UNDERSTANDING
INNOVATION ECOSYSTEMS
A Framework for Joint Analysis and Action

MIT D-Lab designing for a more equitable world

MIT | Practical Impact Alliance

MIT D-Lab

MIT D-Lab works with people around the world to develop and advance collaborative approaches and practical solutions to global poverty challenges. The program's mission is pursued through interdisciplinary courses, research in collaboration with global partners, technology development, and community initiatives — all of which emphasize experiential learning, real-world projects, community-led development, and scalability.

MIT Practical Impact Alliance

The MIT Practical Impact Alliance harvests the power of collaborative learning and action to increase, accelerate, and sustain impact on global poverty. Organized by MIT D-Lab, PIA is a membership organization of leaders from diverse organizations with aligned missions who learn, collaborate, and develop best practices together. PIA working groups focus on addressing a knowledge gap of the group and in the field, with the goal of generating outputs that will serve as relevant, practical tools for PIA members and a broader audience.

The Local Innovation Group

The Local Innovation Group conducts interdisciplinary social science research on processes of local innovation and local systems change in communities facing development challenges around the world. Through evidence synthesis and a portfolio of research projects, our team develops actionable knowledge for practitioners, policymakers, and communities on how local innovation can be encouraged and leveraged as an effective development strategy.

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FOREWORD

An innovator's road is long and fraught with challenges. When operating without reliable access to internet or power, a large network of contacts, supportive tax and regulatory policy, or a financial safety net, the task can sometimes feel impossible.

Over the years, D-Lab has tested a variety of strategies to increase the number of local innovators in the Global South who are creating impact in their communities with new products, services, and processes. We've offered workshops to build the design and prototyping capacities of local communities, and multi-week co-design summits to bring them together with students and experts from around the world who have helped develop their ideas.

We've offered project grants of various sizes. We've partnered with local universities and innovation centers to help them establish local hubs of support. And, through the Local Innovation research group led by Elizabeth Hoffecker, we've conducted research to better understand their innovation process—how it unfolds, what conditions enable it, and what gets in its way.

In 2017, D-Lab took what we had learned from this research, and from implementing such a wide range of interventions, and launched a new strategy focused on supporting local actors who are seeking to create a more supportive enabling environment for local innovation, or what we call "local innovation ecosystem builders." By working to strengthen and connect these actors, we can contribute to strengthening the ecosystem for local innovation as whole, in addition to more targeted efforts to build the capacity of individual innovators.

The Practical Impact Alliance (PIA) was one of the first D-Lab programs to embrace this new strategic focus. In 2018, PIA launched a working group on Strengthening Local Innovation & Entrepreneurship Ecosystems, to which we invited a series of speakers to share stories of the strategies, successes, and challenges of their ecosystem-strengthening programs. As the staff lead of the working group, Molly Rubenstein worked closely with Elizabeth for one year to identify components of her research to translate into best practices and tools for a practitioner audience, which we began to share through presentations, workshops, talks, and articles.

The framework presented in the following pages organizes some of the concepts, lessons, and best practices that we have found so far to be most useful to the government officials, funders, program managers, capacity builders, cultural influencers, and innovators themselves who are trying to increase the rates of success for innovation in their communities around the world. We hope it can help you in your work!

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INTRODUCTION

Place-based innovation ecosystems play a crucial role in driving local and regional economic development. This role has been documented and understood for over 40 years in industrialized economies but is only starting to be appreciated in the context of emerging and developing economies. However, the past several years have seen an intensification of interest in innovation ecosystems among global development actors as well as practitioners and policymakers working across the Global South.

Whether at the municipal level, in places such as Medellín, Colombia and Guadalajara, Mexico, or the national level in Rwanda, South Africa, or India, we see governments, multi-laterals, donors, and civil society actors embarking on initiatives to strengthen local innovation ecosystems. The International Development Innovation Alliance, for example, which includes many of the largest public and private global development agencies, has created a set of recommendations for why and how actors investing in economic development should support the strengthening of innovation ecosystems.

Within the past year, MIT D-Lab has been invited to play a role in some of these ecosystem-strengthening efforts. In contexts ranging from Oaxaca, Mexico to Accra, Ghana, we have been asked to convene ecosystem actors and stakeholders in order to facilitate joint ecosystem strengthening work. In preparing for these engagements, we have researched the state of the field regarding both innovation and entrepreneurial ecosystems as well as existing ecosystem frameworks, models, and tools.

In doing so, it has become clear that much of the current thinking and practice related to these concepts is drawn from research on innovation processes and entrepreneurial clusters in highly developed economies—places like Silicon Valley and Kendall Square, Boston. Much less is known about innovation ecosystems in less-developed contexts in terms of how they can be characterized, how they function, and—most importantly—how they can be strengthened.

At D-Lab, we work from the principle that in order to intervene effectively in systems, we first need to understand them.

To that end, the Local Innovation Group at D-Lab has been conducting multi-year research on local innovation ecosystems in the types of contexts where D-Lab and our partners engage. This involves learning about diverse processes of ecosystem development through primary and secondary case study research.

Based on this research, we have developed a framework for understanding local innovation ecosystems, which we share in this publication. We have found the framework, and accompanying visual model, to be a useful tool for orienting and organizing conversations among ecosystem actors on how particular innovation ecosystems are functioning, what their strengths and weaknesses are, and where opportunities for further development might lie.

This document shares this framework and how we have used it over the past year to catalyze ecosystem-strengthening efforts. We start by clarifying the concept of a "local innovation ecosystem" and presenting the core ideas informing the visual model. We then describe the model and each of its individual components. We follow with guidance from our research on best practices for conducting ecosystem strengthening work, and share three examples of how we have used the model to facilitate ecosystem-strengthening conversations in distinct local contexts.

USING THIS PUBLICATION

The purpose of this publication is to offer a model that can be used by anyone seeking to build understanding of local innovation ecosystems, particularly in the context of presentations, workshops, education, and advocacy for ecosystem-level work.

Whether advocating for resources, the inclusion of missing stakeholders, or seeking to bring awareness to aspects of your ecosystem that need development, it can help to have a clear definition and model of the ecosystem as a shared point of reference.

We therefore describe the ecosystem model in enough detail to enable you to explain the model to others, should you want to do so. We also share specific formats for sessions we've designed as examples of the kinds of conversations that can be facilitated with this material.

WHAT IS A LOCAL INNOVATION ECOSYSTEM?

