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Original Paper

From Research Knowledge to Adoption-Ready Information: How Science Communication Supports the Diffusion of University Research Outputs

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Research Project: Study on the "Promotion-Transformation" Path of Scientific and Technological Achievements in Universities Based on the Theory of Innovation Diffusion (Project Number: GK268803299001-005)

Abstract

Universities increasingly make research outputs searchable through repositories, patent databases, and digital matching platforms, yet informational availability does not necessarily make an innovation intelligible or evaluable to potential adopters. This article asks how organizationally embedded science communication transforms university research outputs into information that external actors can use in pre-adoption decision processes. Drawing on innovation diffusion theory and knowledge-boundary scholarship, we develop the concept of adoption-ready information: information that is traceable to evidence, organized around adoption-relevant attributes, situated in testable contexts, and connected to actors and procedures capable of carrying evaluation forward. We use an embedded comparative case design to examine four contrasting pathways: editorial mediation at Annual Reviews' Knowable Magazine, exhibit-based translation at Chongqing University's Science Communication Innovation Laboratory, standardized transfer-oriented communication at Shandong University, and an AI-assisted human-in-the-loop workflow at Hangzhou Dianzi University. EurekAlert!, Cell Press graphical abstracts, and two Chinese science communication initiatives provide supplementary mechanism evidence. Cross-case analysis identifies four mechanisms—evidence anchoring, attribute articulation, contextual enactment, and organizational relay. Together, they can reduce cognitive uncertainty and move potential adopters from general awareness toward evaluative engagement, testing, and negotiation.

Science communication does not create technical performance or guarantee commercialization; rather, it functions as a cognitive and organizational interface between research dissemination and adoption. The article contributes a process explanation of how communication shapes adoption preparedness while remaining constrained by technical maturity, demand, absorptive capacity, intellectual property, and implementation conditions.

Keywords

science communication, university technology transfer, innovation diffusion, adoption-ready information, knowledge translation, comparative case study

1. Introduction

Universities produce a growing volume of papers, patents, prototypes, and project outputs, while governments and institutions invest heavily in repositories, patent inventories, technology marketplaces, and algorithmic matching systems. These infrastructures improve searchability, but they do not by themselves make research usable in an adoption decision. A research output may be technically sound and easily retrievable while remaining difficult for a firm, investor, public agency, or intermediary to interpret. The practical bottleneck is therefore not always a lack of information. It is often a mismatch between the way knowledge is encoded in research and the way prospective adopters organize judgment and action.

Academic texts are normally structured around research questions, methods, novelty, and disciplinary evidence. Potential adopters ask a different set of questions: What operational problem does the technology address? How does it compare with the current solution? Under what conditions will it work? What has actually been demonstrated? What would a trial require? What risks, costs, intellectual-property constraints, and responsibilities would implementation create? These questions do not merely demand shorter or less technical language. They demand a reorganization of knowledge around a different task environment.

Research on university-industry relations has explained commercialization through intellectual-property regimes, technology transfer offices, academic engagement, funding, and interorganizational relationships (Perkmann et al., 2013; Weckowska, 2015). Work on innovation intermediaries has similarly shown how specialized actors reduce search costs, broker relationships, and mobilize complementary expertise (Howells, 2006). Communication appears in this literature, especially in studies of sensemaking and the work of boundary-spanning personnel, but it is frequently treated as a generic interpersonal competence or an ancillary promotional activity (Andrews et al., 2024; Siegel et al., 2004). The informational form through which a university result becomes discussable, comparable, and testable is rarely examined as an organizational mechanism in its own right.

Science communication scholarship approaches the problem from the other direction. It has moved beyond a simple deficit model toward dialogue, participation, institutional responsibility, and the social organization of communication (Bucchi & Trench, 2021). Recent work also asks whether communication has become a recognizable function within universities (Entradas et al., 2024), while Chinese scholarship has begun to connect the communication of research resources with the innovation chain and university technology transfer (Song & Zhu, 2022; Wu et al., 2016). Yet this literature generally evaluates public understanding, engagement, or reach. It pays less attention to the way communication may enter the pre-adoption sequence through which firms and other organizations identify a candidate technology, interpret its attributes, formulate tests, and negotiate next steps.

