plans do not simply direct action but help construct shared understandings of organizational identity, priorities, and future direction (Spee & Jarzabkowski, 2011; Vaara et al., 2010). These documents play an important role in sensemaking by articulating how institutions interpret their environment and position themselves within it. At the same time, strategic plans often serve external legitimacy functions, signaling alignment with broader expectations from policymakers, funders, and industry partners. The coding framework explicitly treats strategic plans as artifacts of institutional sensemaking rather than as direct causal mechanisms. Therefore, communication as captured through strategic plans in this dissertation may reflect existing collaboration priorities rather than function as a mechanism that directly produces collaboration outcomes.

This interpretation is also supported by scholarship on strategic planning in higher education, which notes that strategic plans frequently operate as aspirational and symbolic documents that articulate direction and values but may be only loose indicators of implementation and day-to-day organizational practices (Birnbaum, 1988; Hall & Lulich, 2021). These perspectives suggest that a more comprehensive assessment of organizational communication would require examining multiple forms of discourse and interaction across institutional levels, particularly those closer to faculty activity and partnership development.

Absence of Moderation Effects

The moderation tests collectively suggest that organizational communication about university-industry collaboration does not substantially alter the relationships between organizational conditions and industry-sponsored research activity. Across all interaction

models, the relationships between organizational conditions (e.g., STEM doctoral orientation and institutional size) and industry-sponsored research remained largely unchanged, regardless of the level of communication about collaboration in strategic plans. This pattern suggests that, within the scope of this dissertation, communication, as captured in institutional strategic plans, plays a more limited role in shaping collaboration outcomes than structural organizational conditions do, highlighting the limitations of using strategic plans as a proxy for organizational communication more broadly.

Not only was organizational communication not significant as a direct predictor of industry-sponsored research expenditures, but its moderating effects were also not statistically significant. Possible reasons for this could be that the organizational condition predictors dominated the model, and therefore, faculty expertise and research infrastructure outweighed communication in terms of their effect. It may also be that strategic plans, as high-level narratives, signal direction but do not necessarily change behavior. There may also be time-lag issues, as communication effects might take place over a longer institutional cycle. Industry relationships, especially those involving larger investments in industry-sponsored research, take time to develop, as does a potential faculty-level shift toward seeking such work. It requires a change in how faculty think about and promote their work, including the types of business development activities they might pursue to find industry partners. The effort to actively seek out partners, build relationships with them, identify joint projects, and persuade partners to fund their research may take much longer than the timeline of a strategic plan, so the results might not be immediate. More proximate indicators of partnership coordination may instead be reflected in ongoing organizational communication practices, including internal coordination across university units, relationship management systems tracking industry engagement, and external

communications, such as partnership announcements. These forms of communication may better capture the dynamic and relational processes through which university-industry collaboration is developed and sustained. If institutional prioritization wanes over time, the influence of strategic plan communication on collaboration activity may also diminish, suggesting that sustained institutional commitment may be necessary to support longer-term industry partnership development.

Another possible explanation for the absence of moderation effects is that the influence of organizational communication may occur through mechanisms not captured by the outcome variable used in this study. Strategic communication about collaboration may influence internal alignment, faculty perceptions of industry engagement, or long-term institutional culture. These effects may not immediately translate into measurable changes in industry-sponsored research expenditures. Since strategic plans only represent one form of communication at an institution, there may be measurement limitations, as previously described. The result may reflect the limitations of strategic plans as a measure of organizational communication. Strategic plans are high-level documents that articulate institutional priorities and aspirations, but they may not capture the operational communication that shapes collaboration activities. Industry engagement often emerges through decentralized channels, including research center initiatives, faculty networks, corporate affiliate programs, and technology transfer offices. If communication about collaboration primarily occurs within these operational contexts rather than in strategic plans, the moderating influence of communication may be understated in the present analysis.

The absence of moderation effects across multiple models suggests that strategic plans may primarily serve as symbolic or signaling functions rather than as directly influencing collaboration outcomes. Strategic plans articulate institutional priorities, communicate identity,

and provide narratives about future direction. However, the results indicate that emphasizing industry collaboration in strategic plans does not significantly alter the relationship between organizational conditions and industry-sponsored research activity. University-industry collaboration often occurs through decentralized processes driven by faculty networks, research centers, and disciplinary communities. Strategic plans are typically produced by central administration and operate at a high level of institutional messaging. If collaboration activities are primarily shaped by faculty research agendas, disciplinary cultures, and laboratory-level partnerships, then strategic plan language may have limited influence on the structural factors that determine collaboration outcomes. In this sense, the absence of moderation effects may reflect the loosely coupled nature of universities, where high-level strategic plan communication does not necessarily translate into the more proximate, operational forms of communication needed to influence faculty research behavior. These intermediary forms of communication could include unit-level planning, targeted engagement with faculty, incentive and recognition structures, and ongoing relationship management with industry partners, all of which are more directly connected to the development and sustainment of collaboration activities (Bruneel et al., 2010; Davey et al., 2011; Orazbayeva et al., 2019).

Near-Significant STEM × Communication Interaction

As noted in Chapter 4, there was a near-significant interaction between STEM orientation and organizational communication. Although this outcome appeared promising, it may not validate the original hypothesis, which predicted that organizational communication would positively moderate the relationship between UBC organizational conditions and UBC process activities. One possible explanation is that STEM-intensive universities already collaborate extensively with industry. It could also be that communication may matter more for institutions

with lower research capacity. Alternatively, some institutions may rhetorically emphasize collaboration as an aspirational strategy. The pattern may indicate that organizational communication about industry collaboration matters more for some types of institutions than for others. The interaction suggests that the relationship between STEM research orientation and industry-sponsored research varies with the level of communication regarding UBC in university strategic plans. One possible interpretation is that universities with strong STEM research may already engage extensively with industry, regardless of whether collaboration is emphasized in strategic communications, and may therefore also emphasize collaboration more prominently in their strategic plans. In such institutions, industry partnerships may emerge organically from faculty research rather than from institutional messaging. Communication may also play a greater role for institutions with more limited STEM capacity. If universities have smaller STEM doctoral portfolios, communication may function as a strategic positioning tool rather than as a driver of collaboration outcomes. The interaction pattern, therefore, may reflect differences between institutions that already possess substantial research capacity and those that seek to build opportunities for collaboration through institutional strategy and messaging.

The near-significant STEM x Communication interaction may indicate that communication operates differently in environments where collaborations are already structurally embedded. In universities with strong STEM research programs, industry engagement may be institutionalized through laboratories, research centers, innovation hubs, tech transfer offices, and longstanding partnerships. In these contexts, collaboration becomes part of routine research activity and may not depend heavily on strategic plan language. Communication, therefore, may have minimal additional impact once collaboration is already structurally supported by research infrastructure and disciplinary specialization. The near-

significant result may also suggest a possible tension between rhetorical emphasis and existing institutional strength. Universities with the most developed STEM research capacity may not need to emphasize industry collaboration as strongly in their strategic narratives because collaboration is already embedded in their research systems. Conversely, institutions seeking to expand industry engagement may place greater rhetorical emphasis on collaboration as part of institutional strategy. This dynamic could produce a modest negative interaction effect, in which stronger communication is observed among institutions that are still developing their industry collaboration capacity.

It is also important to acknowledge the statistical interpretation of the result. The interaction between STEM doctoral orientation and organizational communication approached statistical significance but did not meet conventional thresholds. As a result, the pattern should be interpreted cautiously and treated as exploratory rather than definitive evidence of moderation. Future research using alternative measures of organizational communication, or longitudinal data, may help clarify whether communication interacts with institutional research capacity in shaping university-industry collaboration outcomes. These findings also have implications for how university-industry collaboration is understood within existing theoretical frameworks, particularly with respect to the relative influence of organizational conditions and organizational communication.

Theoretical Implications

The findings of this study offer several theoretical implications for scholarship on university-industry collaboration and organizational communication. In particular, the results contribute to existing literature by clarifying how organizational conditions and organizational communication operate within collaboration ecosystems.

University-Industry Collaboration

One theoretical implication is the ongoing significance of structural research capacity in influencing university-industry collaboration outcomes. The findings show that STEM doctoral orientation and institutional size were the strongest predictors of industry-sponsored research activity. This reinforces previous studies in the university-industry collaboration literature, demonstrating that collaboration depends heavily on universities' scientific capabilities and research infrastructure.

Within the UBC Ecosystem framework, these results suggest that organizational conditions such as disciplinary orientation and research scale may serve as foundational factors enabling collaboration. Organizational communication alone appears insufficient to alter these organizational dynamics. This implication reinforces theoretical models that emphasize the role of scientific capacity and institutional resources as primary drivers of collaboration outcomes (Abreu & Grinevich, 2013; Perkmann et al., 2013; Schartinger et al., 2002; Thune et al., 2016).

Finally, the results contribute to the UBC Ecosystem framework by empirically examining the role of organizational communication within collaboration systems. While the framework identifies organizational conditions as important components of collaboration ecosystems, the present findings suggest that communication, as operationalized via university strategic plans, may not significantly moderate structural determinants of collaboration outcomes. Instead, strategic plan communication may function as an indicator of how institutions position themselves within the ecosystem rather than as a factor that fundamentally reshapes collaboration dynamics. This refinement suggests that collaboration ecosystems may be more strongly influenced by material research capacity and institutional resources than by strategic communication about collaboration priorities.

Organizational Communication Theory

A second theoretical implication concerns the role of organizational communication within collaboration ecosystems. Although universities frequently emphasize industry engagement in strategic plans, the absence of significant moderation effects suggests that communication may function more as a reflection of institutional priorities than as a mechanism that alters collaboration outcomes. The absence of statistically significant communication effects also provides insight into the limits of organizational communication as an explanatory factor in university-industry collaboration.

From an organizational communication perspective, this finding aligns with theories that conceptualize strategic planning documents as sensemaking artifacts and expressions of institutional identity. Strategic plans help institutions articulate goals, signal priorities, and communicate values to internal and external stakeholders (Hall & Lulich, 2021; Spee & Jarzabkowski, 2011; Sutphen et al., 2019; Vaara et al., 2010). However, they may not necessarily produce immediate changes in organizational behavior. This suggests that communication about collaboration may operate primarily as institutional signaling, communicating how universities position themselves within innovation ecosystems rather than directly shaping collaboration activities. This distinction highlights the importance of differentiating between communicative representations of collaboration and the organizational conditions that enable collaboration in practice. Meanwhile, organizational communication scholarship suggests that these representations play an important signaling role rather than simply a symbolic or minor one. From an institutional and discourse perspective, strategic communication conveys priorities, legitimacy, and intent to both internal and external audiences, influencing perceptions of

organizations and how resources and relationships are mobilized (Suchman, 1995; Vaara et al., 2010).

Signaling is particularly important in contexts characterized by uncertainty and multiple stakeholders, such as university-industry collaboration, where partners rely on institutional cues to assess alignment, credibility, and opportunity. Strategic plans, in this sense, can function as signals of openness to collaboration, areas of expertise, and institutional commitment. However, signaling is most effective when it is credible and reinforced by observable organizational conditions and behaviors. When signals are not supported by underlying capacity, infrastructure, or demonstrated engagement, they may have limited influence on partner decision-making.

Organizational communication theory also indicates that the timing and location of signaling matter. High-level strategic discourse, such as institutional plans, may be most influential during early stages of relationship building, setting agendas, and external positioning (Spee & Jarzabkowski, 2011; Vaara et al., 2010). Conversely, more localized and relational forms of communication, such as faculty interactions, partnership development efforts, and ongoing coordination, are more directly involved in maintaining collaboration and turning intentions into actions (Perkmann et al., 2013; Putnam & Nicotera, 2009). This distinction emphasizes the importance of viewing signaling as just one part of a broader, multi-level communication system that functions across different stages of collaboration.

Another theoretical implication relates to the role of strategic plans as organizational artifacts. Strategic plans often articulate aspirational goals and future priorities rather than document existing institutional practices. As a result, the presence of collaboration-related language in strategic plans may indicate institutional intent or positioning rather than actual collaboration activity. This distinction highlights the need to carefully distinguish between

institutional rhetoric and institutional behavior when studying organizational communication. Future theoretical work may therefore need to distinguish between different types of communication artifacts, including strategic plans, operational policies, and external partnership communications.

Constitutive Communication Perspective

Another theoretical implication is that organizational communication and organizational conditions may influence collaboration through different pathways. Organizational conditions, such as research capacity, directly enable collaboration by providing faculty expertise, laboratories, and disciplinary networks that support industry partnerships. Organizational communication, in contrast, may operate through more indirect mechanisms, such as shaping institutional narratives, aligning internal stakeholders, or signaling priorities to external partners. These processes may influence long-term institutional strategy or reputation rather than immediate outcomes of collaboration.

This distinction suggests that theories of university-industry collaboration may benefit from differentiating between structural enablers of collaboration and different forms of organizational communication, including both high-level strategic discourse and more proximate, practice-based communication processes that shape action. From a CCO perspective, these findings indicate that different forms of communication may constitute organizational priorities and identities in distinct ways but vary in their proximity to and influence on the coordination of collaborative activity.

