REVISTA ELECTRÓNICA TRIMESTRAL
VOL. 10. NÚM. 3 (2026)
ISSN: 2594-0937

DEBATES SOBRE INNOVACIÓN

NACLICS SPECIAL ISSUE

Modeling Tomorrow: Innovation for Sustainable Development Innovation Systems, Technological Capabilities, and Sustainability Transitions in Latin America and the Caribbean



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DEBATES SOBRE INNOVACIÓN. Volumen 10, Número 3, Julio-septiembre de 2026, es una publicación trimestral de la Universidad Autónoma Metropolitana a través de la Unidad Xochimilco, División de Ciencias Sociales y Humanidades, Departamento de Producción Económica. Prolongación Canal de Miramontes 3855, Col. Ex-Hacienda San Juan de Dios, Alcaldía Tlalpan, C.P.14387, Ciudad de México y Calzada del Hueso 1100, Col.Villa Quietud, Alcaldía Coyoacán, C.P.04960, Ciudad de México. Teléfono 55 54837200, ext.7279. Página electrónica de la revista https://revistadebates.xoc.uam.mx/index.php/debinnovacion/issue/view/17 y dirección electrónica: noticiaslalics@gmail.com Editor responsable: Dra. Gabriela Dutrénit Bielous. Certificado de Reserva de Derechos al Uso Exclusivo de Título **No. 04-2022-101113015800-102. ISSN 2594-0937**, ambos otorgados por el Instituto Nacional del Derecho de Autor. Responsable de la última actualización de este número: Dra. Maribel García Barrientos y Dr. Guillermo Andrés Alpízar, Departamento de Producción Económica, División de Ciencias Sociales y Humanidades, Unidad Xochimilco. Calzada del Hueso 1100, Col.Villa Quietud, Alcaldía Coyoacán, C.P. 04960, Ciudad de México. Fecha de última modificación: 13 de noviembre de 2026. Tamaño del archivo: 3.5 MB Las opiniones expresadas por los autores no necesariamente reflejan la postura del editor de la publicación. Queda estrictamente prohibida la reproducción total o parcial de los contenidos e imágenes de la publicación sin previa autorización de la Universidad Autónoma Metropolitana.

Modeling Tomorrow: Innovation for Sustainable Development

Innovation Systems, Technological Capabilities, and Sustainability Transitions in Latin America and the Caribbean

CHAPTER 4.

Knowledge Mobilization and Social Sustainability

Knowledge Mobilization and Social Sustainability in Health Based on the Case of Diabetes in Mexico

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1. Introduction

The concept of sustainability requires us to transform and understand not only economic, social, and environmental systems, but also the relationships these systems maintain with the institutional, technological, and knowledge systems that sustain collective well-being. In this regard, health constitutes a cross-cutting dimension of social sustainability, particularly in Latin America, where structural inequality, institutional fragmentation, weaknesses in public systems, and disconnections among the actors involved in the issue under study limit equitable access to knowledge-based solutions.

In countries such as Mexico, where public health systems are insufficient and fragmented, the search for solutions to chronic degenerative diseases such as diabetes requires the mobilization of diverse scientific, technological, and innovation capabilities. Although health-oriented policies, research programs, and academic initiatives have been promoted, a gap and disconnect persist between knowledge production and the needs of the population. This gap is compounded by weak coordination and articulation among actors and by cognitive, institutional, social, organizational, and geographical distances that hinder or facilitate the dissemination, appropriation, and use of knowledge.

Along these lines, the problem motivating this paper is expressed in the following research question: what structural factors affect the translation of scientific knowledge into effective solutions for addressing complex social problems in health? To answer this question, we examine two bodies of theory: health innovation systems and Research-Based Knowledge Mobilization (MoCBI), using diabetes in Mexico as the reference case.

The objective is to discuss the production, dissemination, demand, and application of scientific and technological knowledge, identify the actors present at these stages, and propose a classification of demand that makes it possible to study its correspondence with the supply of

knowledge. Accordingly, the article presents a conceptual review, the methodological strategy, the results of the categorization, and the next steps toward representation through agent-based simulation.