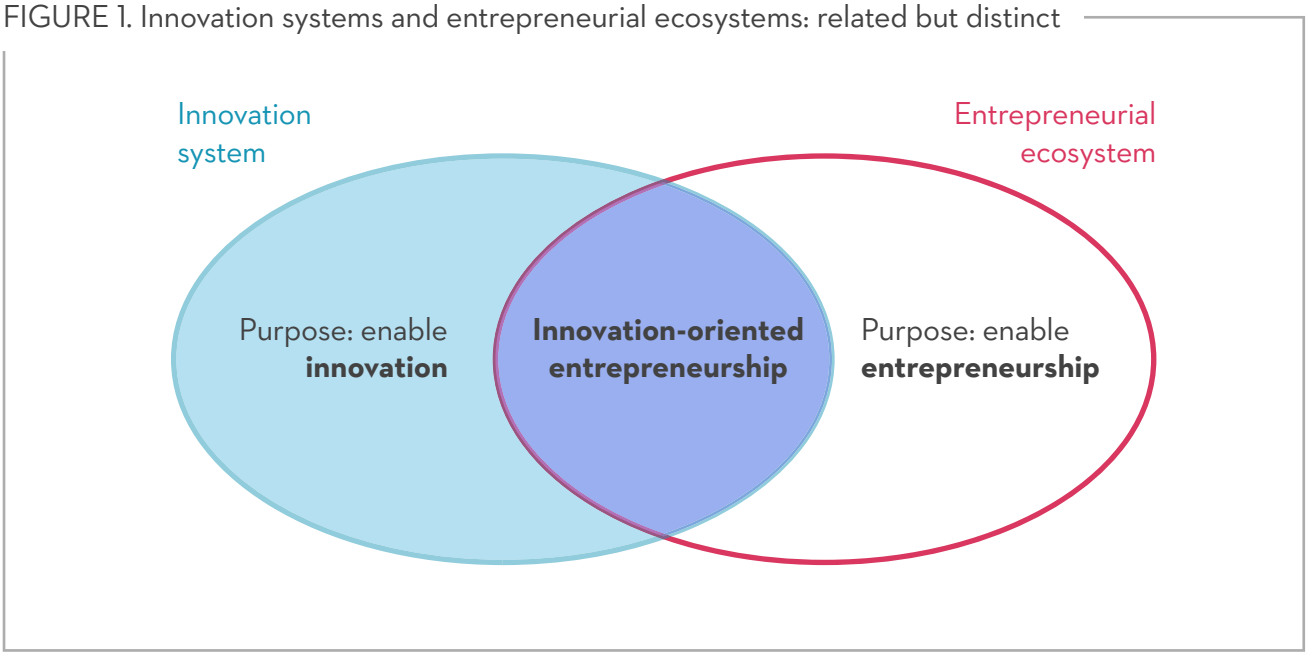
Drawing on the metaphor of a biological ecosystem, local innovation ecosystems refer to the complex, dynamic systems within which innovators operate—systems characterized by an array of interacting actors, resources, relationships, and conditions that work together to either enable or impede innovation.[1] Our understanding of local innovation ecosystems is informed by three bodies of research: first and foremost, research on the characteristics and behavior of complex adaptive systems;[2] second, a large body of work on innovation systems; and third, a more recent but growing body of research and practice related to entrepreneurial ecosystems.

We bring these three streams of literature together with empirical research from our case studies to inform how we conceptualize, describe, and define a local innovation ecosystem. The literature on complex adaptive systems identifies that all such systems have the following characteristics: 1) a collection of **elements** or components; 2) **relationships**, interactions, and inter-dependencies between the elements; and 3) **a purpose** or function, which describes what the system produces or accomplishes, both intentionally and unintentionally.[3]

As a particular type of complex system, innovation systems exist to produce innovation and support processes of innovation. They are typically described in terms of actors, relationships (and networks) between actors, institutional conditions (both formal and informal) and infrastructure.[4] They have been studied at the national, regional, and local levels, but are typically described in a way that ignores the specific social, cultural and ecological contexts within which innovation processes are embedded and on which they depend.[5]

Entrepreneurial ecosystems, on the other hand, are seen as explicitly place-based and consider all aspects of a place that contribute to its ability to produce and sustain successful entrepreneurship.[6] The purpose of entrepreneurial ecosystems is distinct from that of innovation systems (though also overlapping, as can be seen in Figure 1 below), and the ecosystem has been conceptualized in a way that is broader and more vague. However, the ecosystem framing acknowledges that economic activity is embedded in and dependent on environmental and cultural contexts that affect the system's behavior and results.

FIGURE 1. Innovation systems and entrepreneurial ecosystems: related but distinct



Given D-Lab's focus on context-appropriate and sustainable development approaches, we have drawn on the broader ecosystem framing in conceptualizing the kind of system that is needed to produce and sustain innovation at the local level. We therefore talk about "local innovation ecosystems" rather than local innovation systems, and we define and model these using language and concepts drawn from ecology and entrepreneurship as well as innovation systems theory. From this perspective, we see local innovation ecosystems as

place-based communities of interacting actors engaged in producing innovation and supporting processes of innovation, along with the infrastructure, resources, and enabling environment that allow them to create, adopt, and spread more effective ways of doing things.

These processes often involve entrepreneurship but also can involve other mechanisms for bringing new ideas and practices into society, such as direct implementation through government agencies, multi-laterals, large corporations, NGOs or community-based organizations, or through legal and policy changes.

INNOVATION ECOSYSTEM MODEL

To help visualize local innovation ecosystems, we have created a model that illustrates our definition graphically (see Figure 2, next page). This model focuses on describing what a local innovation ecosystem consists of, rather than how it functions, which would be better represented through a systems dynamics model. Similarly, the model focuses on representing important structural features of local innovation ecosystems, rather than comprehensively listing all their elements.

With those considerations in mind, the model is composed of three main components that reflect the structural attributes of complex systems: 1) the ecosystem's purpose; 2) its actors and other essential elements (in concentric circles moving outwards); and 3) the relationships and interconnections between actors and elements, which are illustrated metaphorically through the radiating, 8-pointed star. In the following sections, we focus on describing the specific elements we have chosen to include in the model and their importance to the functioning of local innovation ecosystems.

The model includes the minimum type and number of categories to enable an accurate understanding of a local innovation ecosystem. We also suggest relationships between these different components, i.e. between actor types, the roles they play in the system, and the types of resources they typically provide or interact with, while acknowledging that these relationships are fluid and may look different across distinct systems.

This model therefore provides a starting point for developing more nuanced descriptions, maps, and analyses of specific innovation ecosystems. Over the past year, we have incorporated the framework into the facilitation of events ranging from hour-long sessions to multi-day, immersive workshops. Whether convening a local group of 20 stakeholders from the same ecosystem or an international group of 60 stakeholders from diverse ecosystems, we have found that the framework helps participants develop a shared understanding of innovation ecosystems, what they need to be healthy, and how actors can contribute to strengthening them.

PURPOSE: THE GUIDING STAR

All systems, including innovation ecosystems, have a purpose, which may be defined explicitly or may manifest through the results the system produces.

Vibrant, well-known innovation ecosystems tend to have purposes that reflect the vision, values, and motivations of the actors driving the ecosystems' development.