Decentralized Academic Systems as Loosely Coupled Systems

Universities are often described in organizational theory as loosely coupled systems, where decision-making authority and research activity are distributed across departments,

laboratories, and faculty networks (Birnbaum, 1988; Orton & Weick, 1990; Weick, 1976). Industry collaborations frequently emerge from faculty research programs and disciplinary communities rather than from centralized administrative directives. The absence of strong communication effects may therefore reflect the decentralized nature of universities, where different forms of communication operate at different levels of the organization.

Strategic plans produced by central administration represent one form of institutional discourse, but they may not directly translate into the localized, relational, and practice-based communication through which faculty develop and sustain industry partnerships. This implication suggests that theories of university-industry collaboration should account not only for structural conditions but also for the multi-level and distributed nature of organizational communication, where collaboration is often shaped through ongoing interactions within faculty networks rather than through centralized, institutional messaging alone.

Implications for Universities and Industry Engagement Practitioners

The practical implications of this study are informed not only by empirical analysis but also by sustained engagement with university and industry practitioners who contributed to shaping the research questions, coding framework, and interpretation of findings. As a result, this section is written with direct relevance to those responsible for advancing university-industry collaboration within complex institutional environments.

The findings indicate that industry-sponsored research activity is most strongly associated with structural factors, particularly research capacity, disciplinary orientation, and institutional scale. Simultaneously, communication through strategic plans, while important for signaling priorities and aligning stakeholders, does not independently alter collaboration outcomes. For practitioners, this suggests that strengthening university-industry collaboration requires aligning

strategic intent with the underlying conditions and operational mechanisms that enable collaboration to occur. Three practical implications emerge.

First, institutions should align industry engagement strategies with areas of demonstrated research strength. Strategic plans are most effective when they clearly articulate existing capabilities and identify specific domains where collaboration is most likely to succeed. Efforts to expand collaboration beyond these areas may require deliberate investment in faculty capacity, infrastructure, and applied research programs.

Second, universities should recognize and support the decentralized and faculty-driven nature of collaboration. Industry partnerships often emerge from individual faculty relationships, disciplinary networks, and research programs rather than from centralized directives. As a result, institutions may benefit from investing in mechanisms that support faculty engagement, including research development support, seed funding, industry matchmaking, and administrative structures that reduce barriers to collaboration.

Third, strategic communication should be paired with operational coordination and relationship management processes. While strategic plans can signal priorities, collaboration is enacted through ongoing interactions, internal coordination across units, and sustained engagement with external partners. Institutions may therefore consider strengthening intermediary functions, such as corporate engagement offices, research development teams, and partnership management systems, that translate strategic priorities into actionable opportunities.

These findings suggest that universities seeking to enhance industry engagement should focus not only on articulating collaboration as a priority but also on building the structural and organizational conditions that enable collaboration to be sustained over time. To support the application of these insights, a practitioner-oriented summary of findings and recommended

actions will be provided to stakeholders. This summary is designed as a working tool for academic leaders, research administrators, and industry engagement professionals to support strategic planning, internal alignment, and partnership development efforts.

Focus on Research Capacity

Universities seeking to expand industry-sponsored research may need to prioritize investments in research capacity rather than rely primarily on strategic messaging. The results indicate that organizational conditions, such as STEM doctoral orientation and institutional size, are strongly associated with industry-sponsored research activity. Institutions that aim to increase collaboration with industry may therefore benefit from strengthening research infrastructure, expanding STEM graduate programs, and supporting faculty research capacity in fields that are closely aligned with industry needs.

Strategic plans that emphasize collaboration may help articulate institutional priorities, but the findings suggest that communication as expressed through strategic plans alone is unlikely to substantially increase industry research engagement without corresponding investments in research capability. For practitioners, this underscores the importance of grounding collaboration strategies in demonstrable research strengths and capacity-building investments.

Align Strategic Plan with Institutional Capacity

Strategic planning processes should align collaboration goals with institutional capacity. Many universities emphasize industry engagement in strategic plans, often framing collaboration as a central institutional priority. However, the findings suggest that the presence of collaboration language in strategic plans does not significantly affect collaboration outcomes when organizational conditions are accounted for. Universities may therefore benefit from

ensuring that strategic goals related to industry partnerships are grounded in realistic assessments of research strengths, disciplinary expertise, and available infrastructure.

Strategic planning may be most effective when it reinforces existing areas of research strength rather than when it is used as an attempt to create opportunities for collaboration solely through institutional messaging. From a practitioner perspective, this suggests that strategic plans are most effective when they function as alignment tools rather than as aspirational documents disconnected from institutional capacity.

Operational Structures that Support UBC

Universities may need to focus more on building operational structures that support collaboration rather than only emphasizing collaboration rhetorically. Industry partnerships often emerge from specific mechanisms, such as research centers, corporate partnership programs, technology transfer offices, and faculty-industry networks. The absence of strong communication effects suggests that operational systems supporting collaboration may be more influential than high-level strategic communication.

Institutions seeking to increase industry engagement may therefore benefit from investing in intermediary structures that facilitate collaboration, including industry liaison offices, translational research programs, and corporate affiliate networks. Strategic messaging, while important for signaling intent, is unlikely to produce sustained collaboration outcomes without these supporting structures.

Enabling UBC in Decentralized Contexts

Institutional leaders should recognize the decentralized nature of university-industry collaboration. The findings are consistent with the idea that collaboration often emerges from faculty-level research relationships rather than from centralized administrative initiatives.

Faculty expertise, disciplinary networks, and laboratory-level partnerships frequently drive industry-sponsored research activity.

As a result, institutional strategies aimed at expanding industry engagement may be most effective when they support faculty-driven collaboration rather than when they are used as an attempt to direct collaboration solely through top-down strategic initiatives. Policies that reduce administrative barriers to collaboration and provide incentives for faculty engagement may therefore be particularly important. This reinforces the need for practitioner strategies that enable, rather than attempt to control, distributed collaboration activity across the institution.

Institutions as Regional Innovation Anchors

Universities in smaller or less densely populated regions may have opportunities to leverage regional industry partnerships. The negative relationship between urban density and industry-sponsored research suggests that universities located outside dense metropolitan centers may play an important role as regional innovation anchors. Institutions in these environments may benefit from building strong partnerships with local industries, particularly in engineering, manufacturing, and applied technology sectors.

Regional universities may therefore have opportunities to position themselves as key research partners within local innovation ecosystems. For practitioners, this highlights the importance of tailoring industry engagement strategies to regional context rather than relying on models derived from large metropolitan research institutions.

Strategic Plans as External Communications Signals

Strategic communication about industry collaboration may still play an important role in signaling institutional priorities to external stakeholders. Although communication did not significantly moderate structural predictor relationships in the statistical models, communication

through strategic plans may still influence how universities are perceived by industry partners, policymakers, and regional stakeholders. Strategic plans can communicate an institution's willingness to engage with industry and help frame collaboration as part of the university's broader mission. As a result, communication may still be valuable as a signaling mechanism even if it does not directly alter collaboration outcomes.

The practical implications suggest that universities seeking to expand industry-sponsored research should focus primarily on developing research capacity and operational collaboration structures, while using strategic communication to articulate and reinforce those capabilities. For example, an institution with established strengths in advanced materials or robotics may prioritize investments in shared research facilities, research computing capacity, industry-sponsored labs, or translational research programs in those areas, while using its strategic plan to clearly signal these capabilities and partnership opportunities to external stakeholders. In this case, rather than attempting to generate collaboration independently, strategic communication reinforces and amplifies existing capacity. Strategic messaging may help signal institutional priorities, but the findings indicate that meaningful increases in collaboration are more likely to occur when communication is paired with investments in scientific capacity, infrastructure, and faculty expertise. This reinforces a coordinated approach in which strategic communication, operational structures, and research capacity are aligned rather than treated as independent levers.

Limitations

A number of limitations have been noted throughout this dissertation, and this section aggregates and expands upon these. The main limitations of this study can be categorized as

being within the measurement of communication, the cross-sectional design, the use of proxy measures, and the coding methodology.

Measurement of Communication

As noted earlier in this chapter, one limitation of this study includes using university strategic plans as a measure of communication. Not only are these heterogeneous documents of varying lengths, structures, and formats, but they also might not accurately reflect the actual organizational communication occurring within an institution. For future research, the same method could be applied within a more restricted setting to analyze different or additional texts, such as a college- or unit-level plan. This measurement also has limitations related to how well it represents the construct. The coding framework focused on the presence and maturity of language supporting university-industry collaboration in strategic plans. While this approach captures a key aspect of organizational communication, it does not cover all forms of communication related to collaboration. Universities communicate priorities through many other channels, including speeches by institutional leaders, research center initiatives, partnership announcements, and internal planning documents. Therefore, the coding approach captures one type of communication artifact rather than the entire spectrum of institutional messaging.

Finally, the measurement approach expressed communication rather than enacted behavior. Strategic plans may articulate aspirational goals or institutional intentions that do not fully correspond to operational practices. The presence of collaboration language therefore indicates how universities represent their priorities but may not perfectly correspond to the extent of collaboration activities occurring within the institution.

Cross-Sectional Design

The cross-sectional design of this dissertation is unique in the organizational communication field because it examined all R1 and R2 universities in the United States, whereas most organizational communication studies examined a single or small number of cases in depth (Putnam & Pacanowsky, 1983; Eisenberg et al., 2013; Mumby, 2013; Ashcraft et al., 2009). While this design provided value by enabling assessment of the relationship between organizational conditions and industry-sponsored research, it also limits the ability to make causal claims. This is because the study examined organizational conditions, communication patterns, and industry-sponsored research activity at a single point in time; additionally, it is not possible to determine whether communication reflects existing institutional practices. For example, universities that already engage extensively with industry may incorporate collaboration language into their strategic plans after such partnerships have been established. As a result, the direction of influence between communication and collaboration cannot be definitively determined. The effects of organizational communication may also unfold over longer time horizons than are typically captured using a cross-sectional analysis. Strategic plans often articulate long-term institutional priorities that may influence organizational behavior gradually through resource allocation, cultural change, or the development of new partnerships. These effects may take several years to become visible in measurable outcomes, such as industry-sponsored research expenditures. Because the present study examines communication and collaboration outcomes within a single time period, it may not capture the delayed or cumulative effects of strategic communication.

Cross-sectional designs are also more vulnerable to unobserved contextual factors. Industry-sponsored research activity may be influenced by external conditions, such as regional

economic cycles, federal funding environments, or industry-specific research demand. Because the study examined institutions at a single point in time, it cannot account for how such contextual factors change over time or influence collaboration patterns.

Finally, a cross-sectional approach limits the ability to observe institutional adaptation processes. Universities may adjust their strategic communication and collaboration strategies in response to evolving industry relationships, technological developments, or policy incentives. Longitudinal research examining how strategic communication and collaboration activities evolve over time may provide deeper insight into the dynamic relationship between organizational messaging and university-industry collaboration.

Proxy Measures

Many of the variables included in this dissertation were proxy measures. For instance, industry-sponsored research expenditures served as the measure for UBC process activities; U.S. News and World Report rankings represented rankings; and UBC language in strategic plans served as a proxy for organizational communication. By definition, proxy variables are indirect measures used to approximate concepts that cannot be observed or measured directly. The key limitation of using proxies is that they may capture only part of the underlying concept. In terms of construct validity, a proxy variable may not fully represent the theoretical construct it is intended to measure. For example, strategic plans represent a formal and highly curated form of organizational communication, but universities may communicate priorities through other channels, including leadership messaging, individual department or unit-level strategies, partnership announcements, or operational policies. As a result, the strategic plan language might capture only a portion of the organizational communication related to industry collaboration.

More broadly, proxy measures might also introduce measurement error because they are indirect and can add noise to the analysis, only partially aligning with the underlying phenomenon being studied. Industry-sponsored research expenditures, for example, capture one form of university-industry collaboration, but they do not include other forms, such as consulting agreements, licensing activity, collaboration on joint federal awards, or student talent pipeline development. Since the proxy excludes other relevant aspects of collaboration, it may underestimate or misrepresent the broader scope of university-industry collaboration. It might also create a situation where relationships between variables are misinterpreted. For example, strategic plan language about collaboration might correlate with other organizational conditions, such as a STEM orientation, rather than directly reflect the level of organizational communication across the institution. Therefore, proxies may be imperfect representations of several variables included in this dissertation, which might explain why communication did not strongly moderate the structural predictors.

Coding Methodology

The coding method for this dissertation introduces potential constraints into the study because it translates complex qualitative meaning into structured variables. One limitation of this study is that it reduced complex language into simplified categories and numerical scores. Every decision in the coding methodology was based on theory and multiple checks to ensure reliability and validity. There are still limitations to every decision that was made. For example, in the extraction process, it was decided that a sentence before and after the trigger phrase should be extracted, and the context for that phrase or mention of industry collaboration might have required multiple paragraphs or sections to understand the actual context or significance of the language. Additionally, there remain limitations with potential classification error across the

multiple steps of extraction and classification using the GPT classifier. Some level of classification error is expected in automated coding approaches. For instance, the GPT classifier matched my manual coding scores 75% of the time, so there may be up to a 25% discrepancy in the classification of those passages.

Comparison of Findings to Prior Literature

This dissertation contributes to the UBC literature by examining the relationship between organizational communication, organizational conditions, and UBC process activities within a national sample of research universities. In doing so, it both aligns with and challenges prior assumptions in the literature, while also extending understanding of how collaboration is supported within higher education institutions.