This gap matters because dissemination and adoption are related but analytically distinct. Communication may attract attention without enabling evaluation; conversely, highly technical information may support expert verification while failing to reach the organizational actors who authorize a trial. The relevant question is not whether science communication causes commercialization. It is how communication can change the informational conditions under which potential adopters move from awareness to evaluative engagement.

Accordingly, this article asks: How do organizationally embedded science communication practices transform university research outputs into information that prospective adopters can evaluate and act upon? We answer through a comparative analysis of four deliberately heterogeneous cases spanning professional science journalism, exhibit development, university technology-transfer communication, and AI-assisted multi-audience translation. The comparison focuses on organizational mechanisms rather than institutional performance. It is designed to reveal recurrent processes across distinct media and levels of proximity to adoption, not to rank the cases or estimate causal effects on licensing outcomes.

The article makes three contributions. First, it introduces the concept of adoption-ready information to name an intermediate informational state between research availability and organizational adoption. Second, it connects innovation diffusion theory with science communication by showing how perceived innovation attributes are actively articulated through evidence, comparison, contextualization, and interaction. Third, it identifies four organizational mechanisms—evidence anchoring, attribute articulation, contextual enactment, and organizational relay—that link communication products to subsequent questioning, testing, and negotiation. This framework positions science communication neither as a substitute for technical validation nor as a purely downstream publicity function, but as an interface between dissemination and adoption.

2. Conceptual Framework

2.1 Innovation Diffusion and the Informational Problem of Adoption

Innovation diffusion theory defines diffusion as the process through which an innovation is communicated over time among members of a social system. Rogers (2003) distinguishes knowledge, persuasion, decision, implementation, and confirmation, and argues that adoption is shaped by how potential adopters perceive relative advantage, compatibility, complexity, trialability, and observability. Meta-analytic evidence indicates particularly consistent relationships for relative advantage, compatibility, and complexity (Tornatzky & Klein, 1982). Organizational diffusion research further shows that adoption depends on communication networks, organizational readiness, implementation capacity, and local context (Greenhalgh et al., 2004).

These propositions are often interpreted as if innovation attributes were stable properties waiting to be discovered. Technical properties do have an objective basis, but their relevance to adoption is relational. An efficiency gain becomes a relative advantage only when compared with a current process; compatibility is meaningful only in relation to an installed system, organizational routine, or regulatory requirement; and trialability depends on whether a claim can be translated into a feasible test. Potential adopters therefore encounter not only technical uncertainty but also cognitive uncertainty: uncertainty about what a result means for their own problem, what evidence warrants the claim, and what action would reduce the remaining uncertainty.

Communication is constitutive of this evaluative process without being sovereign over it. It does not change whether a prototype works, but it can determine whether the prototype's evidentiary status is visible, whether its advantages are framed against a relevant baseline, and whether a testable use case can be formulated. In this sense, communication affects the accessibility of innovation attributes to organizational judgment.

2.2 Science Communication as Knowledge Translation and Boundary Work

In conventional public-facing settings, science communication aims to make scientific knowledge accessible, meaningful, and open to engagement. In university technology transfer, however, the audiences are not simply experts and lay publics. They include engineers, managers, investors, public officials, technology managers, designers, and communication professionals, each of whom may be expert in one domain but non-native to another. The problem is therefore cross-professional translation rather than a one-way reduction of complexity.

Knowledge-boundary research helps clarify the challenge. Carlile (2004) distinguishes syntactic boundaries, where actors require common formats; semantic boundaries, where they interpret terms differently; and pragmatic boundaries, where interests and practices diverge. Boundary objects can support collaboration because they are sufficiently stable to coordinate work yet adaptable to local use (Star & Griesemer, 1989). A research-output profile, graphical abstract, exhibit, prototype narrative, or

evidence package can play this role only if it preserves scientific accountability while allowing different actors to locate what matters for their decision.

We therefore use science communication in a deliberately organizational sense: the coordinated work of selecting, verifying, structuring, visualizing, contextualizing, distributing, and updating knowledge for audiences outside the originating research community. This definition includes public communication but is not limited to it. It also encompasses transfer-oriented communication whose proximal purpose is to enable accurate questions, comparison, experimentation, and negotiation.

2.3 Adoption-ready Information and Adoption Preparedness

We define adoption-ready information as an informational form that meets four conditions. First, claims are traceable to sources and differentiated by evidence level. Second, innovation attributes are expressed in relation to an identifiable problem, baseline, and constraint. Third, proposed value is situated in a context in which it can be observed or tested. Fourth, the information is connected to actors, channels, and procedures that can carry evaluation into the next stage. Adoption-ready information is thus not a persuasive description of a supposedly high-value technology. It is a structured cognitive interface that makes remaining uncertainties visible and actionable.