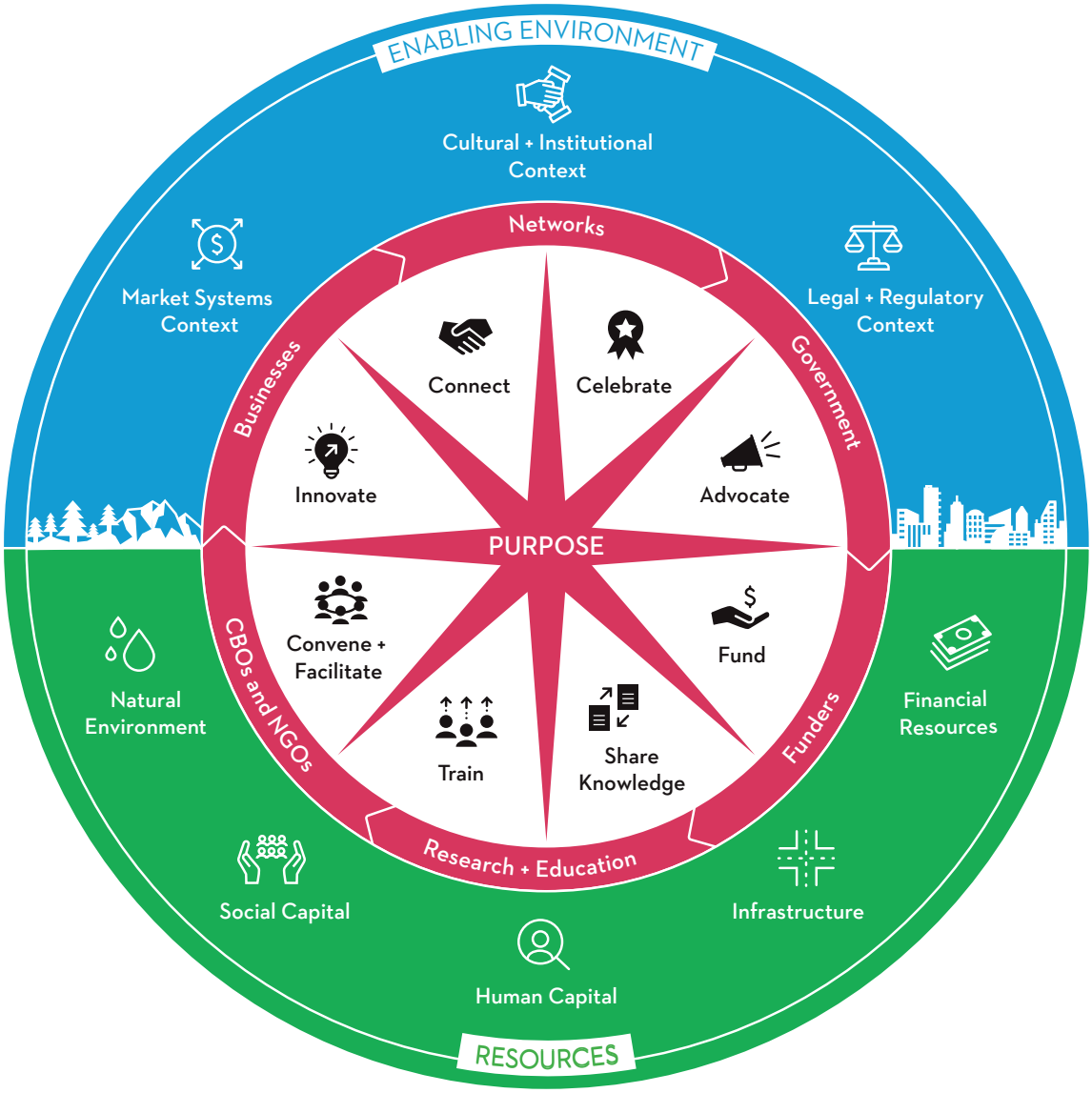
Examples include:

Israel: Agricultural technology innovation ecosystem
PURPOSE: Create and diffuse innovations in agricultural methods and technologies.

Kendal Square, MA (USA): Innovation-driven entrepreneurship ecosystem
PURPOSE: Develop cutting-edge technologies and high-growth-potential, tech-based start-ups.

Philadelphia, PA (USA): Social innovation ecosystem
PURPOSE: Develop innovations in socially and environmentally responsible enterprise.

FIGURE 2. Local innovation ecosystem model



This model places **the purpose** of the ecosystem at the center, since it gives the system coherence and identity. Moving outwards, the model depicts three main categories of ecosystem elements.

1. ACTORS – At the center of the ecosystem, we find the organizations, entities, and individuals (collectively termed "actors") who create, support, and enable innovation through their activities and interactions. This model depicts actors in terms of the roles they play in the ecosystem (in white) and secondarily, in terms of actor types (in pink).

2. RESOURCES – At the bottom, in green, we depict essential resources that the ecosystem needs to function. These resources include natural endowments of the place where the ecosystem is located, as well as resources created by humans, such as infrastructure, financial resources, and human and social capital.

3. ENABLING ENVIRONMENT – At the top, in blue, we find elements of the enabling environment that affect the functioning of the ecosystem. These elements form part of the overall context for creativity and entrepreneurship, influencing productivity as well as the system's ability to produce, diffuse, and scale innovation.

ECOSYSTEM ACTORS AND ROLES

Studies on innovation and entrepreneurial ecosystems have identified that these systems need a diversity of actors playing complementary roles in order to function well. Different authors and organizations categorize ecosystem actors in different ways,[7] but broad agreement exists that certain types of actors are necessary for a balanced, dynamic, and robust system.

Based on our case study research into local innovation ecosystems in developing and developed economies, we identify six types of actors with particularly important roles to play. These include: 1) businesses of various sizes, ranging from start-ups and small and medium enterprises (SMEs) to large firms; 2) community-based and not-for-profit organizations (CBOs and NGOs); 3) centers and institutes of research, education, and R&D; 4) providers of funding, including gift and grant funding as well as financial products and services; 5) governments and government agencies, particularly local and regional bodies; and 6) networks, alliances, associations, and groups of individuals, both formal and informal.[8]

We also identify eight roles[9] that actors play in ecosystems that are producing innovation and innovation-driven entrepreneurship (see next page). By highlighting six types of actors and eight key roles, we acknowledge that the relationship between actors and roles is fluid and can vary based on the circumstances of particular innovation ecosystems. In one ecosystem, for example, the major provider of funding might be local or national government agencies, while in another, the primary funders might be international donor agencies or the private sector, through philanthropic donations and corporate social responsibility (CSR) initiatives.

Similarly, we see cases in which the role of convening ecosystem actors and facilitating interaction between these actors is played by local or international NGOs and others in which this role is played by associations of local enterprises. We therefore agree with Tedesco and Serrano (2019), who argue that the role an actor plays in an ecosystem and the value that it contributes is more important than the sector to which the actor belongs or its legal identity as a for-profit, not-for-profit, private foundation, etc.[10] Consequently, our model emphasizes actor roles over actor types, placing roles closer to the center as they enable the system to achieve its purpose.