Organizational Conditions and UBC

Prior research has often emphasized the role of institutional characteristics such as prestige, size, and structural capacity as key predictors of university-industry collaboration (Perkmann et al., 2013; Rybníček & Königsgruber, 2018). Highly ranked institutions, in particular, are frequently assumed to possess advantages in attracting industry partnerships due to reputation, research infrastructure, and faculty expertise. However, the findings of this study suggest that some of these structural factors may play a more limited role than commonly assumed. Institutional ranking was not a significant predictor of UBC process activities, and while it was moderately correlated with other indicators of research capacity, it did not independently explain variation in industry-sponsored research. This finding challenges the notion that prestige alone drives industry engagement and aligns with emerging perspectives that emphasize applied capacity and relevance over reputation. Institutional size and STEM orientation were included based on strong theoretical and empirical precedent linking these

factors to research activity and university-industry collaboration. Consistent with prior research, both variables emerged as significant direct predictors of industry-sponsored research. This reinforces the importance of structural research capacity in shaping institutional engagement with industry partners. The literature has also highlighted the importance of geographic proximity and regional context in facilitating collaboration, with universities located in dense urban or innovation-rich environments often assumed to have greater access to industry partners (D'Este & Iammarino, 2010; D'Este, et al., 2013; Katz & Martin, 1997; Ponds et al., 2007). In contrast, the findings of this study indicate that urban density was not a strong or positive predictor of UBC process activities. This suggests that institutions outside of major metropolitan areas can still achieve meaningful levels of industry engagement, reinforcing the role of universities as regional innovation anchors. This finding extends prior work by demonstrating that geographic context may be less determinative than the strategies and mechanisms institutions employ to engage external partners.

Organizational Communication as a Moderating Mechanism

While much of the UBC literature has focused on structural and environmental factors, relatively limited attention has been given to the role of organizational communication in shaping collaboration outcomes. Existing frameworks, including the UBC Ecosystem Framework, acknowledge communication as part of the broader system but often do not empirically test its role as a mechanism influencing collaboration.

This dissertation directly examined organizational communication through university strategic plans as a moderating factor and found no statistically significant evidence that organizational communication moderates the relationship between UBC organizational conditions and UBC process activities. This finding diverges from expectations that stronger

communication would amplify the effects of favorable organizational conditions. Instead, the results suggest that communication, as captured through strategic plan language, may not function as a direct or immediate driver of collaboration outcomes. This does not necessarily indicate that communication is unimportant. Rather, it suggests that its effects may be more complex, indirect, or temporally lagged than can be captured through cross-sectional analysis and proxy measures. This finding contributes to the literature by highlighting the need for more nuanced conceptualizations and measurements of communication within UIC systems.

Extending the UBC Literature

The findings from this dissertation contribute to a growing body of scholarship examining the drivers of university-industry collaboration. Consistent with prior literature, structural indicators of research capacity, including institutional size and STEM orientation, emerged as significant predictors of industry-sponsored research, reinforcing their importance in shaping collaboration outcomes. At the same time, other commonly assumed factors, such as ranking and urban density, were not consistently associated with variation in collaboration outcomes, suggesting that their influence may be more limited or context-dependent than often presumed. This study also examined organizational communication as a moderating mechanism within the UBC Ecosystem Framework and found no statistically significant evidence of a moderating effect. This finding suggests that organizational communication, as operationalized in this study, may not function as a direct conditioning mechanism between organizational conditions and UBC process activities. These results underscore the continued importance of structural research capacity while also highlighting the need for more nuanced approaches to understanding how universities translate that capacity into effective industry engagement. By empirically testing relationships within the UBC Ecosystem Framework, this study extends prior

work by clarifying the role of structural predictors and identifying limitations in how organizational communication is currently conceptualized and measured within UBC research.

Directions for Future Research

This dissertation provides many directions for potential future research. In addition to the ideas provided by practitioners and colleagues during the codebook review process, the current findings raise additional questions for future exploration. Practitioners consistently emphasized the distinction between strategic rhetoric and operational reality, noting that strategic plans often reflect aspirational, consensus-driven language, while meaningful university-industry collaboration is frequently driven by decentralized, working-level activities that may not be captured in formal documents. This suggests a need for future research to examine how institutional communication aligns with, or diverges from, operational practices. In addition, reviewers highlighted the role of internal organizational structures and coordination models, particularly in decentralized institutions. Variations in how universities organize and manage industry engagement, including distributed versus centralized approaches, may influence both how collaboration is communicated and how it is enacted. Finally, feedback pointed to the evolution of language used to describe industry engagement, including terms such as knowledge transfer, knowledge exchange, and business development, as well as emerging forms of engagement (e.g., challenge-based or industry-integrated learning). Together, these insights suggest opportunities to further refine how organizational communication supporting university-industry collaboration is conceptualized and measured.

In terms of other practical implications for UBC or organizational communications scholars, the publicly available codebook and GPT classifier could be used to assess additional artifacts to evaluate broader organizational communication within institutions. For instance,

leadership speeches, units, college or department level plans, press releases, or other announcements could be analyzed using the same method. The study could be repeated in 5 years as a longitudinal study to determine whether communication changes over time, and whether these changes affect UBC process activities. It might be interesting to examine institutions that have seen significant shifts in their industry-sponsored research proportions over time to understand what drove those changes. To assess UBC organizational communication more comprehensively, case studies could be used to examine how communication shapes internal collaboration processes and to understand the role of strategic plans and other strategic communication artifacts in shaping university-industry collaboration. Finally, alternative collaboration outcomes could be included alongside or in place of the outcome variable; for instance, licensing revenue, startup formation, economic impact, or philanthropic contributions from industry partners could be included to examine whether the same effects are reinforced or changed.

Conclusion

Universities are increasingly expected to demonstrate that their research contributes not only to scholarly advancement but also to economic and societal impact. Within this context, university-industry collaboration has become an important pathway through which institutions translate knowledge into practical applications and contribute to regional and national innovation systems. This study examined whether organizational communication supporting university-industry collaboration, as expressed through institutional strategic plans, moderates the relationship between organizational conditions and industry-sponsored research activity across U.S. research universities. The findings indicate that organizational conditions, particularly STEM research orientation and institutional size, remain the strongest predictors of industry-

sponsored research engagement, while communication about collaboration in strategic plans does not substantially alter these relationships.

These results suggest that universities' capacity to engage meaningfully with industry is grounded primarily in the underlying structure of the research enterprise. Faculty expertise, disciplinary composition, research infrastructure, and institutional scale appear to shape opportunities for collaboration more strongly than strategic messaging alone. At the same time, strategic plans continue to play an important role as institutional artifacts that articulate priorities, coordinate internal efforts, and signal opportunities for partnerships to external stakeholders. Communication about collaboration may therefore function less as a mechanism that directly drives collaboration outcomes and more as a reflection of how institutions position themselves within broader innovation ecosystems.

For universities developing future strategic plans, the findings underscore the importance of aligning collaboration goals with institutional capacity and supporting those goals with operational structures that enable sustained engagement with industry partners. Institutions may benefit from grounding collaboration strategies in areas of established research strength, investing in structures that facilitate industry partnerships, and recognizing the decentralized nature of collaboration within academic environments. Strategic plans may be most effective when they reinforce institutional capabilities and clearly communicate those capabilities to external partners, including industry, policymakers, and regional economic development organizations.

This dissertation also contributes to the literature methodologically by demonstrating how LLMs can support automated coding for quantitative content analysis of organizational documents. By applying an LLM-assisted classification approach to a large dataset of university

strategic plans, the research illustrates how emerging AI tools can enable systematic analysis of institutional communication across hundreds of organizations, a scale that would be difficult to achieve through manual coding alone. While careful validation and transparent coding procedures remain essential, the results of this study suggest that LLM-assisted coding can serve as a useful complement to traditional qualitative and manual content analysis methods. The approach contributes to the growing body of scholarship exploring the use of machine learning and LLM-based methods in social science research and offers a practical example of how these tools can expand the methodological toolkit available for studying organizational communication and institutional strategy in higher education.

More broadly, this research contributes to ongoing conversations about the role of universities in innovation ecosystems by clarifying the relationship between organizational conditions, organizational communication, and collaboration outcomes. By examining how universities communicate about collaboration and how those communications relate to measurable research activity, the study provides empirical insight into the conditions that shape university-industry engagement. As universities continue to navigate growing expectations for economic and societal impact, understanding the interplay between research capacity, institutional strategy, and external partnerships will remain critical for advancing the practice of university-industry collaboration.

References

- Abreu, M., & Grinevich, V. (2013). The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities. *Res. Policy* 42, 408–422.
<https://doi.org/10.1016/j.respol.2012.10.005>
- Adame, E. A., & Bisel, R. S. (2017). Quantitative methods. *The International Encyclopedia of Organizational Communication*, 1–10.
<https://doi.org/10.1002/9781118955567.wbieoc305>
- Allen, B. J. (2005). Social Constructionism. In S. May & D. K. Mumby (Eds.), *Engaging organizational communication theory and research: Multiple perspectives* (pp. 35–53). Sage Publications, Inc. <https://doi.org/10.4135/9781452204536.n3>
- Allen, M. W., Gotcher, J. M., & Seibert, J.H. (1993). A decade of organizational communication research: Journal articles 1980–1991. *Ann. Int. Commun. Assoc.* 16, 252–330.
<https://doi.org/10.1080/23808985.1993.11678856>
- Angel, S., Lamson-Hall, P., & Blanco, Z. (2021). Anatomy of density: Measurable factors that constitute urban density. *Buildings and Cities*, 2, 264–282. <https://doi.org/10.5334/bc.91>.
- Ankrah, S., & Al-Tabbaa, O. (2015). Universities-industry collaboration: A systematic review. *Scandinavian Journal of Management*, 31(3), 387–408.
<https://doi.org/10.1016/j.scaman.2015.02.00>
- Arizona State University. (2023). *Campus immersion: Strategic plan*.
https://provost.asu.edu/sites/default/files/page/104151/asu_campus_immersion.pdf
- Ashcraft, K. (2014). Feminist Theory. In L. Putnum & D. K. Mumby (Eds.) *The SAGE handbook of organizational communication* (3rd ed., pp. 145–146). SAGE Publications.

- Association of Public & Land-Grant Universities. (2015). *Higher education engagement in economic development: Foundations for strategy and practice* (pp. 1–28). Washington, D.C.
- Association of Public and Land-Grant Universities (APLU). (2021). *Driving U.S. competitiveness through improved university–industry partnerships*. APLU.
<https://www.aplu.org/wp-content/uploads/driving-us-competitiveness-through-improved-university-industry-partnerships.pdf>
- AUTM. *Bayh-Dole Act*. AUTM. Retrieved from <https://autm.net/about-tech-transfer/advocacy/legislation/bayh-dole-act>
- Azagra-Caro, J. M. (2007). What type of faculty member interacts with what type of firm? Some reasons for the delocalisation of university-industry interaction. *Technovation*, 27(11), 704–715. <https://doi.org/10.1016/j.technovation.2007.05.003>
- Barge, J. K., & Shockley-Zalabak, P. (2008). Engaged scholarship and the creation of useful organizational knowledge. *Journal of Applied Communication Research*, 36, 251–265.
<https://doi.org/10.1080/00909880802172277>
- Barringer, S. N., Leahey, E., & Salazar, K. (2020). What catalyzes research universities to commit to interdisciplinary research? *Research in Higher Education*, 61(6), 679–705.
<https://doi.org/10.1007/s11162-020-09603-x>
- Bastedo, M. N. (2012). Organizing higher education: A manifesto. In M. N. Bastedo (Ed.), *The organization of higher education* (pp. 3–17). Baltimore, MD: The Johns Hopkins University Press.

- Bastedo, M. N., & Bowman, N. A. (2010). US News & World Report college rankings: Modeling institutional effects on organizational reputation. *American Journal of Education*, 116(2), 163–183. <https://doi.org/10.1086/649437>
- Battilana, J., Leca, B., & Boxenbaum, E. (2009). How actors change institutions: Towards a theory of institutional entrepreneurship. *Annals of the Academy of Management*, 3(1), 65–107. <https://doi.org/10.5465/19416520903053598>
- Beise, M., Stahl, H., 1999. Public research and industrial innovations in Germany. *Research Policy* 28, 397–422. [https://doi.org/10.1016/S0048-7333\(98\)00126-7](https://doi.org/10.1016/S0048-7333(98)00126-7)
- Belenzon, S., & Schankerman, M.A. (2007). *The impact of private ownership, incentives and local development objectives on university technology transfer performance*. London School of Economics and Political Science. Centre for Economic Performance. <https://researchonline.lse.ac.uk/id/eprint/3724>
- Beniger, J. (1986). *The control revolution*. Cambridge, MA: Harvard University Press.
- Bencherki, N., Sergi, V., Cooren, F., & Vásquez, C. (2020). How strategy comes to matter: Strategizing as the communicative materialization of matters of concern. *Strategic Organization*, 18(3), 387–411. <https://doi.org/10.1177/1476127019890380>
- Benneworth, P., & Fitjar, R. D. (2019). Contextualizing the role of universities to Regional Development: Introduction to the special issue. *Regional Studies, Regional Science*, 6(1), 331–338. <https://doi.org/10.1080/21681376.2019.1601593>
- Bercovitz, J., Feldman, M. (2006). Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development. *Journal of Technology Transfer*, 31(1), 175–188. <https://doi.org/10.1007/s10961-005-5029-z>

- Birnbaum, R. (1988). *How colleges work: The cybernetics of academic organization and leadership*. Jossey-Bass.
- Bisel, R. B., Messersmith, A. S., & Keyton, J. (2010). Understanding organizational culture and communication through a gyroscope metaphor. *Journal of Management Education*, 34(3), 342–366. <https://doi.org/10.1177/1052562909340879>
- Bisel, R. S., & Adame, E. A. (2017). Post-positivist/functionalist approaches. *The international encyclopedia of organizational communication*, 1–22. <https://doi.org/10.1002/9781118955567.wbieoc168>
- Boardman, P. C. (2008). Beyond the stars: The impact of affiliation with university biotechnology centers on the industrial involvement of university scientists. *Technovation*, 28(5), 291–297. <https://doi.org/10.1016/j.technovation.2007.06.001>
- Boardman, P. C., & Ponomariov, B. L. (2009). University researchers working with private companies. *Technovation*, 29(2), 142–153. <https://doi.org/10.1016/j.technovation.2008.03.008>
- Bollen, K. A. (1989). *Structural equations with latent variables*. John Wiley & Sons.
- Bonaccorsi, A., Piccaluga, A. (1994). A theoretical framework for the evaluation of university-industry relationships. *R&D Management*, 24(3), 229–247. <https://doi.org/10.1111/j.1467-9310.1994.tb00876.x>
- Boris, B. M., Keyton, J., & Stephens, K. K. (2014). Organizational communication and technology. In L. L. Putnam & D. K. Mumby (Eds.), *The SAGE handbook of organizational communication: Advances in theory, research, and methods* (3rd ed., pp. 173–195). SAGE Publications.