The concept should be distinguished from adoption itself. Information may be fully adoption-ready while a technology is rejected because it is immature, expensive, incompatible, weakly protected, or irrelevant to actual demand. Its immediate outcome is better described as adoption preparedness: a condition in which a potential adopter can restate the problem, compare the innovation with alternatives, identify missing evidence, propose a test, and specify a next organizational step. This distinction prevents communication reach, comprehension, or enthusiasm from being misreported as commercialization performance.

3. Research Design

3.1 Comparative Logic and Case Selection

The study uses an embedded, theory-building multiple-case design. Cases were selected through theoretical sampling and maximum variation rather than statistical representativeness. A case was eligible when it (a) transformed research outputs for audiences beyond the originating disciplinary community, (b) documented an organizational arrangement rather than an isolated communication product, (c) provided traceable public or organizational materials, and (d) contributed variation in medium and proximity to adoption.

Four core cases meet these criteria. Knowable Magazine, published by Annual Reviews, represents professional editorial mediation grounded in scholarly synthesis. Chongqing University's Science Communication Innovation Laboratory represents the transformation of research results into exhibits and embodied experiences. Shandong University's Technology Transfer Center represents standardized

content linked to project selection and targeted promotion. Hangzhou Dianzi University's (HDU) "Good Research Outcomes" Communication Center represents an emerging AI-assisted, human-in-the-loop workflow that connects audience-specific communication with technology-transfer practice. EurekAlert!, Cell Press graphical abstracts, the University of Science and Technology of China's Quantum Kun Studio, and the Chinese Academy of Sciences' science communication platforms provide supplementary evidence about distribution, visualization, cross-professional production, and platformization.

The cases are intentionally non-equivalent in mission. Knowable Magazine is not a commercialization program, and the Chongqing initiative is not a technology-transfer office. They are included as mechanism-revealing cases: each makes visible a different way of turning research knowledge into usable information. The unit of comparison is therefore the organizational translation mechanism, not the institution, audience size, or downstream commercial outcome.

3.2 Data Sources and Analytical Procedure

The corpus comprises organizational websites, project announcements, operating guidance, published descriptions of communication workflows, and, for the HDU case, project-team action records. Public sources were archived and read as organizational self-descriptions rather than as independent evidence of impact. The action records document workflow development and content iteration; they do not provide a controlled measure of firm adoption. No interviews or personal data were used in this version of the study.

Analysis proceeded in three stages. First, we coded each case for input materials, content transformations, professional roles, distribution channels, verification practices, audience segmentation, and links to subsequent action. Second, we mapped these practices onto diffusion attributes and adoption stages, asking how each practice affected traceability, comparability, testability, or the continuity of evaluation. Third, we conducted cross-case pattern matching and searched for negative evidence. In particular, we retained instances showing that broad reach did not imply industrial uptake, that AI-generated text required verification, and that standardized descriptions could not substitute for testing or relationship work.

The HDU case warrants an additional positionality statement. Members of the research team participated in the development of the initiative. We therefore treat it as an embedded action case, triangulate its description with a publicly available report, and restrict claims to documented workflow features. We do not use the case as evidence that AI-assisted communication increases licensing, revenue, or adoption.

Table 1. Core Cases, Organizational Pathways, and Analytical Boundaries

Case	Organizational pathway	Principal outputs	Primary diffusion function	Inference boundary
Knowable Magazine	Review literature + professional editorial mediation	Features, explainers, interviews, infographics	Reduces complexity while preserving context and traceability	Demonstrates knowledge diffusion, not industrial adoption
Chongqing University Science Communication Innovation Laboratory	Scientific review + design + exhibit firms	Exhibits; technical and creative plans	Increases observability and supports low-risk experiential testing	Commercial and behavioral outcomes are not yet traceable
Shandong University Technology Transfer Center	Standard template + project pool + targeted promotion	Research-output profiles, project pages, roadshows	Articulates advantage, compatibility, maturity, and next steps	Documents a promotion-to-contact pathway, not causal adoption effects
HDU "Good Research Outcomes" Communication Center	Applied framework + AI first draft + human review	Audience-specific texts, research-output cards, communication copy	Scales differentiated translation while retaining human accountability	Public evidence establishes an application pilot only

Note. The cases are compared as mechanism-revealing organizational arrangements; they are not treated as equivalent programs or ranked by performance.