2. Literature Review

2.1 Health Innovation Systems

From their beginnings, Science, Technology, and Innovation (STI) studies sought to understand how knowledge production, technological development, and innovation contribute to addressing problems that affect society. In the specific case of health, this perspective must be broadened to consider simultaneously the actors, regulatory framework, funding sources, infrastructure, and dynamics of the problem to be addressed.

Consoli and Mina (2009), Hanlin and Andersen (2019), and Natera et al. (2020) have studied health innovation processes, the obstacles to producing and applying knowledge in developing countries, and the links between innovation studies and the health disciplines. While the former focus on the development of products and services, the health disciplines have concentrated on knowledge generation and its translation into practice. Weak articulation between the two limits the application of the knowledge produced.

In this regard, the Health Innovation Systems (HIS) approach overcomes limitations associated with the linearity of processes. Innovation depends not only on producing knowledge, but also on interactions among those who generate, disseminate, demand, and use it to create value. For this reason, HIS performance is conditioned by actors' capacities to coordinate and build linkages, as well as by the institutional, geographical, organizational, technological, and social contexts in which they interact.

2.2 From Knowledge Transfer to Knowledge Mobilization

The literature has defined and used different concepts to explain how generated knowledge is disseminated toward its application. Knowledge transfer emphasizes the unidirectional processes developed between organizations during exchange and the capacities required by recipients to assimilate and appropriate knowledge; translational research seeks to reduce the gaps between the laboratory, research involving human subjects, and clinical practice; knowledge translation considers feedback cycles and the joint participation of knowledge users in its interpretation; and

knowledge mobilization broadens these approaches to include bidirectional flows, specific contexts, the actors involved at each stage, and the relationships between supply and demand.

Table 1. Approaches to Analyzing Knowledge Dissemination and Application

Approach	Focus	Analytical Limitation
Knowledge transfer	Exchange and adoption of knowledge and technology between organizations.	May oversimplify the understanding of feedback processes if represented as a linear transfer.
Translational research	Progression from basic science to clinical research and practice.	Focuses on representing the sequence of stages and the obstacles to applying knowledge in clinical practice.
Knowledge translation	Feedback among research processes, users, involved actors, and application contexts.	Has limitations in integrating decision-makers and institutional support.
Knowledge mobilization	Identifies bidirectional flows among actors across generation, dissemination, demand, and application, as well as the presence of users and beneficiaries.	Makes it possible to specify stages, actors, and conditions for application to specific problems.

Source: author's own elaboration based on Rojas and Natera (2019).

The Social Sciences and Humanities Research Council defines knowledge mobilization as the reciprocal and complementary flow and uptake of knowledge among researchers, knowledge mobilizers, and users, both within and outside academia, with the aim of producing benefits and impacts (SSHRC, 2020).

This definition recognizes that mobilized knowledge may come from different sources: research, formal education, or experience acquired through doing, using, and interacting (Jensen et al., 2007). Consequently, mobilization is not limited to disseminating results; it encompasses processes of communication, appropriation, learning, and use, as well as the contextual conditions that facilitate or hinder these processes.

2.3 Research-Based Knowledge Mobilization

The Research-Based Knowledge Mobilization framework was developed by Rojas and Natera (2019) to understand the processes of knowledge generation, dissemination, demand, and use in relation to complex health problems. Its contribution lies in connecting these stages through bidirectional relationships and recognizing the participation of heterogeneous actors.

According to the literature review, the actors represented in the Health Innovation System include academia, health institutes, and hospitals, which participate in the stages of knowledge

production. Health service providers intervene in its use; the productive sector can transform results into goods and services and identify the system's needs; and policymakers focus on creating and strengthening capabilities, instruments, and support. They are joined by users and beneficiaries, whose position depends on their relationship with the application of knowledge.