- Bouwma-Gearhart, J., Lenhart, C., Carter, R., Mundorff, K., Cho, H., & Knoch, J. (2021). Inclusively recognizing faculty innovation and entrepreneurship impact within promotion and tenure considerations. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(3), 182. <https://doi.org/10.3390/joitmc7030182>
- Boyer, E. L. (1996). The scholarship of engagement. *Bulletin of the American Academy of Arts and Sciences*, 49(7), 18–33. <https://doi.org/10.2307/3824459>
- Breschi, S., & Lissoni, F. (2001). Localised knowledge spillovers vs. innovative milieu: Knowledge “tacitness” reconsidered. *Papers in regional science*, 80(3), 255–273. <https://doi.org/10.1111/j.1435-5597.2001.tb01799.x>
- Bruneel, J., D’Este, P., & Salter, A. (2010). Investigating the factors that diminish the barriers to university–industry collaboration. *Research Policy*, 39(7), 858–868. <https://doi.org/10.1016/j.respol.2010.03.006>
- Burmester, E. T. (2003). *Beyond masters and mentors: Gender and doctoral education in rhetoric and composition*. University of Illinois, Chicago. <https://www.proquest.com/openview/77c80a3de69abad0002246257e90784f/1?pq-origsite=gscholar&cbl=18750&diss=y>
- Bush, V. (1945). *Science, the endless frontier: A report to the President on a program for postwar scientific research*. United States Government Printing Office. <https://www.nsf.gov/od/lpa/nsf50/vbush1945.htm>
- Carayol, N. (2003). Objectives, agreements and matching in science–industry collaborations: Reassembling the pieces of the puzzle. *Research Policy*, 32(6), 887–908. [https://doi.org/10.1016/S0048-7333\(02\)00108-7](https://doi.org/10.1016/S0048-7333(02)00108-7)

- Carlino, G. A., Chatterjee, S., & Hunt, R. M. (2007). Urban density and the rate of invention. *Journal of Urban Economics*, 61(3), 389–419. <https://doi.org/10.1016/j.jue.2006.08.003>
- Carnegie Classification of Institutions of Higher Education. (2025). *Basic classification description*. American Council on Education and Indiana University Center for Postsecondary Research. <https://carnegieclassifications.acenet.edu/carnegie-classification/classification-methodology/2025-institutional-classification/>
- Clark, J. H. C., Murri, K., Nijhawan, V., Blackwell, C. T., Overton, D., & Ingram, S. (2020). *The innovation impact of U.S. universities: Rankings and policy conclusions*. George W. Bush Institute-SMU Economic Growth Initiative. <https://gwbushcenter.imgix.net/wp-content/uploads/gwbi-university-impact-report-ranks-exec-summary.pdf>
- Cohen, W. M., Nelson, R. R., Walsh, J. P. (2002). Links and impacts: The influence of public research on industrial R&D. *Management Science*, 48(1), 1–23. <https://doi.org/10.1287/mnsc.48.1.1.14273>
- Corman, S. R. (2005). Postpositivism. In S. May & D. K. Mumby (Eds.), *Engaging organizational communication theory and research: Multiple perspectives* (pp. 15–34). Thousand Oaks, CA: SAGE.
- Cronbach, L. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–335. <https://doi.org/10.1007/BF02310555>
- Ćudić, B., Alešnik, P., & Hazemali, D. (2022). Factors impacting university–industry collaboration in European countries. *Journal of Innovation and Entrepreneurship*, 11(33). <https://doi.org/10.1186/s13731-022-00226-3>.

- D'Este P. and Iammarino S. (2010) The spatial profile of university-business research partnerships, *Papers in Regional Science*, 89(2), 335–350. <https://doi.org/10.1111/j.1435-5957.2010.00292.x>
- D'Este, P., & Perkmann, M. (2010). Why do academics engage with industry? The entrepreneurial university and individual motivations. *The Journal of Technology Transfer*, 36(3), 316–339. <https://doi.org/10.1007/s10961-010-9153-z>
- D'Este, P., Guy, F., & Iammarino, S. (2013). Shaping the formation of university-industry research collaborations: what type of proximity does really matter? *Journal of economic geography*, 13(4), 537–558. <https://doi.org/10.1093/jeg/lbs010>
- D'Este, P., Patel, P. (2007). University-industry linkages in the UK: What are the factors determining the variety of interactions with industry? *Research Policy*, 36(9), 1295–1313. <https://doi.org/10.1016/j.respol.2007.05.002>
- Davey, T. (2017). Converting university knowledge into value: how conceptual frameworks contribute to the understanding of the third mission role of European universities. *International journal of technology transfer and commercialisation*, 15(1), 65-96. <https://doi.org/10.1504/IJTTC.2017.084637>
- Davey, T., Baaken, T., Galán-Muros, V., & Meerman, A. (2011). *State of the cooperation between higher education institutions and public and private organizations in Europe*. European Commission, Directorate-General for Education and Culture. <https://ec.europa.eu/docsroom/documents/10414/attachments/1/translations/en/renditions/native>
- Davis, M. (2016). Can college rankings be believed? *She Ji: The Journal of Design, Economics, and Innovation*, 2(3), 215–230. <https://doi.org/10.1016/j.sheji.2016.11.002>

- Day, T. (2025, June 19). *What's hindering university-industry engagement? Insights from the UIIN Community*. UIIN. <https://www.uiin.org/2025/06/19/whats-hindering-university-industry-engagement-insights-from-the-uiin-community/>
- Deetz, S. (2001). Conceptual foundations. In F. M. Jablin, & L.L Putnam (Eds.), *The new handbook of organizational communication: Advances in theory, research, and methods* (pp. 3–46). Thousand Oaks, CA: Sage.
- Deetz, S. (2008). Engagement as co-generative theorizing. *Journal of Applied Communication Research*, 36(3), 288–296. <https://doi.org/10.1080/00909880802172301>
- Deetz, S. A., & Putnam, L. L. (2001). Thinking about the future of communication studies. In W. Gudykunst (Ed.), *Communication yearbook* (vol. 24, pp. 1–14). Thousand Oaks, CA: SAGE.
- Deetz, S., & Eger, E. (2014). Developing a metatheoretical perspective for organizational communication studies. In L. L. Putnam & D. K. Mumby (Eds.), *The SAGE Handbook of Organizational Communication* (3rd ed., pp. 29). SAGE Publications.
- Deetz, S.(1994a). The future of the discipline: The challenges, the research, and the social contribution. In S. A. Deetz (Ed.), *Communication yearbook* (vol. 17, pp. 565–600). Thousand Oaks, CA: Sage.
- Deetz, S.(1994b). Representative practices and the political analysis of corporations. In B. Kovacic (Ed.), *Organizational communication: New perspectives* (pp. 209–242). Albany: State University of New York Press.
- Desselle, S., Rosenthal, M., Holmes, E. R., Andrews, B., Lui, J., & Raja, L. (2017). Components of a measure to describe organizational culture in academic pharmacy. *American journal of pharmaceutical education*, 81(10), 6–19. <https://doi.org/10.5688/ajpe6022>

- DiMaggio, P. J. (1988). Interest and agency in institutional theory. In L. G. Zucker (Ed.), *Institutional patterns and organizations: Culture and environment* (pp. 3–22). Cambridge, MA: Ballinger.
- Drost, E. A. (2011). Validity and reliability in social science research. *Education Research and perspectives*, 38(1), 105–123.
https://www.researchgate.net/publication/261473819_VValidity_and_Reliability_in_Social_Science_Research
- Duranton, G. (2015). Growing through cities in developing countries. *The World Bank Research Observer*, 30(1), 39–73. <https://doi.org/10.1093/wbro/lku006>
- Duranton, G., & Puga, D. (2020). The economics of urban density. *Journal of Economic Perspectives*, 34(3), 3–26. <https://doi.org/10.1257/jep.34.3.3>.
- Eddy, E. D. 1957. *Colleges for our land and time: The land-grant idea in American education*. New York: Harper.
- Eisenberg, E. M., & Riley, P. (2001). Organizational culture. In F. M. Jablin & L. L. Putnam (Eds.), *The new handbook of organizational communication: Advances in theory, research, and methods* (pp. 291–322). Thousand Oaks, CA: SAGE.
- Eschenfelder, B. (2011). Lessons about engaged communication scholarship: I heard it through the grapevine. *Florida Communication Journal*, 39, 37–54.
<https://betheschenfelder.com/wp-content/uploads/2011/06/FCJ-MY-ARTICLE.pdf>
- Etzkowitz, H. (1998). The norms of entrepreneurial science: Cognitive effects of the new university-industry linkages. *Research Policy*, 27, 823–833.
[https://doi.org/10.1016/S0048-7333\(98\)00093-6](https://doi.org/10.1016/S0048-7333(98)00093-6)

- Etzkowitz, H. (2003). Innovation in innovation: The triple helix of university-industry government relations. *Social science information*, 42(3), 293–337.
<https://doi.org/10.1177/05390184030423002>
- Etzkowitz, H. (2003). Research groups as “quasi-firms”: The invention of the entrepreneurial university. *Research Policy*, 32(1), 109–121. [https://doi.org/10.1016/S0048-7333\(02\)00009-4](https://doi.org/10.1016/S0048-7333(02)00009-4)
- Etzkowitz, H., & Leydesdorff, L. (2000), The dynamics of innovation: From national system and “mode2” to a Triple Helix of university-industry-government relations. *Research Policy*, 29, 109–123. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- Etzkowitz, H., & Leydesdorff, L. A. (1997). *Universities and the global knowledge economy: A triple helix of university-industry-government relations*. Pinter.
- Etzkowitz, H., and Leydesdorff, L. (1998), The endless transition: a “Triple Helix” of university-industry-government relations. *Minerva*, 36, 203–208.
<https://www.jstor.org/stable/41821107>
- Executive Office of the President. (2011). *A strategy for American innovation: Securing our economic growth and prosperity*. National Economic Council.
<https://obamawhitehouse.archives.gov/sites/default/files/uploads/InnovationStrategy.pdf>
- Farinha, L., & Ferreira, J. J. (2013). Triangulation of the triple helix: a conceptual framework. *Triple Helix Association, Working Paper, 1*.
- Felin, T., Foss, N. J., & Ployhart, R. E. (2015). The microfoundations movement in strategy and organization theory. *The Academy of Management Annals*, 9(1), 575–632.
<https://doi.org/10.1080/19416520.2015.1007651>

- Flores, E. M. (2011). *Becoming a researcher: A qualitative study of the apprenticeship model in doctoral education* (Order No. 3472095). Available from ProQuest One Academic. (887909519).
- Friedland, R., & Alford, R. R. (1991). Bringing society back in: Symbols, practices, and institutional contradictions. In W. W. Powell & P. J. DiMaggio (Eds.), *The new institutionalism in organizational analysis* (pp. 232–263). University of Chicago Press.
- Friedman, J., & Silberman, J. (2003). University technology transfer: Do incentives, management, and location matter? *Journal of Technology Transfer*, 28(1), 17–30. <https://doi.org/10.1023/A:1021675521312>
- Fritz, M. S., & Mackinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological science*, 18(3), 233–239. <https://doi.org/10.1111/j.1467-9280.2007.01882.x>
- Galán-Muros, V. & Davey, T. (2017). The UBC ecosystem: putting together a comprehensive framework for university-business cooperation. *The Journal of Technology Transfer*, 44(4), 1311–1346. <https://doi.org/10.1007/s10961-017-9562-3>
- Galán-Muros, V. E. (2016). *The University-Business Cooperation Ecosystem: An evidence-based approach for the management of European university-business cooperation*. Vrije Universiteit.
- Garner, J. T. (2015). Different ways to disagree: A study of organizational dissent to explore connections between mixed methods research and engaged scholarship. *Journal of Mixed Methods Research*, 9(2), 178–195. <https://doi.org/10.1177/1558689813515333>
- Geissler, M. Jahn, S., and Haefner, P. (2006), The entrepreneurial climate at universities: The impact of organizational factors. In D. Smallbone, J. Leitao, M. Raposo, and F. Welter,

- (Eds.), *The Theory and practice of entrepreneurship - Frontiers in European entrepreneurship*. Edward Elgar Publishing.
- Godin, B. (2006). The linear model of innovation: The historical construction of an analytical framework. *Science, Technology, & Human Values*, 31(6), 639–667.
<https://doi.org/10.1177/0162243906291865>
- Golde, C. M. (2008). Applying lessons from professional education to the preparation of the professoriate. *New Directions for Teaching and Learning*, 113, 17–25.
<https://doi.org/10.1002/tl.305>
- Golde, C. M., & Dore, T. M. (2001). *At Cross Purposes: What the experiences of doctoral students reveal about doctoral education*. The Pew Charitable Trusts.
<https://www.phdcompletion.org/promising/AtCrossPurposes.pdf>
- Grunig, S. D. (1997). Research, reputation, and resources: The effect of research activity on perceptions of undergraduate education and institutional resource acquisition. *Journal of Higher Education*, 68(1), 17–52. <https://doi.org/10.2307/2959935>
- Gupta, K. P., & Sengar, R. (2020). Organisational communication in higher educational institutions: scale development and validation. *International Journal of Education Economics and Development*, 11(1), 1–26. <https://doi.org/10.1504/ijeed.2020.104283>
- Hair, J. F., Black, W.C., Babin, B.J., & Anderson, R.E. (2010). *Multivariate data analysis* (7th ed.). Prentice Hall.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., Tatham, R.L., 2006. *Multivariate Data Analysis* (Sixth ed). Pearson-Prentice Hall.