4. Findings: Four Organizational Pathways

4.1 Professional Editorial Mediation: From Scholarly Synthesis to Credible Explanation

Knowable Magazine was launched by Annual Reviews in 2017 to make scientific knowledge accessible to broad audiences. It draws on expert review articles across the publisher's 51 journals and

produces in-depth features, explainers, interviews, infographics, slideshows, and comics. Its website describes a process of reporting, editing, copyediting, and fact-checking, with links back to relevant papers and review articles (Knowable Magazine, n.d.). The central transformation is not simple compression. Editorial work organizes a field around what is known, what remains uncertain, why the issue matters, and how the evidence developed. The result offers readers both an interpretive route and a path back to the underlying scholarship.

Cell Press graphical abstracts reveal a related mechanism at the publication interface. A graphical abstract is expected to present the main finding in a single, concise, readable panel rather than replicate the paper (Cell Press, 2018). The constraint forces authors to select a focal relationship and make the informational sequence visually legible. Although the intended audience remains largely scholarly, the practice demonstrates that accessibility is partly a design property of the information, not merely a characteristic of the reader.

These practices function as evidence anchoring. Scientific claims are made more accessible without being detached from source, method, uncertainty, or editorial responsibility. For potential adopters, the transferable insight is procedural: credibility is produced by visible provenance, calibrated claims, and accountable review. A shorter description that hides uncertainty is not necessarily more adoption-ready than a longer one; the decisive issue is whether a reader can distinguish a supported result from an extrapolated possibility.

EurekAlert! adds a distribution layer to this pathway. Operated by the American Association for the Advancement of Science, it uses contributor eligibility rules, release guidelines, embargo services, and journalist-facing infrastructure to distribute science news produced by eligible research organizations (EurekAlert!, n.d.). More than 1,900 institutions use the service. EurekAlert! does not assume responsibility for the scientific conclusions supplied by institutions, but it stabilizes the interface between public information officers and reporters. The case shows that credible communication depends on a division of labor among content ownership, institutional review, platform rules, and professional distribution.

4.2 Exhibit-based Translation: Making Abstract Mechanisms Observable and Experienceable

The Science Communication Innovation Laboratory at Chongqing University was jointly initiated by the China Science and Technology Museum, Chongqing University, and the Chongqing Association for Science and Technology. It describes itself as an organized research and service institution focused on translating frontier research results into science communication exhibits. In its first project cycle, the laboratory solicited 63 exhibit proposals nationwide and selected 19 after eligibility screening, written review, and panel review. Each proposal was assessed independently by two natural scientists and one specialist in humanities, art, or design; selected research teams then worked with exhibit firms on first-of-a-kind technical and creative plans (School of Optoelectronic Engineering, Chongqing

University, 2024).

The organizational arrangement turns communication into collaborative design. Scientists protect factual and mechanistic integrity; designers determine how an audience will perceive and navigate the idea; exhibit firms address manufacturability, interaction, safety, and maintenance. Translation therefore occurs not only in wording but in material affordances. A mechanism hidden in a paper becomes a visible relationship, manipulable model, or sequence of effects that an audience can inspect and discuss.

Exhibit development is not equivalent to commercial product development, but it reveals how contextual enactment changes perceived innovation attributes. Observability increases when an audience can see a process or outcome, while complexity may decrease when a mechanism is externalized through interaction. Experience also creates a low-stakes arena for questions and feedback. The University of Science and Technology of China's Quantum Kun Studio illustrates a similar cross-professional arrangement in audiovisual form: science communication students developed scripts, storyboards, voice-over, and editing while researchers served as scientific advisers for an animation about nanoscale capillary condensation (University of Science and Technology of China, 2022). In both cases, vividness is not ornamental. It is a means of constructing an encounter in which an otherwise abstract claim can be inspected.

The adoption relevance lies in the structure of the scene, not in spectacle. A useful scene specifies a user, task, environment, comparison, and condition of failure. When these elements are absent, an exhibit may increase attention without improving evaluation. When they are present, visualization and interaction can help a prospective adopter formulate what would need to be reproduced in a prototype, demonstration, or field test.