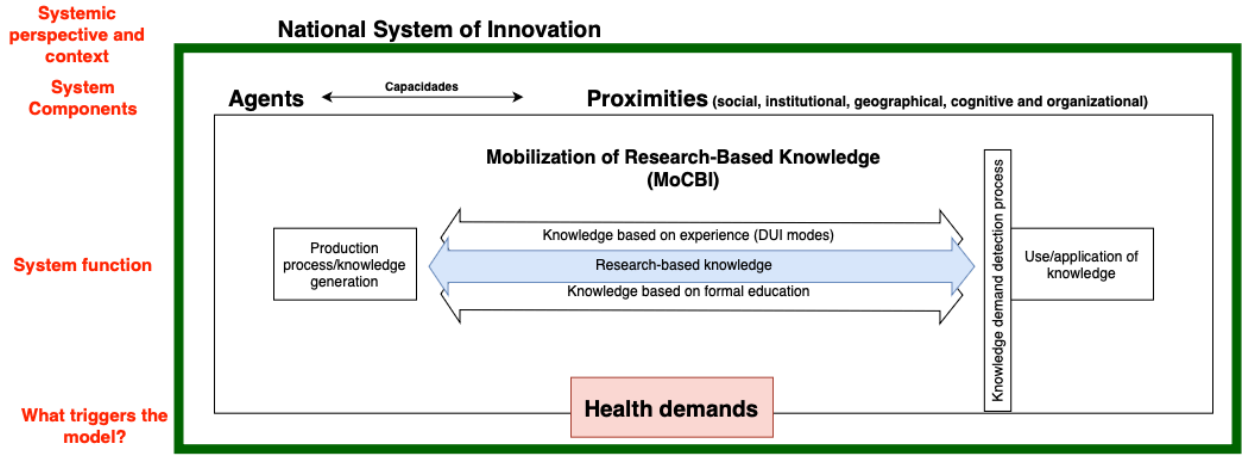


Figure 1. Stages and Actors in Research-Based Knowledge Mobilization
Source: author's own elaboration based on Rojas and Natera (2019).

2.4 Knowledge Demand

Demand is a fundamental stage in the MoCBI process because it guides the production and application of knowledge toward specific needs within the HIS. For an innovation to generate social benefits, continuous communication between producers and users, interaction among basic science, applied research, and implementation, and correspondence between supply and demand are required (Kirat & Lung, 1999; Muscio et al., 2010; Sarewitz & Pielke, 2007).

The literature review shows that Sarewitz and Pielke (2007) propose reconciling scientific supply with expected outcomes. Edler and Georghiou (2007) show that demand can guide innovation and public policy. Arocena and Sutz (2010) warn that weak knowledge demand in developing countries makes it difficult to define priorities and targeted programs. Sarkki et al. (2021) add funding as a link between social needs, research agendas, and scientific supply.

3. Methodology

This paper conducts a conceptual review to propose an analytical framework for studying knowledge mobilization and social sustainability in relation to diabetes in Mexico. The selection

focused on contributions from STI and the social sciences that explain the relationship among knowledge production, dissemination, demand, and use.

The methodology was organized into three stages. First, the concepts of knowledge transfer, translational research, knowledge translation, and knowledge mobilization were analyzed and compared to identify their scope, intersections, and limitations. Second, MoCBI was disaggregated into stages and types of actors according to their nature and relationship with knowledge use. Third, different definitions of demand were reviewed and grouped into four nonexclusive analytical dimensions.

Diabetes serves as the case study because it combines multiple factors and because addressing it requires the use and application of complementary knowledge and capabilities distributed across different institutions. In this regard, the unit of analysis can be understood as the relationship developed among heterogeneous actors as they produce, disseminate, demand, or apply knowledge within the HIS.

This conceptual review provides the basis for subsequently proposing an agent-based simulation model. The model will integrate the proximity framework, the concepts of sustainability, and a typology of demands to represent interactions among actors, explore barriers, and identify possible points of articulation. This article presents the conceptual results that support this representation.