At the same time, certain types of actors are better positioned to play certain roles over others. When these actors are missing from the ecosystem or not playing the roles for which they are best positioned, the ecosystem becomes less supportive of innovation. In emerging market ecosystems, a common challenge is that financial resource providers such as banks are unwilling to offer loans—and sometimes even checking accounts—to community-based innovators, who they perceive as too risky.

When finance providers are not providing finance, when associations are not effectively connecting their members, or when universities and research institutes are not producing and sharing knowledge that is relevant to solve local challenges, ecosystems struggle to produce innovation. Similarly, ecosystems that lack diversity in the types of actors providing key roles are less adaptable and resilient to change, as compared to ecosystems where a variety of different types of actors exist and provide complementary — and even competitive — offerings.[11]

COMMON ACTOR CHALLENGES

Here, we highlight several actor-related challenges that are relevant in the context of emerging economies.

1. Key roles are not filled. If essential roles are unfulfilled because certain actors are absent, ineffective, or not performing their core functions, the ecosystem will be less capable of producing and supporting innovation.

2. Actors are disconnected. When actors in the ecosystem are not connected to each other, or when the quality of the connection is poor—indicated by high levels of mistrust, lack of information and resource-sharing, and difficulty or unwillingness to coordinate action—the ecosystem underperforms.

3. No backbone organizations. If the ecosystem lacks an organization (or coalition of organizations) whose focus is on system-strengthening through coordination, information-sharing, and facilitation, the ecosystem may become disconnected.

8 Key Roles

Innovate

Innovators identify, develop, and put into use new and improved ways of doing things within a specific local context.[12] Whether as individuals, members of groups, start-ups, or research units, innovators play the defining role within local innovation ecosystems. The extent to which diverse types ofactors can innovate—and create impact from innovation—is indicative of the system's health and level of development.

Connect

The role and activity of connecting different actors to each other, whether through social networking or value chain development, is fundamental to the process of enabling local innovation. This includes processes of network-building, relationship brokering,[13] supply chain development, and trust-building between actors who might not previously have worked together.

Celebrate

Actors who promote local innovators—whether through positive press, innovator showcases, competitions and prizes, and/or storytelling—help to create a supportive culture for innovation. This includes shared values, language, norms, and standards that reward those who introduce new ways of doing things and encourage others to take on the difficult and risky task of innovation.[14]

Train

Innovation involves doing things in new ways, and innovation processes often require that certain actors in the system develop new mindsets, skills, and/or capabilities. Training and capacity-building, whether in specific technical domains or more general business and leadership skills, is therefore a key activity within innovation processes and more broadly within the ecosystem.

Share Knowledge

Sharing knowledge between different domains, sectors, and types of actors (such as researchers, farmers, entrepreneurs, and consumers) contributes to the production of innovation and the spread of innovative practices throughout a system. This role includes providing and sharing scientific knowledge, technical and practical know-how, information, and business intelligence.

Convene and Facilitate

This role involves bringing diverse members of the ecosystem together and facilitating productive, mutually beneficial interactions, whether in the context of working groups, stakeholder workshops and gatherings, task forces, or Innovation Platforms (IPs).[15] Facilitation has been highlighted as a particularly important role within successful multi-stakeholder innovation processes.[16]

Advocate

The work of innovators and entrepreneurs is either encouraged or stymied by the legal, regulatory, economic, and tax policies of places where they operate. Advocacy for the conditions needed to support innovation and for a level playing field for community-based innovators and entrepreneurs is often necessary in order to order to address system-level constraints and barriers to success.

Fund

An essential role in any innovation ecosystem is the provision of funding, ranging from philanthropic and grant funding to credit, loans, and equity investments. In healthy innovation ecosystems, a variety of different actors offer a diverse range of funding types and sizes, ensuring that innovators and entrepreneurs can obtain the financing they need at each stage in their innovation process.

RESOURCES

Most models of entrepreneurial ecosystems focus on identifying system actors, placing less emphasis on the other elements that are necessary for the system to function and fulfill its purpose. The literature on innovation systems, however, makes clear that innovation processes require resources and enabling conditions, in addition to the types of actors and roles we have previously mentioned.

Our model therefore identifies five types of resources necessary for innovation processes (below) and three aspects of the enabling environment (next page) that directly influence the system's ability to produce and support innovation. Drawing on the ecosystem metaphor, we can think of resources as the soil and nutrients of the system, which directly contribute to its ability to produce innovation; while the enabling environment includes aspects of the local context that affect how (and how well) the system functions.

Like the quality of soil and water in a natural ecosystem, the quality and availability of resources such as human and social capital in an innovation ecosystem directly affect the extent to which innovation processes can emerge and how they unfold over time. While many resources influence a location's ability to produce and support innovation, we have highlighted five foundational resource types that have relevance across diverse geographic and cultural contexts.

5 Key Resources

Natural Environment

The environmental characteristics of a place, including its natural heritage and features that make it distinctive, as well as the natural capital and ecological resources that are both abundant and scarce, provide a crucial context and catalyst for innovation in terms of locally relevant constraints, opportunities, challenges, and "innovation domains,"[17] as well as raw materials that are utilized and transformed through the innovation process.

Human Capital

Human capital includes the knowledge, skills, capacities, and competencies that enable people to produce innovation, support innovation processes, and contribute to economic activity more generally through the creation of goods, services, and new ideas. In our model, we use the category of human capital broadly to include the accumulated store of knowledge and know-how, including technological know-how, that is present within individuals and groups in a given location.

Social Capital

Social capital refers to resources such as information, trust, and norms of reciprocity[18] that exist within a group or social network and create benefits for the group, one of the most important being the ability to engage in "mutually beneficial collective action."[19] These resources can affect the ability of group members to connect effectively with each other ("bonding capital") and to connect effectively with other individuals or groups ("bridging capital"),[20] both of which play a critical role in processes of innovation and entrepreneurship.

Infrastructure

Infrastructure includes the networks, systems, and facilities (labs, maker spaces, fabrication centers, etc.), both tangible and intangible, that are necessary for innovation and innovation-oriented economic activity. Examples of physical infrastructure include roads, electric grids, and internet networks; examples of technological infrastructure include information systems.

Financial Resources

This category encompasses the types and quantities of funding, financial products, and related services that are available to innovators to support their innovation process and the diffusion of innovation through entrepreneurship and other channels. Financial resources include various types of funding with different requirements and terms, such as gifts, grants, loans, and equity, as well as financial products and services such as banking services, insurance, and revolving credit.[21]

ENABLING ENVIRONMENT

The enabling environment for innovation refers to those aspects of a place that contribute to facilitating or inhibiting innovation processes. Like sunshine or oxygen in a natural ecosystem, these elements directly affect the extent to which innovation emerges at all as well as how it unfolds over time and to what extent it produces societal impact.

Research studies from the fields of entrepreneurship, management, and systems of innovation agree on the critical role of the enabling environment in innovation ecosystems and on the specific components of the environment that most directly affect the system's performance. In our model, we highlight three aspects of the enabling environment that have been shown to affect the ability of a local system to produce innovation and to adapt and utilize innovations introduced from elsewhere.