4.3 Standardized Transfer-oriented Communication: Embedding Content in a Service Chain

Shandong University's Technology Transfer Center periodically solicits research results that are relatively mature, clearly owned, innovative, and considered to have commercialization potential. Research teams complete a standardized "Outstanding Scientific and Technological Achievement Profile". Selected results enter a priority project pool and may receive support related to high-value patents, market promotion, investment, roadshows, exhibitions, and targeted dissemination to firms, regions, and capital providers (Shandong University Technology Transfer Center, 2023). Public project pages commonly organize information around a project introduction, application context, and team information.

The distinctive feature is the coupling of content standardization with downstream services. A template creates a common syntax across heterogeneous fields, enabling projects to be screened, displayed, circulated, and discussed. Yet standardization is not valuable simply because every field is completed. It becomes adoption-relevant when the fields surface the problem addressed, comparative advantage,

maturity, evidence, application boundary, and cooperation conditions. These fields permit a potential adopter to decide whether a result warrants further attention and what expertise should be brought into the conversation.

The case also demonstrates that the same result requires different informational forms across adoption stages. A concise profile or visualization may support initial discovery; an explanatory brief and use case may support persuasion and comparison; and a prototype, test protocol, evidence package, and technology-manager contact become necessary for decision and trial. The Chinese Academy of Sciences has developed multi-platform science communication brands that combine in-depth explanation with educational and digital channels (Computer Network Information Center, Chinese Academy of Sciences, n.d.). Such networks underline that standardized content requires stable organizational distribution if it is to travel beyond a single webpage.

This pathway can be described as attribute articulation. It reorganizes technical material around the comparisons that potential adopters must make, but it does not make those comparisons on their behalf. A standardized result may reveal that a technology is not competitive or not ready. That outcome should be treated as useful screening rather than communication failure.

4.4 AI-assisted, Human-in-the-loop Translation: Scaling Differentiated Communication without Abandoning Accountability

HDU is exploring the integration of science communication and technology-transfer work through its "Good Research Outcomes" Communication Center. A public report describes chatkp.com, a science-language model developed by HDU's Narrative Expression System Master Teacher Studio and piloted in scenarios related to the university's Technology Transfer Center. The system can parse papers, patents, and research descriptions; extract technical principles, claimed innovations, and possible application directions; and generate texts for public, corporate, investment, and governmental audiences as well as standardized research-output cards (Chen & Liang, 2026).

The project operationalizes audience translation through four communication principles: clarity, vividness, contextual relevance, and value articulation. Clarity requires conceptual and factual accuracy. Vividness uses analogy, narrative, and examples to reduce unnecessary cognitive burden. Contextual relevance connects a technology to a real task rather than attaching a generic application label. Value articulation explains what difference the result could make while retaining the distinction between demonstrated performance and prospective value.

The mechanism-relevant feature is not the language model alone but the conversion of differentiated communication into a repeatable workflow. Generative AI can extract recurring fields, produce first drafts for multiple audiences, and maintain versions as a result evolves. These functions can lower the marginal cost of preparing materials for a large portfolio. The same capabilities also introduce identifiable hazards: models can collapse evidence levels, invent plausible applications, suppress

uncertainty, or intensify promotional language. Scale without governance would therefore make information more fluent but less trustworthy.

A defensible workflow is sequential and role-based: machine translation and structuring; factual review by researchers; narrative review by science communication professionals; contextual calibration by technology managers or industry specialists; and revision in response to user questions and test results. When evidence is incomplete, outputs should use conditional language such as "may be applicable" or "requires validation". The current evidence supports the existence of an application pilot and an emerging organizational workflow. It does not support claims that the model has increased licensing, revenue, or firm adoption. Precisely because the case remains developmental, it clarifies a general principle: AI can scale translation tasks, but accountability must remain attached to identifiable human roles and evidence sources.

5. Cross-Case Mechanisms: How Science Communication Produces Adoption-Ready Information

Across the cases, science communication is not reducible to a media product. It is an organizational capacity assembled from content rules, professional roles, distribution channels, and opportunities for verification. Four mechanisms recur across otherwise dissimilar settings. They are analytically distinct but operate recursively: questions raised by an audience, evidence produced by a test, and constraints identified in negotiation can all revise the next version of the information.