Hall, B. H. (2001, October). University-industry research partnerships and intellectual property.

In *NSF-CISTP Workshop, Washington, DC* (Vol. 11).

<https://eml.berkeley.edu/~bhhall/papers/BHH%20IP-Univ-Ind.pdf>

Hall, R., & Lulich, J. (2021). *University strategic plans: What they say about innovation.*

Innovative Higher Education, 46(3), 261–284. <https://doi.org/10.1007/s10755-020-09535-5>

Harris, M. (2010). Interdisciplinary strategy and collaboration: A case study of American research universities. *Journal of Research Administration*, 41(1), 22–46.

<https://eric.ed.gov/?id=EJ886790>

Hawes, L. (1974). Social collectivities as communication: Perspectives on organizational behavior. *Quarterly Journal of Speech*, 60, 497–502.

<https://doi.org/10.1080/00335637409383259>

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: a regression-based approach* (2nd ed.). The Guilford Press.

Hazelkorn, E. (2014). Rankings and the global reputation race. *New Directions for Higher Education*, 168, 13–26. <https://doi.org/10.1002/he.20110>

Hazelkorn, E. (2015). *Rankings and the reshaping of higher education: The battle for world-class excellence*. Springer.

Heggestad, E. D., Scheaf, D. J., Banks, G. C., Monroe Hausfeld, M., Tonidandel, S., & Williams,

E. B. (2019). Scale adaptation in organizational science research: A review and best-practice recommendations. *Journal of Management*, 45(6), 2596–2627.

<https://doi.org/10.1177/0149206319850280>

- Henderson, R., Jaffe, A., & Trajtenberg, M. (1998). Universities as a source of commercial technology: A detailed analysis of university patenting. *Review of Economics and Statistics*, 80(1), 119–127. <https://doi.org/10.1162/003465398557221>
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, 33(2–3), 61–83.
<https://doi.org/10.1017/S0140525X0999152X>
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: A multidisciplinary journal*, 6(1), 1–55. <https://doi.org/10.1080/10705519909540118>
- Hughes, A., Kitson, M. (2012). Pathways to impact and the strategic role of universities: new evidence on the breadth and depth of university knowledge exchange in the UK and the factors constraining its development. *Cambridge J. Econ*, 36, 723–750.
<https://doi.org/10.1093/cje/bes017>
- Huyghe, A., & Knockaert, M. (2014). The influence of organizational culture and climate on entrepreneurial intentions among research scientists. *The Journal of Technology Transfer*, 40(1), 138–160. <https://doi.org/10.1007/s10961-014-9333-3>
- Huyghe, A., & Knockaert, M. (2015). The influence of organizational culture and climate on entrepreneurial intentions among research scientists. *J Technol Transf*, 40, 138–160.
<https://doi.org/10.1007/s10961-014-9333-3>
- Israel, B. A., Schulz, E. A., Parker, E., & Becker, A. B. (2001). Community-based participatory research: Policy recommendations for promoting a partnership approach in health research. *Education for Health*, 14(2), 189–197.
<https://doi.org/10.1080/13576280110051055>

- Katz J.S. and Martin B.R. (1997) What is Research Collaboration? *Research Policy*, 26, 1–18.
[https://doi.org/10.1016/s0048-7333\(96\)00917-1](https://doi.org/10.1016/s0048-7333(96)00917-1)
- Kellogg Commission, National Association of State Universities and Land-Grant Colleges,
 Office of Public Affairs. (1999). *Returning to our roots: the engaged institution*.
 Washington, D.C. <https://www.aplu.org/wp-content/uploads/returning-to-our-roots-the-engaged-institution.pdf>
- Keyton, J. (2011). *Communication and organizational culture: A key to understanding work experiences* (2nd ed.). SAGE.
- Keyton, J. (2017). Communication in organizations. *Annual Review of Organizational Psychology and Organizational Behavior*, 4, 501-526. <https://doi.org/10.1146/annurev-orgpsych-032516-113341>
- Kezar, A., & Lester, J. (2009). *Organizing higher education for collaboration: A guide for campus leaders*. Jossey-Bass.
- Kline, R. (2005). *Principles and practices of structural equation modeling* (2nd ed.). New York: Guilford Press.
- Koschmann, M., Lewis, L., & Isbell, M. (2011). *NSF/SBE White Paper: Effective Collaboration in a Complex and Interdependent Society*. NSF. Retrieved from
http://www.nsf.gov/sbe/sbe_2020/Abstracts.pdf
- Kristinsson, S., Jóhannesson, H., & Þorsteinsson, T. (2014). The public role of universities - Sponsorship in Icelandic universities. *Icelandic Review of Politics and Administration*, 10, 473–498. <https://doi.org/10.13177/irpa.a.2014.10.2.14>

- Kuhn, T. (2008). A communicative theory of the firm: Developing an alternative perspective on intra-organizational power and stakeholder relationships. *Organization Studies*, 29(8–9), 1227–1254. <https://doi.org/10.1177/0170840608094778>
- Lammers, J. & Garcia, M. (2014). In *The SAGE Handbook of Organizational Communication* (3rd ed., pp. 195–217). essay, SAGE Publications.
- Lammers, J. C. (2011). How institutions communicate: Institutional messages, institutional logics, and organizational communication. *Management Communication Quarterly*, 25(1), 154–182. <https://doi.org/10.1177/0893318910389280>
- Lammers, J. C., & Barbour, J. B. (2006). An institutional theory of organizational communication. *Communication Theory*, 16(3), 356–377. <https://doi.org/10.1111/j.1468-2885.2006.00274.x>
- Lawrence, T. B., & Suddaby, R. (2006). Institutions and institutional work. In S. R. Clegg, C. Hardy, T. B. Lawrence, & W. R. Nord (Eds.), *Handbook of organization studies* (2nd ed.). SAGE.
- Leahey, E., Barringer, S. N., & Ring-Ramirez, M. (2019). Universities’ structural commitment to interdisciplinary research. *Scientometrics*, 118(3), 891–919. <https://doi.org/10.1007/s11192-018-2992-3>
- Lee, Y. S. (1996). ‘Technology transfer’ and the research university: a search for the boundaries of university-industry collaboration. *Research policy*, 25(6), 843–863. [https://doi.org/10.1016/0048-7333\(95\)00857-8](https://doi.org/10.1016/0048-7333(95)00857-8)
- Lee, Y. S. (2000). The sustainability of university-industry research collaboration: An empirical assessment. *Journal of Technology Transfer*, 25(2), 111–133. <https://doi.org/10.1023/a:1007895322042>

- Lewis, L. K. (2012). Becoming useful: Using engaged scholarship as a means to move NPO scholarship forward. *Management Communication Quarterly*, 26(1), 186–192.
<https://doi.org/10.1177/0893318911423763>
- Leydesdorff, L. (2005), 'The Triple Helix model and the study of knowledge-based innovation systems. *International Journal of Contemporary Sociology*, 42(1), pp 12–27.
<https://doi.org/10.48550/arXiv.0911.4291>
- Lupo, L., Magnusson, O., Hovy, D., Naurin, E., & Wängnerud, L. (2023). Towards human-level text coding with LLMs: The case of fatherhood roles in public policy documents. *Cambridge Medium*, 37, 1–26. <https://arxiv.org/abs/2311.11844>
- Maguire, S., Hardy, C., & Lawrence, T. (2004). Institutional entrepreneurship in emerging fields: HIV/AIDS treatment advocacy in Canada. *Academy of Management Journal*, 47(5), 654–679. <https://doi.org/10.2307/20159610>
- Markides, C. (2007). In search of ambidextrous professors. *Academy of Management Journal*, 50, 762–768. <https://doi.org/10.5465/amj.2007.26279168>
- Markman, G.D., Phan, P.H., Balkin, D.B., and Gianiodis, P.T. (2005), Entrepreneurship and university-based technology transfer. *Journal of Business Venturing*, 20(2), 241–263.
<https://doi.org/10.1016/j.jbusvent.2003.12.003>
- Mayr, S., Erdfelder, E., Buchner, A., & Faul, F. (2007). A short tutorial of GPower. *Tutorials in quantitative methods for psychology*, 3(2), 51–59.
<https://doi.org/10.20982/tqmp.03.2.p051>
- McCoy, C. J. (2018). *A conditional process analysis of boundary spanning functions in Us research universities* [Doctoral dissertation, University of Oklahoma]. SHAREOK.
<https://hdl.handle.net/11244/300227>

- McGahan, A. M. (2007). Academic research that matters to managers: On zebras, dogs, lemmings, hammers, and turnips. *Academy of Management Journal*, 50, 748–753.
<https://doi.org/10.5465/amj.2007.26279166>
- McKelvey, B. (2006). Response: Van de Ven and Johnson’s “engaged scholarship”: Nice try, but . . . *Academy of Management Review*, 31, 822–829.
<https://doi.org/10.5465/amr.2006.22527451>
- McPhee, R.D., Zaug, P. (2001). Organizational theory, organizational communication, organizational knowledge, and problematic integration. *J. Commun.* 51, 574–91.
<https://doi.org/10.1111/j.1460-2466.2001.tb02897.x>
- McPhee, R. D., & Zaug, P. (2008). The communicative constitution of organizations: A framework for explanation. *The Electronic Journal of Communication*, 10. 21-47.
<https://doi.org/10.4324/9780203891025>
- Medina, A., Hernández, J. C., Muñoz-Cerón, E., & Rus-Casas, C. (2020). Identification of Educational Models That Encourage Business Participation in Higher Education Institutions. *Sustainability*, 12(20), 8421. <https://doi.org/10.3390/su12208421>
- Messick, S., & Linn, R. L. (1989). Educational measurement. *Validity*, 13–103.
- Meyer-Krahmer, F., Schmoch, U., 1998. Science-based technologies: university-industry interactions in four fields. *Research Policy*, 27, 835–851. [https://doi.org/10.1016/s0048-7333\(98\)00094-8](https://doi.org/10.1016/s0048-7333(98)00094-8)
- Miller, K. I. (2000). Common ground from the post-positivist perspective: From “straw person” argument to collaborative coexistence. In S. R. Corman & M. S. Poole (Eds.), *Perspectives on organizational communication: Finding common ground* (pp. 46–67). Guilford.

Mirowski, P., & Sent, E. M. (2008). The commercialization of science and the response of STS.

Part of book or chapter of book (Hackett, Edward J.; Amsterdamska, Olga; Lynch, Michael (ed.), *Handbook of Science and Technology Studies*, 635-689.

<https://hdl.handle.net/2066/68684>

Mitton, C., Adair, C.E., McKenzie, E., Patten, S.B., and Wayne Perry, B. (2007). Knowledge transfer and exchange: Review and synthesis of the literature. *The Milbank Quarterly*, 85(4), 729–768. <https://doi.org/10.1111/j.1468-0009.2007.00506.x>

Morrill, J. S. (1888). *State aid to land grant colleges: An address*. Free Press Association.

Morrison-Smith, S., & Ruiz, J. (2020). Challenges and barriers in virtual teams: a literature review. *SN Applied Sciences*, 2(6), 1–33. <https://doi.org/10.1007/s42452-020-2801-5>

Mowery, D. C., Nelson, R. R., Sampat, B. N., & Ziedonis, A. A. (2004). *Ivory tower and industrial innovation: University-industry technology transfer before and after the Bayh-Dole Act*. Stanford University Press.

Mumby, D. K. (2013). *Organizational communication: A critical approach* (2nd ed.). SAGE Publications.

Mumby, D. K. (2014). Critical theory and postmodernism. *The SAGE handbook of organizational communication: Advances in theory, research, and methods*, 101-126.