In addition to affecting the context for innovation specifically, these aspects of the enabling environment also affect the broader context for entrepreneurship and local economic development. They therefore refer to larger and overlapping economic, cultural, and socio-political systems which interact with and influence more specific innovation systems.

3 Environmental Elements

Market Systems Context

Market systems refer to the economic systems through which "private and public actors collaborate, coordinate, and compete for the production, distribution and consumption of goods and services."[22] They include value chains, end markets and households, and input and service markets, as well many of the same resources and enabling conditions that influence the functioning of economic activity. The type and nature of supply chains and value chains in a given local context, as well as the structure, diversity, and complexity of local market systems, directly influences the context for innovation. Innovation in the production of a cash crop, for example, is unlikely to occur if value chains for that crop are nonexistent, weak, or fragmented.

Cultural and Institutional Context

The cultural and institutional context of a location affects market systems generally as well as the more specific functioning of local innovation ecosystems.[23] This aspect of context includes cultural beliefs, values, and customs as well as formal and informal rules, standards, norms, and shared habits (collectively referred to as "institutions")[24] that produce predictable routines of behavior and interaction.[25] Regardless of whether rules and norms are formal (referred to as "hard institutions") or informal ("soft institutions"),[26] they affect how actors interact with each other and with their environment, and therefore profoundly influence the context for innovation and entrepreneurship.

Regulatory and Policy Context

The types of laws, regulations, and policies that exist in a location, as well as the manner and extent to which they are enforced, create the incentives—or disincentives—for innovation. From laws protecting intellectual property to regulations influencing the ability to start a new company to tax and certification policies, the legal, regulatory, and policy context directly affects the functioning and performance of local innovation ecosystems. In addition to the content and enforcement of laws, this aspect of context also includes the processes through which regulation and policy are created and can be changed, and the extent to which these processed are closed (i.e. dominated by narrow interests) or open to influence and participation from a wide variety of actors, particularly less powerful ones.

STRENGTHENING INNOVATION ECOSYSTEMS

To strengthen local innovation ecosystems, we first need to understand them, but understanding alone is not enough. We also need effective strategies for action—for how to catalyze, lead, support, or contribute to ecosystem-strengthening work. Through our research, we have identified eight strategies that effective ecosystem builders have used to create innovation ecosystems from scratch or to strengthen existing ecosystems to make them more robust, diverse, inclusive, and effective at producing innovation (see next page).

Some of these strategies are more relevant than others at different stages of an ecosystem's development (see box below), but across stages, there is typically a need for some form of ecosystem convening—bringing actors together in facilitated meetings, workshops, or events to engage in joint visioning, opportunity identification, peer learning, and relationship-building. Facilitating inclusive, multi-stakeholder learning and relationship building is one of D-Lab's strengths, and we have increasingly been asked to bring this skill set to ecosystem convening work.

In doing so, we have found it helpful to combine the insights from our research with activities and techniques drawn from our decades-long experience facilitating participatory design processes. Frequently, this involves bringing the local ecosystem framework into events organized around D-Lab's "Learn, Imagine, Create, and Test" design cycle. In the following pages, we share some recent examples of these convenings and highlight how we used the ecosystem framework in each of these distinct contexts.

STARTING POINTS FOR ECOSYSTEM STRENGTHENING

When D-Lab is asked to lead or support ecosystem-strengthening work, a first step is to identify where the ecosystem is starting from in terms of its history, level of development, and needs. Some of the most common starting points for ecosystem-strengthening work are the following:

Nascent ecosystems – In these settings, an innovation ecosystem is just starting to form. Some actors might be present, but others are missing, and key resources and enabling conditions are absent or weak. A desire exists to create a vibrant ecosystem for innovation and entrepreneurship, but this full-fledged ecosystem does not yet exist.	**Ecosystem strengthening** in these settings involves bringing those who are already innovating together to develop a joint vision of what a vibrant ecosystem might look like; build relationships, shared values and norms; develop the capacity of existing actors and create new actors and resources; and engage in strategic, short-term, joint action to address immediate, shared, system-level blockages and constraints.
Lopsided ecosystems – These ecosystems have more players and components than nascent systems, but are heavy in some areas and weak in others. They may be dominated by just one or two actor types or sectors, or they may be over-reliant on some resources and unable to access others.	**Ecosystem strengthening** in these settings involves convening the existing actors and stakeholders to assess the strengths and weaknesses of the system, identify missing actors, roles, resources, and conditions and develop joint action plans to strengthen elements of the system that are under-developed.
Established but disconnected ecosystems – These systems are crowded with many actors and initiatives that are not operating synergistically to produce innovation. Instead, there is lack of coordination, insufficient information-sharing, duplication of efforts, low levels of trust, ineffective collaboration between actors and/or weak capacity for effective collective action.	**Ecosystem strengthening** in these settings involves helping actors in the system to see who is doing what and identifying the strengths of the system through mapping efforts and multi-stakeholder workshops. These efforts may also involve creating new platforms to enhance information sharing and facilitating activities to build trust and collaborative working relationships between members of the system.

Strategies for Strengthening Innovation Ecosystems

1. Identify a "shared dream" of the future

To be successful, ecosystem-strengthening efforts need to facilitate a process through which stakeholders can develop a shared vision of the future they desire for the system. What desirable and undesirable results is the system producing now? What results do stakeholders wish the system were producing? Articulating a shared dream for the ecosystem's future helps system stakeholders identify a concrete vision to work towards.

2. Start with the motivated champions

Successful ecosystem strengthening initiatives start working with the most motivated members of the system, those who are equally passionate about the shared dream and already working towards it. These may not be the most well-connected, powerful, or visible actors in the system, but they are the ones with the energy and focus to drive the process forward and the excitement to enlist others to join. Often, early champions are leaders of accelerators, incubators, social innovation networks, or others who are already interfacing between innovators, entrepreneurs, funders, local governments, and other actors. Strengthening them first contributes to building the core of an ecosystem.

3. Facilitate safe, neutral spaces for learning

Learning and problem-solving happen most effectively when organizational and personal agendas are set aside and when participants can let their guard down, take risks, and speak honestly. This requires that meeting spaces be "neutral" and equally accessible and comfortable for all. It also requires skillful and neutral facilitation of group meetings, visioning sessions, or steering committees, so all members can trust that the process is unbiased, transparent, and belongs to them and is not being unduly influenced by internal or external agendas.

4. Establish a common language

Language is powerful. The words we use affect how we organize information, how we make connections between concepts—even what we think is possible. Successful ecosystem-building initiatives develop and use shared frameworks and language to build community and shared ways of working among members. The innovation ecosystems framework is one tool that can be used to establish a common set of terms and concepts that ecosystem cultivators can use to build shared understanding of the system as it exists currently and as it could exist in the future.