5.1 Evidence Anchoring: Reducing Uncertainty about Claims and Boundaries

Evidence anchoring links a statement to its source, status, and responsible reviewer. Potential adopters need to know not only what a technology is said to do, but why that statement should be believed and how far it can be generalized. Knowable's editorial workflow, Chongqing University's multidisciplinary review, and the HDU human-review sequence all make credibility an organizational achievement rather than an effect of institutional prestige.

For transfer-oriented communication, evidence anchoring requires explicit distinctions among a conceptual proposition, laboratory result, prototype test, pilot-scale performance, and customer validation. It also requires separating a demonstrated function from an inferred application. Conditional language is not a weakness: it helps a prospective partner decide what uncertainty remains and what evidence would reduce it. The proximal effect is traceability. Claims become inspectable rather than merely persuasive, creating a basis for comparison and trial.

5.2 Attribute Articulation: Making Innovation Characteristics Comparable

Attribute articulation reorganizes technical indicators around adoption-relevant comparisons. Researchers commonly foreground novelty, mechanism, and peak performance; organizations assess improvement over a baseline, fit with installed processes, switching cost, training requirements, reliability, and responsibility. Communication makes these attributes perceptible when it places a result

within a problem definition, comparator, constraint, and use condition.

This is why accessible communication should not be equated with intellectual dilution. It changes the order and relation of information: first identify the decision problem; then present the principle, evidence, advantage, and limitation. A result profile, explainer, or audience-specific brief becomes useful when it enables side-by-side evaluation. It may reveal an attractive advantage, but it may also reveal poor compatibility or excessive complexity. The mechanism improves comparability; it does not predetermine a favorable judgment.

5.3 Contextual Enactment: Turning Value Claims into Testable Propositions

Contextual enactment places an abstract value claim into a concrete arrangement of user, task, environment, indicator, and failure condition. Exhibits, animations, prototypes, use cases, and test plans differ in realism, but each can make a mechanism or consequence more observable. The Chongqing initiative materializes scientific mechanisms through interactive design; Shandong University's application descriptions direct communication toward industry problems; and technology managers can convert those descriptions into questions for demonstration or trial.

This mechanism links observability to trialability. An audience progresses from understanding what a result means to understanding how the claim might be checked. Importantly, the scene disciplines as well as amplifies value. It exposes missing assumptions, identifies engineering interfaces, and prevents laboratory performance from being narrated as proven industrial capability. The feedback loop is central: results from demonstration, testing, or user questioning revise the target scene, evidence statement, and sometimes the technical design itself.

5.4 Organizational Relay: Connecting Communication to the Next Adoption Stage

Organizational relay connects an informational encounter to actors and procedures that can continue the evaluation. Scientists carry responsibility for technical facts; editors and communicators structure meaning; designers construct visual or interactive access; technology managers diagnose demand and coordinate relationships; platforms distribute material; and potential users participate in validation. No single role can perform the entire translation.

The mechanism also requires stage-audience-channel alignment. Materials for broad publics and early leads should emphasize clarity, relevance, and discoverability. Engineers require interfaces, parameters, failure modes, and evidence. Managers and investors require cost, risk, ownership, team capacity, and implementation pathways. A communication product that does not identify the next contact, test, meeting, or decision procedure may generate attention but has little organizational continuity. Conversely, matching and brokerage without prior cognitive translation can stall because the parties must reconstruct basic meaning at high cost.

Organizational relay thus produces actionability in a limited and precise sense: it makes the next evaluative action identifiable and assignable. It does not guarantee that the action will be taken or that

the eventual decision will be positive.

Table 2. Mechanisms, Informational Qualities, and Proximal Adoption Effects

Mechanism	Core operation	Information quality	Relevant adoption work	What the mechanism cannot establish
Evidence anchoring	Link claims to sources, evidence levels, uncertainty, and responsible reviewers	Traceability	Credibility assessment; identification of missing evidence	Technical validity beyond the available evidence
Attribute articulation	Reorganize indicators around problem, baseline, constraints, and alternatives	Comparability	Perception of advantage, compatibility, and complexity	A positive value judgment by the adopter
Contextual enactment	Specify user, task, environment, metrics, and failure conditions	Testability	Observation, demonstration, and trial design	Performance under untested operating conditions
Organizational relay	Assign roles and connect content to channels, contacts, and next procedures	Actionability	Questioning, testing, meeting, and negotiation	Implementation capacity or final adoption

Note. The effects shown are proximal informational and organizational conditions; they should not be interpreted as direct measures of commercialization.