Myers, K. K. (2014). Mixed methods: When more really is more. In L. L. Putnam & D. K. Mumby (Eds.), *The SAGE handbook of organizational communication: Advances in theory, research, and methods* (pp. 297–320). Sage.

National Center for Science and Engineering Statistics. (2023). *Higher education R&D expenditures, by source of funds: FYs 1953–2022* (Table 1) [Data table]. In *Higher Education Research and Development (HERD) Survey, Fiscal Year 2022*. National

- Science Foundation. <https://nces.nsf.gov/pubs/nsf24308/assets/data-tables/tables/nsf24308-tab001.pdf>
- National Economic Council and Office of Science and Technology Policy. (2015). *A Strategy for American Innovation*. The White House.
https://obamawhitehouse.archives.gov/sites/default/files/strategy_for_american_innovation_october_2015.pdf
- National Science Foundation (NSF). *Academic Research and Development*. Science and Engineering Indicators. Retrieved from <https://nces.nsf.gov/pubs/nsb20202/academic-research-in-the-united-states>
- National Science Foundation, National Center for Science and Engineering Statistics. (2024). *Higher Education Research and Development (HERD) Survey 2023*. National Science Foundation, National Center for Science and Engineering Statistics.
https://nces.nsf.gov/surveys/higher-education-research-development/2023#survey-description_key-survey-information
- National Science Foundation, National Center for Science and Engineering Statistics. (2024). *Higher Education Research and Development Survey (HERD), Fiscal Years 2014–2023*. National Science Foundation, National Center for Science and Engineering Statistics.
<https://nces.nsf.gov/surveys/higher-education-research-development/>
- Netemeyer, R.G., Bearden, W.O., Sharma, S., (2003). *Scaling Procedures: Issues and Applications*. Sage.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). McGraw-Hill.
- Olson, G. M., & Olson, J. S. (2000). Distance matters. *Human-computer interaction*, 15(2–3), 139–178. https://doi.org/10.1207/s15327051hci1523_4

- Orton, J. D., & Weick, K. E. (1990). Loosely coupled systems: A reconceptualization. *Academy of Management Review*, 15(2), 203–223. <https://doi.org/10.2307/258154>
- Pacanowsky, M. E., & O'Donnell-Trujillo, N. (1982). Communication and organizational cultures. *Western Journal of Speech Communication*, 46(2), 115–130. <https://doi.org/10.1080/10570318209374072>
- Pacanowsky, M. E., & O'Donnell-Trujillo, N. (1983). Organizational communication as cultural performance. *Communication Monographs*, 50(2), 126–147. <https://doi.org/10.1080/03637758309390158>
- Palmer, D., Biggart, N., & Dick, B. (2008). Is the new institutionalism a theory? In R. Greenwood, C. Oliver, K. Sahlin, & R. Suddaby (Eds.), *The SAGE handbook of organizational institutionalism* (pp. 739–768). Thousand Oaks, CA: SAGE.
- Parker, M. (2000). *Organizational culture and identity: Unity and division at work*. Thousand Oaks, CA: SAGE.
- Pearl, A., Ward, E., Janke, E., Rios, M., & Eatman, T. K. (2025). Rewarding faculty publicly-engaged scholarship in promotion and tenure policies at Carnegie-classified community engagement institutions: A descriptive analysis. *Journal of Participatory Research Methods*, 6(5). <https://doi.org/10.35844/001c.153977>
- Pearce, W. B. (1989). *Communication and the human condition*. Southern Illinois University Press.
- Perkmann, M., & Walsh, K. (2008). Engaging the scholar: Three types of academic consulting and their impact on universities and industry. *Research Policy*, 37(10), 1884–1891. <https://doi.org/10.1016/j.respol.2008.07.009>

- Perkmann, M., Neely, A., & Walsh, K. (2011). How should firms evaluate success in university-industry alliances? A performance measurement system. *R&D Management*, 41(2), 202–216. <https://doi.org/10.1111/j.1467-9310.2011.00637.x>
- Perkmann, M., Salandra, R., Tartari, V., McKelvey, M., & Hughes, A. (2021). Academic engagement: A review of the literature 2011–2019. *Research Policy*, 50(1), 104114. <https://doi.org/10.1016/j.respol.2020.104114>
- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D’este, P., & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university-industry relations. *Research policy*, 42(2), 423–442. <https://doi.org/10.1016/j.respol.2012.09.007>
- Phillips, D. C. (1987). *Philosophy, science, and social inquiry*. Pergamon Press.
- Phillips, D. C. (1990). Postpositivistic science: Myths and realities. In E. G. Guba (Ed.), *The paradigm dialog* (pp. 31–45). Sage.
- Phillips, N., Lawrence, T. B., & Hardy, C. (2004). Discourse and institutions. *Academy of Management Review*, 29(4), 635–652 <https://doi.org/10.2307/20159075>
- Philpott, K., Dooley, L. O'Reilly, C., and Lupton, G. (2011), The entrepreneurial university: examining the underlying academic tensions. *Technovation*, 31(4), 162–170. <https://doi.org/10.1016/j.technovation.2010.12.003>
- Plewa, C., Quester, P., & Baaken, T. (2006). Organizational culture differences and market orientation: an exploratory study of barriers to university industry relationships. *International Journal of Technology Transfer and Commercialization*, 5(4), 373. <https://doi.org/10.1504/ijttc.2006.013344>

- Polt, W., Gassler, H., and Schibany, A. (2001), Benchmarking industry-science relations: the role of framework conditions. *Science and Public Policy*, 28(4), 247–258.
<https://doi.org/10.3152/147154301781781453>
- Ponds R., van Oort F. and Frenken K. (2007) The geographical and institutional proximity of research collaboration. *Papers in Regional Science* 86(3), 423–443.
<https://doi.org/10.1111/j.1435-5957.2007.00126.x>
- Posit Team. (2026). *RStudio: Integrated development environment for R* (Version 2026.01.1+403) [Computer software]. Posit Software, PBC. <https://www.posit.co/>
- Potts, T. (2010). The natural advantage of regions: linking sustainability, innovation, and regional development in Australia. *Journal of Cleaner Production*, 18(8), 713–725.
<https://doi.org/10.1016/j.jclepro.2010.01.008>
- Powell, W. W., & Colyvas, J. A. (2008). Microfoundations of institutional theory. In R. Greenwood, C. Oliver, K. Sahlin, & R. Suddaby (Eds.), *The Sage handbook of organizational institutionalism* (pp. 276–298). SAGE.
- Princeton University. (2016). *Princeton University strategic framework*.
https://www.princeton.edu/sites/default/files/documents/2016/01/PU_Strategic_Framework.pdf
- Putnam, L. L. (1983). The interpretive perspective: An alternative to functionalism. In L. L. Putnam & M. E. Pacanowsky (Eds.), *Communication in organizations, an interpretive approach* (pp. 31–54). SAGE.
- Putnam, L. L., & Nicotera, A. M. (2009). *Building theories of organization: The constitutive role of communication*. Routledge.

- Putnam, L. L., & Pacanowsky, M. E. (Eds.). (1983). *Communication and organizations: An interpretive approach*. Sage.
- R Core Team. (2026). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>
- R&D World. (2023, October 10). *Academic R&D continues slow rise*. R&D World. <https://www.rdworldonline.com/academic-rd-continues-slow-rise/>
- Ranga, M., Hoareau, C., Durazzi, N., Etzkowitz, H., Marcucci, P., & Usher, A. (2013). Study on university-business cooperation in the US. *London: LSE Enterprise*. <https://archive.science-marketing.com/pdf/2013-07-07-Ranga.pdf>
- Rasmussen, E., Moen, Ø., & Gulbrandsen, M. (2006). Initiatives to promote commercialization of university knowledge. *Technovation*, 26(4), 518–533. <https://doi.org/10.1016/j.technovation.2004.11.005>
- Reiter, A. G. (2026). *U.S. News & World Report historical liberal arts college and university rankings*. <http://andyreiter.com/datasets/>
- Robinson, R., & Sweet, J. (2026). *UBC communication coding repository* [Computer software]. GitHub. https://github.com/jsweet8258/LCR_UCB_Scoring-Reference.git
- Rosenthal, R. and Rosnow, R. L. (1991). *Essentials of Behavioral Research: Methods and Data Analysis*. Second Edition. McGraw-Hill Publishing Company.
- Rourke, L., & Anderson, T. (2004). Validity in quantitative content analysis. *Educational technology research and development*, 52(1), 5–18. <https://doi.org/10.1007/bf02504769>
- Rushton, J. P., and Meltzer, S. (1981). Research productivity, university revenue, and scholarly impact (citations) of 169 British, Canadian, and United States universities. *Scientometrics*, 3, 275–303. <https://doi.org/10.1007/bf02021122>

- Rybníček, R., & Königgruber, R. (2018). What makes industry–university collaboration succeed? A systematic review of the literature. *Journal of Business Economics*, 89, 221–250. <https://doi.org/10.1007/s11573-018-0916-6>.
- Rytting, C. M., Sorensen, T., Argyle, L., Busby, E., Fulda, N., Gubler, J., & Wingate, D. (2023). *Towards coding social science datasets with language models*. arXiv. <https://arxiv.org/abs/2306.02177>
- Sampat, B. N. (2006). Patenting and US academic research in the 20th century: The world before and after Bayh-Dole. *Research Policy*, 35(6), 772–789. <https://doi.org/10.1016/j.respol.2006.04.009>
- Saunders, M. N. K. (2011). The management researcher as practitioner: Issues from the interface. In C. Cassell & B. Lee (Eds.), *Challenges and controversies in management research* (pp. 243–257). Routledge.
- Schartinger, D., Rammera, C., Fischer, M.M., Fröhlich, J., 2002. Knowledge interactions between universities and industry in Austria: sectoral patterns and determinants. *Research Policy* 31, 303–328. [https://doi.org/10.1016/s0048-7333\(01\)00111-1](https://doi.org/10.1016/s0048-7333(01)00111-1)
- Scott, W. R., & Meyer, J. W. (1983). The organization of societal sectors. In J. W. Meyer & W. R. Scott (Eds.), *Organizational environments: Ritual and rationality* (pp. 129–153). SAGE.
- Shaffer, T. J. (2012). The land-grant system and graduate education: Reclaiming a narrative of engagement. In D. W. Butin & S. Seider (Eds.), *Collaborative futures: Critical reflections on publicly active graduate education* (pp. 49–74). Information Age Publishing.

- Shockley-Zalabak, P., Barge, J. K., Lewis, L., & Lynn Simpson, J. (2017). Engaged scholarship. *The international encyclopedia of organizational communication*, 1-15.
<https://doi.org/10.1002/9781118955567.wbieoc071>
- Siegel, D. S., Waldman, D., & Link, A. (2003). Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study. *Research policy*, 32(1), 27-48. [https://doi.org/10.1016/s0048-7333\(01\)00196-2](https://doi.org/10.1016/s0048-7333(01)00196-2)
- Siegel, D. S., & Wright, M. (2015). Academic entrepreneurship: Time for a rethink? *British Journal of Management*, 26(4), 582–595. <https://doi.org/10.1111/1467-8551.12116>
- Simpson, J. L., & Seibold, D. R. (2008). Practical engagements and co-created research. *Journal of Applied Communication Research*, 36, 266–280.
<https://doi.org/10.1080/00909880802172285>
- Slaughter, S., & Leslie, L. L. (1997). *Academic capitalism: Politics, policies, and the entrepreneurial university*. Johns Hopkins University Press.
- Smircich, L. (1983). Concepts of culture and organizational analysis. *Administrative Science Quarterly*, 28(3), 339–358. <https://doi.org/10.2307/2392246>
- Sotirin, P. (2014). In *The SAGE Handbook of Organizational Communication* (3rd ed., pp. 24–24). SAGE Publications.
- Spee, A. P., & Jarzabkowski, P. (2011). Strategic planning as communicative process. *Organization Studies*, 32(9), 1217–1245. <https://doi.org/10.1177/0170840611411387>
- Spikes, D. R. 1(992). Preface. In R. D. Christy & L. Williamson (Eds.), *A century of service: Land-grant colleges and universities, 1890–1990*. Transaction.
- Spronken-Smith, R. (2018). Reforming doctoral education: There is a better way. *University of Otago*, 9(18). <https://escholarship.org/uc/item/4s08b4jx>

- Spronken-Smith, R., Brown, K. & Miroso, R. (2018). Employability and graduate attributes of PhD graduates. Chapter in Bitzer, E. (Ed). *Spaces, journeys and new horizons for postgraduate supervision*. African Sun Media.
- Stephens, K. K. (2017). Organizational communication methods published in MCQ 2001-2015: Trends and pedagogical implications. *Management Communication Quarterly*, 31(1), 130-138. <https://doi.org/10.1177/0893318916675735>
- Stephens, K. K. (2018). Adapting and advancing organizational communication research methods: Balancing methodological diversity and depth, while creating methodological curiosity. In P. J. Salem & E. Timmerman (Eds.), *Transformative practice and research in organizational communication* (pp. 151–167). IGI Global Scientific Publishing.
- Sutphen, M., Solbrekke, T. D., & Sugrue, C. (2019). *Toward articulating an academic praxis by interrogating university strategic plans*. *Studies in Higher Education*, 44(8), 1400–1412. <https://doi.org/10.1080/03075079.2018.1440384>
- Taylor, J. R., & Van Every, E. J. (2000). *The emergent organization: Communication as its site and surface*. Lawrence Erlbaum Associates.
- Thornton, P., & Ocasio, W. (2008). Institutional logics. In R. Greenwood, C. Oliver, K. Sahlin, & R. Suddaby (Eds.), *The SAGE handbook of organizational institutionalism* (pp. 99–129). SAGE.
- Thune, T., Gulbrandsen, M., & Borlaug, S. B. (2016). The role of academic engagement in university–industry collaboration: A review and research agenda. *Journal of Technology Transfer*, 41(2), 189–209. <https://doi.org/10.1007/s10961-015-9404-3>