5. Build on what is already working well

It can be tempting to fixate on what isn't working, but successful ecosystem strengthening work usually starts by identifying what is working well; i.e. the seedlings of the flowers we want, rather than the weeds. Once we find those "seeds of the future," we ask: what is in their way? What needs to be changed so that these seedlings can grow into strong plants? By identifying and removing barriers for initiatives that have the potential for success, we can create conditions for a part of the ecosystem to start to flourish, which brings energy and more stakeholders to the process.

6. Set achievable, "next step" goals

Once specific areas of challenge and opportunity have been identified, successful ecosystem builders focus first on the most practical, near-term aspect of that challenge—an area where a "small win" is possible in the near term. These initial successes clear the way for initiatives to gain momentum and to build trust and comaraderie among participants. They also built participants' confidence and skills to tackle more complex challenges involving collective action, such as changes to regulations.

7. Create opportunities to learn by seeing and doing

A common challenge in innovation ecosystems is that actors lack specific technical, business, or leadership skills they need to move forward. An effective way to build these skills is to provide actors with context-specific opportunities to learn from each other and from existing experts (both within and beyond the system), through learning journeys, peer demonstrations, processes of joint design, experimentation, and participatory research.

8. Celebrate progress publicly

To expand participation in ecosystem-strengthening beyond the initial core group, it is important to publicly celebrate progress and "wins." Showcasing successful innovators, organizing public celebrations and festivals, running feature news stories, or organizing official "launch parties" all help to bring awareness and attention to ecosystem-strengthening work, energizing existing participants and motivating others to join.

Note: Adapted and expanded from a previously published piece by Elizabeth Hoffecker, "Why Cultivating Your Innovation Ecosystem is Worth the Work," Stanford Social Innovation Review (September 2018). Five of these strategies are described there in more depth.

CASE STUDY: LAÂYOUNE

Getting Started

In November 2018, D-Lab included, for the first time, a series of ecosystem building sessions within the context of a week-long Co-Design Summit in the city of Laâyoune. Laâyoune is the main city of the Laâyoune-Sakia Lhamra province, a coastal desert territory in the south of Morocco, where D-Lab is engaged with the Phosboucraa Foundation in an ongoing innovation ecosystem cultivation project.

Morocco is investing heavily in the economic development of the region, and Laâyoune is experiencing economic growth. Compared to other nearby regions, though, there continues to be high unemployment and relatively little dynamism in the entrepreneurial and innovation sphere. To address this, the Phosboucraa Foundation invited the MIT D-Lab Practical Impact Alliance to help strengthen local innovation capacity in 2017.

Given the nascent stage of the innovation ecosystem in Laâyoune, the Phosboucraa Foundation and D-Lab agreed that the program's priority should be to help local intermediaries better understand the realities and best practices of innovation ecosystem cultivation, and to build relationships between them, with the entrepreneurs they serve, and with others in the Moroccan ecosystem, to create a strong platform for future coordination and collaboration.

Leading up to the Co-Design Summit, the project team conducted market and stakeholder analysis, trained 12 local facilitators in D-Lab's Creative Capacity Building (CCB) methodology, and, together with these facilitators, conducted CCB trainings for 30 local, early stage, and aspiring entrepreneurs. We also offered one-day Introduction to Design Thinking workshops for ecosystem actors from Laâyoune and other Moroccan cities. The summit itself gathered some of those aspiring entrepreneurs with local and national entrepreneur supporters and international development practitioners, and formed them into teams. Each team used co-design to explore local business opportunities for one or two of the entrepreneurs and develop proposals for new ventures or growth strategies for existing businesses.

GOALS AND OBJECTIVES

This co-design methodology is designed to build empathy and forge connections among disparate stakeholders, but we included three new sessions to accomplish our goal of building understanding of the innovation ecosystem and inspire momentum to improve it.

These three ecosystem sessions were designed to:

Provide a Shared Framework: establish a shared vocabulary for talking about the ecosystem and give participants a broader picture of where their efforts fit in, how the system currently functions, and where they might find opportunities to strengthen it.

Chart a Path Forward: help identify specific top-priority areas for development within the support ecosystem that could increase successful innovative entrepreneurial activity.

Change Mindsets: help the entrepreneurs feel empowered to contribute to the improvement of the system as a whole, and help the supporters of entrepreneurship feel motivated to collaborate with others in the system, including the entrepreneurs themselves, to achieve their shared goals.

Build Relationships: help stakeholders identify promising opportunities for those collaborations where their priorities and personalities align with others in the room.

MIT D-Lab Founding Director Amy Smith (standing, center) and facilitator Taylor Cruz (standing, left) conferring over a team co-design exercise.

ACTIVITIES

INTRODUCTIONS

In the first ecosystem session, we introduced the ecosystem framework, inviting participants filling each actor role to share an illustrative story from their own experience. Then each participant in the room wrote their name and organization on a sticky note in a color that indicated their actor type, and placed it on a big printout of the ecosystem model in a position to indicate the role they play in the ecosystem, with a colored dot indicating whether they operate locally, nationally, or internationally. We then invited participants to identify patterns they observed and other participants with whom they might want to connect. This visual stayed in the space for the remainder of the week.

IDENTIFYING CHALLENGES

At the end of the Co-Design Summit, after teams had generated business ideas, we asked them to map out the assets available locally and nationally, within different areas of the ecosystem, to support entrepreneur(s) in realizing their ideas and addressing the challenges they would face in the process.

Each team placed those challenges on a matrix according to how much of an impact each would make for the entrepreneur if the challenge were addressed (**Important**) and how difficult they thought it would be for local and national actors to address it (**Achievable**). Each team selected three challenges they recommended that ecosystem actors address, including at least one highly achievable challenge, and presented them to the whole group.

PROBLEM FRAMING AND SOLUTIONS

We aggregated the selected challenges into a master list of eight that were both concrete and achievable enough for the participants to address over the year to come. There was at least one challenge related to each of the actor roles within the framework. On the last day of the Co-Design Summit, we asked participants to step out of their entrepreneur's team and select one of these challenges to work on.

Groups formed to address five of the challenges, and each group spent an hour discussing the root causes of their selected challenge and proposing some possible solutions. At the end of the session, we asked each participant to record the ideas they were most interested in seeing pursued and the commitments they were willing to make to advance their chosen challenge's solutions.

OUTCOMES

Establishing a Shared Framework
Using the ecosystem framework, participants were able to clearly articulate some of the most important gaps in the existing ecosystem, including the following four, which we recommended that Phosboucraa Foundation and its local training center, the Laâyoune Learning Center, prioritize in the year to come.

Information: Entrepreneurs don't know what they need to do to be successful or what resources are available to help them. ***Connection:*** There is not currently enough coordination between the different support programs for entrepreneurs in Laâyoune. ***Infrastructure:*** Entrepreneurs have trouble accessing the space and materials they need to do their work effectively. ***Training:*** In spite of existing programs, entrepreneurs in Laâyoune lack key "soft" skills—team and financial management, strategic planning, communications, etc.