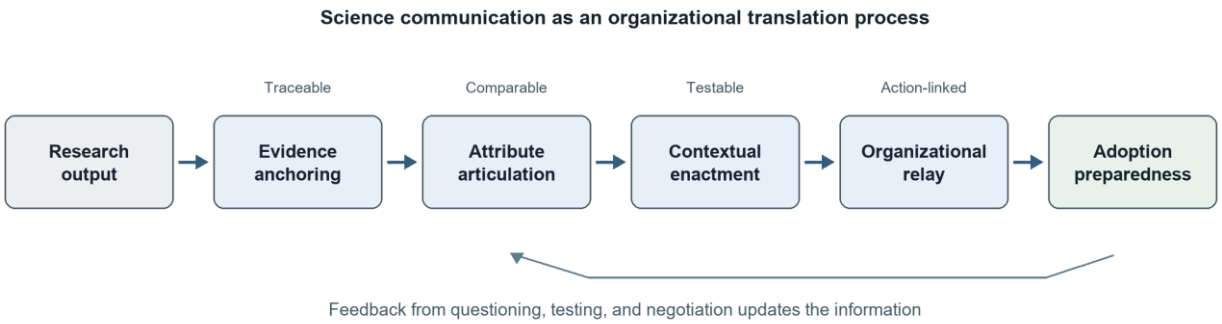

Figure 1. Proposed Mechanism Linking Science Communication to Adoption Preparedness

Figure 1 summarizes the argument. Science communication changes neither the intrinsic performance of a research output nor the external conditions of adoption. It changes how evidence and possible value are made available for organizational use. When information is traceable, comparable, testable, and connected to a next step, potential adopters are better positioned to formulate questions, commission tests, and negotiate conditions. Those activities produce feedback that updates both the communication and, at times, the innovation. Adoption preparedness is therefore iterative rather than a one-directional funnel.

6. Discussion

6.1 From Public Dissemination to a Pre-adoption Interface

The findings extend the role of university science communication beyond downstream publicity. Communication can enter earlier, when a research output is selected, structured, reviewed, and connected to a possible use. This does not collapse public communication into commercialization. Public-facing cases such as Knowable Magazine and science exhibits have civic and educational purposes that are valuable in their own right. Their analytical relevance is that they reveal mechanisms—provenance, editorial accountability, visualization, and experiential access—that can also improve the informational quality of transfer-oriented communication.

The concept of adoption-ready information names this interface without assuming that all communication should serve markets. A university may create adoption-ready information for firms, hospitals, schools, public agencies, nonprofit organizations, or communities. What changes is the decision task, not the obligation to preserve scientific accuracy and public responsibility.

6.2 Making Perceived Attributes an Organizational Accomplishment

Innovation diffusion theory emphasizes perceived attributes, but it says less about the organizational work through which those perceptions become possible. The cases show that relative advantage, compatibility, complexity, trialability, and observability are mediated by informational design.

Evidence anchoring determines whether an advantage is credible. Attribute articulation establishes the comparator and constraint against which advantage and compatibility can be judged. Contextual enactment makes consequences observable and questions testable. Organizational relay connects perception to the social process of trial and implementation.

This account does not imply that communicators manufacture innovation attributes. Rather, communication selectively makes technically grounded relationships available to particular audiences. The distinction is important: a technically unsupported advantage cannot be rescued by superior storytelling, while a real advantage may remain organizationally inert if no one can identify where it applies or how to verify it.

6.3 Bridging Knowledge Boundaries through Layered rather than Simplified Information

The analysis also qualifies the language of simplification. Potential adopters are often highly knowledgeable, but their expertise is organized around different objects and responsibilities. An engineer may require more technical detail than a research summary provides, while a senior manager may need a clear statement of cost exposure and operational risk. Effective translation is therefore layered: it provides a concise problem-value-evidence structure while retaining routes to methods, parameters, sources, and responsible experts.

This layered design helps research-output profiles and evidence packages function as boundary objects. Stability comes from common fields, provenance, and version control; flexibility comes from audience-specific ordering and level of detail. Communication quality is not achieved by finding one universally simple description, but by maintaining consistency across multiple views of the same evidence.