- Thursby, J., Thursby, M., (2011). University-industry linkages in nanotechnology and biotechnology: evidence on collaborative patterns for new methods of inventing. *J. Tech. Transf*, 36, 605–623. <https://doi.org/10.1007/s10961-011-9213-z>
- Todorovic, Z. W., McNaughton, R. B., & Guild, P. (2011). ENTRE-U: An entrepreneurial orientation scale for universities. *Technovation*, 31(2-3), 128–137. <https://doi.org/10.1016/j.technovation.2010.10.009>
- Tornatzky, L. G., Waugaman, P. G., & Gray, D. O. (2002). *Innovation U.: New university roles in a knowledge economy*. Southern Technology Council.
- Törnberg, P. (2024). *Large Language Models Outperform Expert Coders and Supervised Classifiers at Annotating Political Social Media Messages*. *Social Science Computer Review*, 43(6), 1181–1195. <https://doi.org/10.1177/08944393241286471>
- University of South Florida. (2021). Community-engaged scholarship toolkit. University of South Florida. <https://www.usf.edu/engagement/faculty/community-engaged-scholarship-toolkit.aspx>
- Vaara, E., Sorsa, V., & Pälli, P. (2010). On the force potential of strategy texts: A critical discourse analysis of a strategic plan and its power effects in a city organization. *Organization*, 17(6), 685–702. <https://doi.org/10.1177/1350508409354227>
- Van de Ven, A. (2007). *Engaged scholarship a guide for organizational and social research*. Oxford University Press.
- Van de Ven, A. H. (2007). *Engaged scholarship: A guide for organizational and social research*. Oxford University Press.
- Van de Ven, A. H., & Johnson, P. E. (2006). Knowledge for theory and practice. *Academy of Management Review*, 31, 802–821. <https://doi.org/10.5465/amr.2006.22527385>

- van der Sijde, P.C. (2012). Profiting from knowledge circulation: the gains from university-industry interaction. *Industry and Higher Education*, 26(1), 15–19.
<https://doi.org/10.5367/ihe.2012.0082>
- van Oort F.G., Burger M.J. and Raspe O. (2008). Interfirm relations and economic clustering in the Dutch Randstad region. In U. Blien and G. Maier (Eds.), *The economics of regional clusters: networks, technology and policy*. Edward Elgar.
- Viale, R., & Etzkowitz, H. (2010). *The capitalization of knowledge: A Triple Helix of university-industry-government* (R. Viale & H. Etzkowitz, Eds.) (1st ed.). Edward Elgar Publishing.
- Viktor Slavtchev (2013) Proximity and the Transfer of Academic Knowledge: Evidence from the Spatial Pattern of Industry Collaborations of East German Professors, *Regional Studies*, 47(5), 686–702, <https://doi.org/10.1080/00343404.2010.487058>
- Walker, G. E., Golde, C. M., Jones, L., Bueschel, A. C , & Hutchings, P. (2008). *The formation of scholars: Rethinking doctoral education for the twenty-first century*. Jossey-Bass.
- Walter, H. L., & Meluch, A. L. (2019). Measurement in organizational communication. In *Communication Research Measures III* (pp. 82–93). Routledge.
- Washburn, J. (2008). *University, Inc.: The corporate corruption of higher education*. Basic Books.
- Weick KE. 1965. *The social psychology of organizing*. Addison-Wesley
- Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly*, 21(1), 1–19. <https://doi.org/10.2307/2391875>
- Weick, K. E. (1995). *Sensemaking in organizations*. Sage.

- Wert-Gray, S., Center, C., Brashers, D. E., & Meyers, R. A. (1991). Research topics and methodological orientations in organizational communication: A decade in review. *Communication Studies*, 42, 141–154. <https://doi.org/10.1080/10510979109368329>
- Zaumane, I. (2021, May). Strategic internal communication: Analysis of the practice of regional higher educational institutions of Latvia. In *Society. Integration. Education. Proceedings of the International Scientific Conference* (Vol. 6, pp. 551–563). Rēzekne Academy of Technologies. <https://doi.org/10.17770/sie2021vol6.6468>
- Zhang, H., Wu, C., Xie, J., Rubino, F., Graver, S., Cai, J., Kim, C., & Carroll, J. M. (2025). Exploring inductive and deductive qualitative coding with AI: Investigating inter-rater reliability between large language model and human coders. *Human-Computer Interaction & Emerging Technologies*, 195, 142–152. <https://doi.org/10.54941/ahfe1006232>
- Zheng, P., & Harris, M. (2007). The university in the knowledge economy: the triple helix model and its implications. *Industry and Higher Education*, 21(4), 253–263. <https://doi.org/10.5367/000000007781698338>

Appendix A - Coding Guidelines for Organizational Communication Supporting University-Industry Collaboration (UBC) Construct

Coding Scheme:

- **Frequency:** Measures the prevalence of industry-related language within strategic plans and is normalized by plan length to account for substantial variation in document size across institutions. Indicators include both explicit references (e.g., industry, business, corporate, private sector, companies) and commonly used proxies for industry engagement identified in the UBC literature (e.g., applied or translational research, commercialization, technology transfer, entrepreneurship, innovation partnerships). Because strategic plans often communicate institutional priorities through broader innovation and engagement frames, general engagement terms (e.g., external engagement, partnerships, outreach) are included only when contextual language indicates relevance to collaboration with industry or reflects organizational activities, structures, or priorities that reasonably support university-business collaboration and industry-sponsored research.
- **Maturity:** Captures the extent to which industry collaboration is framed in aspirational or developmental language rather than in language that indicates established, embedded institutional strategies. Contextual language surrounding industry-related references is analyzed to distinguish between forward-looking intentions (e.g., exploring, seeking to develop, planning) and language indicating ongoing, institutionalized practices (e.g., existing structures, sustained programs, established partnerships, or routinized processes or integration into university-wide strategy).
- **Temporal Relevance:** The age of each strategic plan is recorded to account for the temporal relevance of communicated priorities and is incorporated into the composite communication measure.

Composite Communication Measure: A composite organizational communication score is calculated by combining normalized sentence frequency, average maturity score, and strategic plan age to reflect the prevalence, institutionalization, and temporal relevance of industry-related communication within each institution.

Frequency Coding: Indicators Of Industry Engagement And Collaboration

Purpose: This coding scheme identifies language within university strategic plans that signals organizational communication supporting university-industry collaboration (UBC), including both direct references to industry engagement and broader organizational language that reasonably supports industry-sponsored research.

Because strategic plans frequently organize priorities around talent development, innovation, and community or economic impact, industry collaboration may appear under different thematic headings and with different terminology. Frequency coding therefore emphasizes contextual relevance rather than reliance on any single term or label. General innovation, engagement, or workforce language is excluded when it is framed solely in terms of community service, civic engagement, or student outcomes without reference to research, knowledge translation, external partners, or organizational infrastructure.

1. Direct Industry Reference

The text is likely referencing industry collaboration if it includes:

- “industry” / “industries”
- “corporate”
- “business” / “businesses”
- “company” / “companies”
- “firms”
- “private enterprise(s)” / “commercial enterprise(s)”
- “private sector”
- “employer(s)”
- “startup(s)”
- “spinoff” / “spinout”
- “industrial partner(s)”

Direct industry reference terms are coded only when they clearly denote external, private-sector organizations or actors, and not when used to describe internal university functions, abstract organizational concepts, or the university’s own research or academic enterprise.

2. Engagement and Collaboration Mechanisms

Engagement and partnership language is frequently used in place-based or economic development sections of strategic plans, where universities position themselves as anchor institutions or contributors to regional competitiveness through public-private collaboration.

The text is likely referencing industry collaboration if it includes:

- “partnership(s)” / “partner with” / “strategic partnership”
- “collaborate with” / “collaboration(s)”
- “strategic alliance(s)” / “strategic partner(s)”

- “joint venture(s)”
- “public–private partnership(s)” / “PPP”
- “affiliate program(s)”
- “industry-sponsored research”
- “contract research”
- “collaborative research”
- “innovation ecosystem”
- “economic development”
- “business engagement(s)”
- “consult” / “consultation”
- “holistic engagement”
- “executive education”
- “corporate relations”
- “university-industry research collaboration(s)”
- “partnership engagement”
- “intentional partnering”

General collaboration or partnership terms are coded only when contextual language indicates relevance to industry collaboration or organizational activities, structures, or priorities that plausibly support university-industry collaboration or industry-sponsored research.

3. Innovation, Research Translation, and Commercialization

In strategic plans, innovation-focused language often reflects how universities frame industry collaboration within the research enterprise, particularly through translation, commercialization, and applied research activities.

The text is likely referencing industry collaboration if it includes:

- “innovation hub(s)”
- “technology transfer” / “tech transfer”
- “IP licensing” / “licensing” / “license(s)”
- “invention(s)” / “invention disclosure(s)”
- “patent(s)”
- “commercialization”
- “entrepreneurship” / “entrepreneur(s)” / “entrepreneurial”
- “accelerator(s)” / “incubator(s)”
- “R&D with industry”
- “innovation ecosystem”
- “translational research” / “applied research” / “use-inspired research”
- “knowledge transfer” / “knowledge exchange”
- “industry funded research”
- “corporate sponsored research”
- “business development”
- “shared discoveries”

Innovation- or entrepreneurship-related terms are coded when used in ways that plausibly support research translation, commercialization, or sustained engagement with industry partners.

4. Workforce, Talent, and Applied Learning

In many institutions, industry collaboration is communicated primarily through talent and workforce language, especially where employer engagement, applied learning, and career alignment serve as the dominant interface between universities and industry partners.

The text may reference organizational communication supporting industry collaboration if it includes:

- “internship(s)” / “co-op(s)”
- “workforce development”
- “talent pipeline(s)”
- “skills training”
- “experiential learning”
- “career readiness”
- “employer engagement”
- “lifelong learning”
- “placement(s)”
- “dual education” / “dual-study program(s)”
- “challenge-based learning” / “problem-based learning” / “hackathon(s)” / “practicum(s)” / “capstone(s)”
- “upskilling”
- “high impact practice(s)”
- “student recruitment” / “talent recruitment”
- “talent pathways”

Workforce- and talent-related language is included when it reflects institutional priorities, structures, or partnerships that plausibly support industry collaboration or contribute to an organizational climate supportive of industry-sponsored research.

Frequency Output: Count industry-related sentences meeting the above criteria and normalize counts by strategic plan length (e.g., per 1,000 words) to enable comparison across institutional documents.

Maturity Coding: Assessing Institutionalization of Industry Collaboration

Purpose: This coding scheme assesses the maturity of organizational communication supporting university-industry collaboration by evaluating the extent to which industry-related activities are framed as aspirational versus established and embedded within institutional strategy and practice. Each industry-related sentence identified through the frequency coding process serves as the unit of analysis for maturity scoring.

Maturity distinctions apply across talent, innovation, and place contexts. For example, aspirational statements about workforce pipelines, commercialization, or regional partnerships may reflect early intent, while references to governance structures, leadership accountability, and performance metrics in any of these areas indicate more embedded institutional practice.

Maturity Scale

Strategic plans often blend aspirational and operational language within the same sentence or paragraph. Coders would assign maturity scores based on the dominant signal conveyed, recognizing that vision-setting and implementation commitments are frequently layered together in institutional planning documents.

Level 1: Aspirational or Developmental (Score: 1)

Language emphasizes intentions, exploration, or future-oriented goals without evidence of established structures, sustained programs, or routinized practices.

Examples:

- “The university seeks to build relationships with industry.”
- “We aim to explore partnerships with corporate partners.”

Level 2: Programmatic or Operational (Score: 2)

Language references existing programs, initiatives, offices, or activities that support industry engagement but are not positioned as fully institutionalized or central to the university’s strategy.

Examples:

- “The university has launched a corporate affiliate program.”
- “The technology transfer office supports licensing and commercialization activities.”

Level 3: Strategic or Institutionalized (Score: 3)

Industry collaboration is positioned as embedded within institutional strategy, or is supported by governance structures, named leadership responsibility, policy integration, budgetary

commitment, or institutional performance metrics, or is framed as an ongoing and integral component of the university's mission or research enterprise. Language reflects organizational communication beyond standalone programs.

Examples:

- “Industry partnerships are a core component of the university's research strategy.”
- “Commercialization and industry-sponsored research are tracked through institutional performance metrics.”

Maturity Scoring Procedure: Each retained sentence is evaluated using a GPT-based classifier and assigned a maturity score of 1, 2, or 3 based on the degree of institutionalization reflected in the language. Scores of one indicate aspirational or nascent communication, while scores of three indicate mature, embedded strategies. When structural commitment cues (e.g., named executive oversight, policy integration, budget allocation, institutional metrics) are explicitly referenced, scores should trend toward the upper end of the scale. Sentences are used as the unit of analysis to balance interpretability with granularity, allowing for consistent maturity scoring while minimizing coder inference across heterogeneous strategic plan structures. An average maturity score is calculated for each institution across all coded sentences.