Charting a Path Forward
A few concrete proposals emerged from the ecosystem problem-solving sessions to address those four challenges, including 1) a committee to coordinate local ecosystem activities, 2) an interactive ecosystem resource guide, 3) a local co-working space, and 4) new training programs for entrepreneurship instructors and new experiential learning opportunities for students.

A few of these are becoming reality. Phosboucraa Foundation has established an incubator program to strengthen the existing entrepreneurship offer of its training center, the Laâyoune Learning Center. D-Lab staff are helping to craft the curriculum and train local facilitators to deliver it.

The plans for the incubation program include a robust mentor matching feature, to help address the information and connection gaps in the system and ensure that the training remains grounded in real-world experiences. The Laâyoune Learning Center is also planning to establish a co-working and networking space for the entrepreneurs.

Changing Mindsets & Building Relationships
The WhatsApp group created for participants remained active for months following the event, most often with appreciations of local ecosystem actors for providing mentorship to the local entrepreneurs or connecting them to training, funding, and other support opportunities. Some of these actors will be participating in the new incubator program as mentors.

CASE STUDY: KAMPALA
Building Connection

We conducted a one-day ecosystem workshop in Kampala, Uganda, in March 2018, while engaged in laying the groundwork for a Co-Design Summit similar to the one we had recently conducted in Laâyoune. Unlike the ecosystem sessions in Laâyoune, the Kampala workshop was framed as a standalone event and an opportunity to meet a number of ecosystem players we had not worked with before, rather than as the culmination of a year of work.

In this case, we were working in a local ecosystem where there was much more activity already on the ground. The innovation-driven entrepreneurship ecosystem in Kampala is growing rapidly and attracting the attention and investment of international actors. For our event, we were able to build off of the ecosystem assessment that the Aspen Network of Development Entrepreneurs (ANDE) had commissioned as Part 1 of the Uganda Entrepreneurial Ecosystem Initiative (UEEI). The report, produced by the Centre for Development Alternatives (CDA), Enterprise Uganda, and Koltai & Co, lays out a detailed assessment of the local assets and limitations of the entrepreneurial ecosystem in Kampala, as well as suggestions for what sorts of improvements should ideally be made to move forward.

To identify what unique value we could offer through our workshop, we spoke with representatives from ANDE, the CDA, Enterprise Uganda, and Koltai & Co so we could coordinate with the UEEI Phase 1 and Phase 2 efforts. We also spoke with staff from Innovation Village Kampala, a local co-working space and incubator already working to build international awareness and local energy, momentum, and collaboration that would strengthen the entrepreneurship ecosystem in Kampala.

GOALS AND OBJECTIVES

Our preparation for our visit taught us that there were two opportunities for us to add value to existing ecosystem work.

First, only some progress had been made to clarify what actions the local actors could take to begin accomplishing the goals set out as recommendations in the UEEI Phase 1 report.

Second, although there were a number of different institutions actively working to increase attention and support to local innovative entrepreneurs, there was relatively little coordination or collaboration among them.

For our day-long workshop, we decided to focus on addressing that lack of connection and collaboration through an agenda focused on information sharing and problem-solving around specific action pathways. Our objectives were to:

Build awareness: Provide an opportunity for local actors to share information with one another about relevant resources and activities already present in Kampala.

Change mindsets: Overcome the tendency towards independence and competitiveness and build motivation to work together, while also building confidence in these local actors that they could change the system as a whole.

Chart a path forward: Identify a few "easy win" opportunities for productive collaborations that could offer improvements to the ecosystem in the short term, along the action pathways suggested by the UEEI Phase 1 report, or priorities voiced by the participants during the session.

SETTING AND PARTICIPANTS

Innovation Village hosted the event in their space, which is a large and fairly well-established co-working space for local entrepreneurs, and shared the event with some members of the recently formed Kampala Entrepreneurship Ecosystem Steering Committee. We also worked with one of our local entrepreneurship education partners, Kyusa Uganda, to identify additional participants to invite, including some who were not as well-connected to the work that Innovation Village was already conducting.

The 26 attendees represented a variety of actor types, most of which provided a mix of services to the ecosystem:

- 2 successful entrepreneurs
- 10 entrepreneur training programs
- 3 business support service providers
- 3 investment funds/financing agencies
- 1 research & analysis firm
- 1 local and 1 international backbone ecosystem convener and multi-role actor

ACTIVITIES

INTRODUCTIONS

Participants introduced themselves to the others at their table. We briefly introduced ourselves and explained our intentions in facilitating this day's activities, and then we introduced our ecosystem framework and the UEEI Part 1 Report Action Pathways as a starting point for the groups to build off of.

SHARING

We placed large pieces of white paper on the walls around the room, one with each of the Ecosystem Actor Roles from our framework, and any corresponding UEEI recommended Action Pathways listed at the top. We asked each person to sit quietly for a few minutes, think of any updates they had to contribute on activities happening within each role's domain, and write them down on sticky notes.

Then we invited everyone to leave their seats, add their notes to the appropriate actor role paper, and circulate the room to read through what other people had posted. Playing music in the background during these and other silent activities helped to keep the energy up.

PROBLEM IDENTIFICATION & TEAM FORMATION

Participants shared observations on what they'd read: new things they had learned and areas that struck them as remaining problematic within each domain. Then the facilitators shared the list of problem areas that had most strongly emerged from the discussion, and participants selected the area they most wanted to work with that afternoon, before breaking for lunch.

PROBLEM FRAMING & SOLUTIONS

Participants explored the ultimate consequences and root causes of the problem area they had identified. Then they generated ideas for ways they could potentially address the challenge, and selected one idea that seemed both worthwhile and feasible with the resources and connections of the people at the table. Finally, they began to explore what resources would be required to execute on that idea.

CONCLUSION

Each group briefly shared their problem, their proposed solution, and any ways others in the room could participate or contribute. They briefly shared reflections on the day's experience before closing at 3:30pm with tea.

OUTCOMES

Building Awareness

It became clear during the morning that there were many resources already available in the Kampala ecosystem that not everyone was aware of, including affordable legal services and other business support for entrepreneurs, and a non-branded website that two of the groups had created to act as a go-to resource for entrepreneurship-oriented information in Kampala: www.starthereuganda.com.

Charting a Path Forward

The group selected four areas to address: 1) the sparseness of effective training offerings for entrepreneurs, 2) the cultural obstructions around sharing stories of failure and struggle that made it challenging for entrepreneurs to support one another, 3) the difficulty of providing/finding affordable business support services for entrepreneurs, and 4) the limited extent to which the government was creating policies supportive to innovation-oriented entrepreneurial activity.

The groups developed ideas to address the first three, respectively: a new teacher training program for entrepreneurship educators, a new "Fail Fair"-type social event or anonymous story-sharing platform for entrepreneurs, and a worksheet-based business support service toolkit that would help boil down expert guidance into an affordable, easily distributable form. In each case, one or two specific organizations took responsibility for the follow-through.