6.4 Artificial Intelligence as a Scaling Layer, not an Autonomous Intermediary

Generative AI changes the economics of translation. It can parse large portfolios, extract recurring elements, produce multiple audience versions, and update materials as evidence changes. These capabilities may help universities address a practical bottleneck: a small number of communication and transfer professionals cannot manually reconstruct every paper and patent. AI may therefore scale the production of candidate adoption-ready information.

However, linguistic fluency can disguise evidentiary weakness. An autonomous model has no institutional authority to determine whether an application is feasible, whether a result is confidential, or whether a performance claim survives engineering scale-up. The HDU case suggests that AI should be positioned inside a governed workflow with provenance, evidence labels, role-specific review, version history, and audience feedback. Under this arrangement, automation handles extraction and first-draft variation while humans retain epistemic, legal, and relational responsibility. AI augments an intermediary system; it does not replace one.

7. Practical Implications

First, universities should treat research-output communication as part of the front end of research management and technology transfer. Repositories should extend beyond titles, abstracts, and patent identifiers to include the problem context, comparator, maturity, evidence level, application boundary, known risk, cooperation condition, and responsible contact. These fields should be updated after demonstrations, technical meetings, or trials rather than frozen at the time of deposit.

Second, institutions need a coordinated division of labor among researchers, science communication professionals, technology managers, and industry specialists. Researchers are accountable for facts and evidence; communicators for accessibility and narrative integrity; technology managers for demand diagnosis and continuity of action; and industry specialists for operating conditions, comparators, and validation criteria. Communication capability is therefore a team property, not an individual talent.

Third, content and channels should be aligned with adoption stages. Discovery may rely on searchable profiles, concise cards, and visual explanation. Evaluation requires deeper evidence, comparative baselines, and context-specific cases. Trial requires samples, prototypes, protocols, and contact with responsible experts. Senior decision makers may need a separate layer addressing resources, risk, ownership, and implementation. The objective is consistency across layers, not identical wording.

Fourth, institutions using generative AI should implement a human-in-the-loop protocol. Minimum controls include source links, evidence-level labels, conditional language for unverified applications, confidential-information screening, named reviewers, and version control. AI-produced descriptions should never convert an anticipated use into a demonstrated result.

Fifth, evaluation should move beyond views, reposts, and general awareness. Proximal indicators of adoption preparedness include whether a target audience can accurately restate the problem and mechanism, identify the relevant comparison, ask technically meaningful questions, specify missing evidence, express willingness to test, and enter a meeting or trial-design process. A staged record of inquiries, technical conversations, demonstrations, tests, and negotiations can help distinguish whether a project stalled because of communication, evidence, demand, price, intellectual property, or implementation capacity.

8. Limitations and Future Research

This study has four limitations. First, the cases are heterogeneous and intentionally asymmetric. International cases are more strongly oriented toward public knowledge diffusion, while the Chinese cases more directly connect communication with exhibits or technology transfer. The design supports mechanism discovery, not performance comparison. Second, much of the evidence consists of organizational self-description, which is more likely to document successful or intended practices than failures. Third, the HDU case is an action case involving members of the research team; despite explicit

bracketing, independent evaluation is needed. Fourth, the study observes informational arrangements and reported workflows rather than the behavior of matched firms over time.

Future research should follow the same research output longitudinally from original paper or patent, through multiple communication versions, to audience questions, test design, negotiation, and either adoption or rejection. Paired interviews with researchers, technology managers, and potential adopters could reveal how meanings and constraints change across interactions. Experiments could compare source-only abstracts, simplified descriptions, and evidence-anchored adoption-ready profiles on comprehension, attribute perception, question quality, and willingness to test. Comparative work across regions and sectors should also examine where communication has little effect because technical maturity, organizational capacity, regulation, or market demand dominates the decision.

9. Conclusion

Making university research available does not make it adoptable. Between a searchable output and an organizational decision lies a translation problem: prospective adopters must establish what is claimed, compare alternatives, design a relevant test, and identify who can carry the process forward. We conceptualize the informational result as adoption-ready information.

The cases identify four mechanisms: evidence anchoring creates traceability; attribute articulation, comparability; contextual enactment, testability; and organizational relay, continuity into subsequent action. Together they may reduce cognitive uncertainty and strengthen adoption preparedness, within limits set by technical performance, demand, absorptive capacity, intellectual property, price, and implementation conditions. Embedded in these conditions, science communication provides an interface through which research becomes available for responsible evaluation, experimentation, and negotiation.

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