Appendix B - Stage I — UBC Relevance Prompt Bundle

Appendix Figure B.1 Stage I - UBC Relevance Prompt Bundle

Stage I — UBC Relevance PromptBundle

Human-readable companion to 03. Stage_I - UBC_Relevance_PromptBundle.json. This file is for reading; the JSON is what the pipeline loads at runtime.

Field	Value
prompt_bundle_id	UBC_Relevance_PromptBundle
prompt_bundle_version	0.1
updated_at	2026-02-23
rubric_version	0.3
output_schema	Stage_I - RelevanceResult.schema.json

Purpose

Stage I of the waterfall: classify whether a passage is related to university–industry collaboration (UBC). If not relevant, score = 0 and Stage II is skipped.

System Message

You are an expert research coding assistant with extensive knowledge in university–industry collaboration (UBC). Your task is to determine whether user-provided passage_text is related to UBC. Return ONLY valid JSON that matches the provided schema. Do not include any extra keys.

User Message

Task: Determine whether the passage_text is related to university–industry collaboration (UBC).

Scope definition

UBC includes: partnerships between universities and industry or business; technology transfer and commercialization; industry-sponsored research; economic development driven by university–industry relationships; workforce development connected to employer or industry engagement; corporate relations; licensing and intellectual property activity.

UBC does NOT include: purely internal campus matters (student life, campus environment, general academics) with no connection to industry or external economic engagement.

Decision rule

Fidelity rule: Base your judgment on explicit language in the passage_text. Do NOT infer or introduce missing facts.

Scored examples (3)

Use these to calibrate your judgment.

Example 1 (Not UBC-related)

UCLA has evolved over the last 100 plus years from a young startup campus to one of the largest institutions of higher education in the world and a global leader in achieving educational and research outcomes.

- Relevant: no
 - Score: 0
 - Why: No mention of industry, business, economic development, workforce, or partnerships. General university history.
-

Example 2 (UBC-related)

The plan also will emphasize helping communities in economic development and cultural enhancement efforts.

- Relevant: yes
 - Score: 1
 - Why: “Economic development” signals relevance to university–industry engagement, even without the word “industry.”
-

Example 3 (UBC-related)

Community participation that promotes social responsibility, citizenship, and economic development.

- Relevant: yes
 - Score: 1
 - Why: “Economic development” is a UBC-adjacent concept. This is relevant, not a false positive.
-

Input (placeholders)

```
passage_id: {{passage_id}}
passage_text:
{{passage_text}}
```

Output requirements

Return a JSON object with keys exactly:

Key	Type	Description
<code>is_abc_relevant</code>	boolean	true or false
<code>rationale</code>	string	1–2 sentences explaining the decision
<code>confidence</code>	string	low / medium / high

Do not add any other text.

Appendix C - Stage II — UBC Maturity Scorer Prompt Bundle

Appendix Figure C.1 Stage II - UBC Maturity Scorer Prompt Bundle

Stage II — UBC Maturity Scorer PromptBundle

Human-readable companion to 05. Stage_II - UBC_Maturity_Scorer_PromptBundle.json. This file is for reading; the JSON is what the pipeline loads at runtime.

Field	Value
prompt_bundle_id	UBC_Maturity_Scorer_PromptBundle
prompt_bundle_version	0.2
updated_at	2026-02-23
rubric_version	0.3
output_schema	Stage_II - ScoringResult.schema.json
allowed_scores	1, 2, 3

Purpose

Stage II of the waterfall: score UBC-relevant passages for maturity on a 1–3 scale. Only passages classified as UBC-relevant by Stage I reach this stage.

System Message

You are an expert research coding assistant with extensive knowledge in university–industry collaboration (UBC). You apply a user-defined 1–3 maturity rubric to user-provided passage_text about UBC. You must follow the user-defined Mixed-signal rule and Fidelity rule. Return ONLY valid JSON that matches the ScoringResult schema. Do not include any extra keys.

User Message

Task: Score the passage_text for UBC maturity using the following 1–3 rubric.

Rubric

Score	Label	Definition
1	Aspirational or Developmental	Intent/future-oriented, no established structures
2	Programmatic or Operational	Existing programs/initiatives/offices/activities or other concrete evidence of practice
3	Strategic or Institutionalized	Embedded strategy, explicit governance, accountability, policy integration, budget; key metrics declared as an institutional priority; or priorities anchored in the institution’s core identity or purpose

Decision rules

Mixed-signal rule: If the passage_text mixes aspiration and evidence of practice, score higher.

Fidelity rule: Do NOT infer or introduce missing facts or upgrade maturity based on speculation.

Scored examples (7)

Use these to calibrate your scoring.

Example 1 (Score 1 — Aspirational)

The plan also will emphasize helping communities in economic development and cultural enhancement efforts.

- Score: 1
- Why: Future-oriented (“will emphasize”), no established structures, programs, or offices described.

Example 2 (Score 1 — Aspirational, boundary with not-relevant)

Community participation that promotes social responsibility, citizenship, and economic development.

- Score: 1
- Why: “Economic development” signals relevance to UBC even without the word “industry.” This is aspirational engagement language, not a false positive.

Example 3 (Score 2 — Programmatic)

Provide fiscal resources and organizational structures to support multidisciplinary and cross-campus education, minors and certificate programs using a scholar/practitioner joint approach, which is augmented by an adjunct model that brings in experts from industry or alumni.

- Score: 2
- Why: Describes an existing adjunct model that actively brings industry experts into academic programs — an operational mechanism.

Example 4 (Score 2 — Programmatic, boundary with 1)

Implement an updated technology transfer program.

- Score: 2
- Why: “Updated” implies a technology transfer program already exists and is being improved. This is operational activity, not aspiration.

Example 5 (Score 3 — Strategic)

Licensing revenue income (Regents 2.5.3) \$2.9M Annual progress

- Score: 3

- Why: A quantified KPI for licensing revenue, tied to a Regents plan objective with annual tracking — an institutional performance metric for technology transfer.

Example 6 (Score 3 — Strategic, boundary with 1)

Advance and accelerate the impact of our university’s outstanding record of breakthrough discoveries and innovations by dedicating resources for marketing, advancement, corporate relations, and alumni engagement.

- Score: 3
- Why: “Outstanding record” establishes an existing track record. “Dedicating resources for corporate relations” signals budgetary commitment to UBC functions. Together these indicate institutional commitment.

Example 7 (Score 3 — Strategic, boundary with 1)

Finally, a key ingredient in student success is ensuring the active engagement of corporate and nonprofit organizations in the lives of our students, through placement in internships, feedback on the relevance and impact of our educational programs and curricula, design and support of new interdisciplinary project-based learning opportunities, philanthropy, and funding of our research.

- Score: 3
- Why: Corporate engagement is framed as a “key ingredient” across multiple institutional functions (internships, curriculum feedback, research funding). This breadth and centrality signals an institutional focus area.

Input (placeholders)

```
passage_id: {{passage_id}}
passage_text:
{{passage_text}}
```

Output requirements

Return a JSON object with keys exactly:

Key	Type	Description
score	integer	1, 2, or 3
rationale	string	Concise explanation citing passage_text
evidence_spans	array	1–3 spans with start, end (0-based, end-exclusive offsets into passage_text) and quote
confidence	string	low / medium / high
needs_human_review	boolean	true if ambiguous or confidence is low

Do not add any other text.

Appendix D - IRB Exemption

Appendix Figure D.1 IRB Exemption



Office of Research Integrity,
Compliance and Security

TO: Tim Steffensmeier
Leadership Studies
Manhattan, KS 66506

Proposal Number: IRB-13486

FROM: Lisa Rubin, Chair
Committee on Research Involving Human Subjects

DATE: 01/21/2026

RE: Proposal Entitled, "PhD Dissertation: Assessing the impact of organizational communication on university-industry collaboration: a quantitative examination of university strategic plans."

The Committee on Research Involving Human Subjects / Institutional Review Board (IRB) for Kansas State University has reviewed the proposal identified above and has determined that it is EXEMPT from further IRB review. This exemption applies only to the proposal - as written - and currently on file with the IRB. Any change potentially affecting human subjects must be approved by the IRB prior to implementation and may disqualify the proposal from exemption.

Based upon information provided to the IRB, this activity is exempt under the criteria set forth in the Federal Policy for the Protection of Human Subjects, **45 CFR §104(d), category:Exempt Category 2 Subsection ii.**

Certain research is exempt from the requirements of HHS/OHRP regulations. A determination that research is exempt does not imply that investigators have no ethical responsibilities to subjects in such research; it means only that the regulatory requirements related to IRB review, informed consent, and assurance of compliance do not apply to the research.

Any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Committee on Research Involving Human Subjects, the University Research Compliance Office, and if the subjects are KSU students, to the Director of the Student Health Center.

Electronically signed by Lisa Rubin on 01/21/2026 12:35 PM ET

Appendix E - Practitioner Brief

Beyond Strategic Plans: What Actually Drives University-Industry Collaboration

THE CHALLENGE:

Universities are under increasing pressure to expand partnerships with industry, contribute to economic development, and demonstrate measurable impact. In response, many institutions emphasize industry collaboration in strategic plans and institutional messaging. At the same time, institutions often assume that success in university-industry collaboration depends on factors outside their control, such as location, ranking, or reputation. These assumptions can lead to strategies that overemphasize communication and underinvest in the structural conditions that enable collaboration.

What This Study Shows: This study examined how organizational conditions and organizational communication, as reflected in university strategic plans, relate to industry-sponsored research across U.S. research universities.

The findings point to a clear pattern:

- Collaboration outcomes are driven primarily by research capacity (faculty size) and disciplinary alignment (STEM fields)
- Urban density, institutional ranking, and governance structure (public vs. private) are not primary drivers of collaboration
- Universities operate as decentralized systems, where collaboration is often initiated through faculty relationships
- Strategic plans and institutional messaging play a role in signaling priorities, but do not independently drive collaboration outcomes

These findings suggest that collaboration is shaped more by what institutions do and enable than by how they position themselves.

COMMON NARRATIVES IN PRACTICE: RETHINKING COLLABORATION

Common Narratives	Reality	Takeaways
Narrative 1: Location Limits Collaboration “If we were in a denser city, we’d have more industry partnerships.”	Institutions in less dense regions can be strong industry partners and often serve as regional innovation anchors.	Geography is not necessarily a barrier and may be an advantage.
Narrative 2: Prestige Drives Partnerships “Companies tend to partner with higher-ranked universities, not institutions like ours.”	Institutional ranking does not significantly predict industry-sponsored research.	Relevant expertise and applied capacity matter more than reputation.
Narrative 3: Institutional Type Determines Outcomes “As a public (or private) institution, we face structural limitations in working with industry.”	No meaningful difference was observed between public and private institutions.	Collaboration success depends on capability, not governance structure.
Narrative 4: Strategy Alone Drives Results “If we elevate industry engagement in our strategic plan, we should start to see more partnerships.”	Strategic communication alone does not increase collaboration outcomes.	Messaging must be paired with research capacity, operational structures, and faculty engagement

APPROACHES TO STRENGTHENING INDUSTRY ENGAGEMENT

1. Invest Where You Are Already Strong: Prioritize areas of demonstrated research capacity and alignment with industry needs.

Example: An institution with strengths in advanced materials or robotics may invest in shared facilities or industry-sponsored labs in those areas, while using strategic communication to signal these capabilities to partners.

2. Build Partnership Infrastructure: Create clear and accessible pathways for industry engagement, including:

- industry liaison functions or corporate partnership programs
- translational research initiatives, technology transfer and commercialization support

3. Enable Faculty-Driven Collaboration in Decentralized Systems: Recognize that partnerships often originate at the faculty level. Actions might include:

- reducing administrative barriers
- providing seed funding or partnership support
- aligning incentives with engagement activities

4. Align Strategy with Institutional Capacity: Ensure that strategic priorities reflect actual strengths rather than aspirational positioning. Strategic plans are most effective when they:

- reinforce areas of excellence
- clarify focus
- signal credible partnership opportunities

5. Use Communication Strategically: Strategic communication plays an important but specific role.

- It signals priorities to external stakeholders
- It helps coordinate internal efforts
- It positions the institution within the innovation ecosystem
- It is most effective when it reflects real capabilities and opportunities.

6. Leverage Regional Advantage: Universities outside dense metropolitan areas may have opportunities to serve as key regional innovation anchors. Institutions can:

- build deep partnerships with local industries
- align research with regional economic priorities
- position themselves as essential contributors to local innovation ecosystems

PRACTICAL DIAGNOSTIC QUESTIONS

Leaders can use the following questions to assess institutional readiness:

- Do we have clearly defined research strengths aligned with industry demand?
- Are there clear pathways for industry partners to engage with the university?
- Are faculty supported and incentivized to pursue industry collaboration?
- Do our strategic priorities reflect actual capabilities?
- Are we leveraging our regional context effectively?
- Does our strategic plan function as a clear and credible signal of our strengths, priorities, and partnership opportunities?

Institutions are rarely “too remote,” “too small,” or “not prestigious enough” to engage with industry. The more important question is: *Are we aligned, equipped, and organized to do so?*