4. Results Analysis

4.1 Diabetes and the Disconnect Between Knowledge Production and Use

Diabetes is a chronic degenerative disease that occurs when blood glucose levels are too high. It has no cure, but people living with the disease can adopt prevention and control measures to keep their health stable.

It can be understood as a complex problem arising from the interaction of multiple biological, social, political, technological, and environmental factors, as well as from insufficient mechanisms, protocols, technologies, and multidisciplinary treatments (Gómez et al., 2011; Hernández-Romieu et al., 2011). Accordingly, the problem cannot be explained or addressed by a single discipline or institution.

In Mexico, diabetes represents a serious public health problem and remains a growing cause of mortality. An analysis of 300 projects funded by CONACYT between 2002 and 2014 showed

that most were oriented toward fundamental or basic science rather than the application of knowledge (Natera et al., 2019). This analysis illustrates the presence of a latent gap between knowledge generation and its application.

Academic knowledge production often responds to incentives focused on political objectives or academic advancement, particularly publications. Moreover, many public universities lack the capabilities required to apply knowledge outside the institution. In this regard, one result is that the problem lies not in an absence of research capabilities, but in insufficient articulation among scientific agendas, demands, health services, policymakers, the business sector, and the users and beneficiaries of knowledge.

4.2 Stages and Actors in the MoCBI Process

The first conceptual result is the delimitation of four related stages: production, dissemination, demand, and use. Demand can modify priorities in research agendas; dissemination can generate linkages, learning, and an evolving understanding of new needs; and application can reveal problems that require knowledge to be produced, appropriated, or adapted.

4.3 Demand Typology

The third result is a proposed typology of knowledge demand comprising four dimensions. The categories are not mutually exclusive: a demand may be public, explicit, internal, and latent, or it may combine different features depending on the actor, scope, and moment at which it is identified.

Table 2. Dimensions for Characterizing Knowledge Demand

Dimension	First Category	Second Category	Criterion for Distinction
Origin	Public	Private	Provision of services, programs, or public policies compared with the needs of companies or industries.
Degree of observability	Explicit	Implicit	A recognized and formulated problem compared with a need that has not yet been precisely defined.
Scale	Internal	External	Requirements within an organization or territory.
Response capacity	Latent	Potential	A need whose fulfillment depends on available capabilities compared with a need for which no solution yet exists.

Source: author's own elaboration based on Arocena and Sutz (2010), Edler and Georghiou (2007), Fabrizio and Thomas (2012), Muscio et al. (2010), and Sarewitz and Pielke (2007).

4.4 Implications for Systemic Analysis and Simulation

Analyzing a complex problem from multiple perspectives allows us to understand that solutions do not follow linear trajectories. They therefore require an understanding of the emerging interactions among the actors that make up the system and of the cognitive, institutional, social, organizational, and geographical distances that condition them.

Agent-based simulation makes it possible to observe how actors relate to one another, the obstacles that restrict knowledge flows, and the points at which supply and demand could be articulated. The model functions as a mixed-method tool for organizing assumptions, constructing scenarios, and identifying milestones in knowledge mobilization.

The main implication is that producing relevant knowledge does not guarantee its application. Social sustainability requires coordination mechanisms, appropriation capabilities, and spaces in which the demands of patients, professionals, health services, and policymakers can engage with the available scientific and technological capabilities.

5. Next Steps

The next stage is to contrast this proposal with empirical evidence from different available information sources: projects funded by CONACYT, case studies, interviews, research studies, published theses, and databases from institutions dedicated to health and diabetes research. This comparison will make it possible to identify the types of demand expressed, who formulate them, and the extent to which they correspond to the defined typologies.

Finally, the model is proposed for constructing scenarios, supporting policy design, and identifying critical points of coordination. Its application to other sectors will require adapting the actors, capabilities, and conditions to the problem under study. The purpose is to analyze how knowledge systems can contribute to more equitable responses to complex problems.

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