Changing Mindsets

More than once, someone in the room mentioned that they wished it had not taken so long for this group of people to get together in one place and share information, and that they hoped the group would continue to gather on a more regular basis.

At the end of the day, one of the entrepreneurs in the room shared that, "For the first time, after today, I actually believe that we can be the ones who solve these problems; that we don't need someone else to come and solve them for us."

CASE STUDY: GUADALAJARA

Discovering Identity and Collaboration

This case study describes a half-day workshop that took place as a stand-alone event in the city of Guadalajara, Mexico in December 2018. The four-hour workshop was organized by the MIT Enterprise Forum (MITEF) Mexico, a not-for-profit organization based in Guadalajara and affiliated with MIT.

Guadalajara is Mexico's second-largest city and home to the country's most robust innovation and entrepreneurship ecosystem. It has been branded "the Silicon Valley of Mexico" for its role as an important technology and software hub, yet some ecosystem actors would prefer a self-defined identity. Guadalajara offers an abundance of initiatives, events, and resources for entrepreneurs and innovators, but these can be challenging to navigate because the ecosystem lacks strong coordinating mechanisms.

Taking this context into consideration, workshop organizers identified a need to convene ecosystem actors to understand the extent and nature of existing collaboration and to start a conversation about the ecosystem's identity. There was also interest in discovering to what extent actors shared a common sense of purpose or vision for the ecosystem's future development.

ORGANIZERS

MITEF Mexico convened the ecosystem workshop to learn more about who the actors in the ecosystem were and how they were or were not connecting and collaborating. To create a balance in the workshop between collecting information about the ecosystem from participants and facilitating real-time connections, MITEF Mexico invited MIT D-Lab to co-design the workshop and deliver some of the content and sessions.

GOALS AND OBJECTIVES

The primary goal of the workshop was to learn more about Guadalajara's ecosystem from the perspective of key actors in it. Specifically, through the workshop, the organizing teams sought to gain insights into the following questions:

1. Who are the principal players in Guadalajara's innovation and entrepreneurship ecosystem?

2. How are these players connecting and collaborating with each other?

3. Do ecosystem actors currently have a shared vision or sense of purpose for the ecosystem and if so, what is it?

4. What are the strengths and assets of Guadalajara's ecosystem that could serve as building blocks for the construction of a unique identity beyond "the Silicon Valley of Mexico"?

PARTICIPANTS

The workshop brought together 47 actors representing 34 organizations in the ecosystem, which reflected a diversity of both actor types and roles. The actor types represented included universities and research centers; co-working spaces, incubators and accelerators; public and private innovation centers; representatives of networks and associations of entrepreneurs and innovators; chambers of commerce; representatives of the state and municipal government; and one representative of the press (a leading magazine for the tech industry). The event was hosted at Centraal Bosch, an open innovation center, co-working, and meeting space administered by a German technology company.

Participants discuss the ecosystem's purpose in small groups

ACTIVITIES

PRESENTATION: SHARED FRAMEWORK

We opened the workshop by sharing the goals for the day, background information on the organizers, and an introductory presentation on the ecosystem framework used by MIT D-Lab as well as a model of actor roles developed by MITEF Mexico.[27] This helped build shared understanding through a common set of definitions and framework to inform subsequent activities.

TABLE DISCUSSION 1: PURPOSE

Interspersed throughout the main presentation, we paused for participants to engage in small-group discussion at their tables. In the first activity, they used a worksheet to discuss and identify the purpose of their ecosystem, starting by identifying the results (both intended and unintended) that the system was producing and then moving to the desired results they would like to see.

By identifying what results they envisioned the system producing, they could identify the purpose they wanted it to serve.

TABLE DISCUSSION 2: ASSETS

In the second activity, participants used a different worksheet to identify and analyze key resources, assets, and opportunities within their ecosystem. After discussing in small groups, participants each filled out their own worksheet and posted these on the walls.

We then used a break for a "gallery walk" where participants could read what others had written, discuss informally between themselves, and make connections.

INFORMATION SHARING

In the final activity of the day, 34 participants filled out an online questionnaire designed to gather information about the extent and nature of their collaborations with other ecosystem actors, including those not present in the workshop.

The information collected through the questionnaire was subsequently analyzed by members of the organizing team to produce a detailed social network map of the collaborations between ecosystem actors, who were categorized by their roles.[28]

OUTCOMES

Mapping Actors and Connections:

The information shared by workshop participants through the questionnaire administered during the workshop resulted in the identification of 188 ecosystem actors and 474 collaborative interactions between these actors.

These interactions were analyzed using social network mapping methods and software to determine their directionality (who sought to collaborate with whom), intensity, and the level of effort required to establish successful collaborations. A paper describing the results of this analysis and sharing the social network maps of collaboration in the ecosystem is forthcoming.

Identifying Assets:

By analyzing the worksheets participants completed, we identified assets of the Guadalajara ecosystem, including resources such as a strong technological base, a well-renowned and competitive higher education sector, and abundant human capital (including youth talent), as well as cultural assets within the enabling environment such as an openness to innovation, change, and diversity.

These assets combine with aspects of Guadalajara's history, heritage, and traditions to generate points of strength that can anchor the ecosystem's identity and help to differentiate it from other globally-relevant innovation ecosystems.

Creating a Shared Vision:

Through worksheets, each participant shared their individual perspective on the current purpose of Guadalajara's ecosystem, the results it was producing intentionally and unintentionally, and their desired vision for the ecosystem's purpose.

While there was some convergence around a vision of the ecosystem oriented around technology and high-impact entrepreneurship, there was sufficient diversity within the visions to warrant additional work among ecosystem actors in this area. Future convenings, workshops, or gatherings could provide a space for actors to build consensus around a shared vision to guide the ecosystem's development.

END NOTES

1. See Hoffecker (2018).

2. Complex adaptive systems (CAS) are systems in which many heterogeneous actors interact, adapting their strategies and actions based on the actions of other actors and on changing system conditions and contributing to these changing conditions through their evolving responses to them (Douthwaite and Hoffecker, 2019).

3. For an excellent introduction to the properties and behavior of complex systems—and to systems thinking more generally—see Thinking in Systems: A Primer by Donella Meadows (2008).

4. See Wieczorek and Hekkert (2012).

5. See Mytelka (2000) and Spielman (2010).

6. See Acs, et al. (2017).

7. A common approach to categorizing actors is to group them by major sector of the economy; e.g., government, industry, and academia, which is known as the Triple Helix model (Etzkowitz and Leydesdorff, 2000). Others have expanded this to a Quadruple Helix, including as the fourth element either entrepreneurs, finance, or "a media and culture-based public" (see Colapinto and Porlezza, 2012). The MIT REAP program adds a fifth major category, "risk capital," to create a model with 5 major stakeholder groups (MIT REAP 2017). Steven Koltai of Koltai and Co. has expanded this further to create a model with 6 actor types and 6 roles (ANDE, 2018).

8. In a review of 57 cases of innovation processes in smallholder agricultural in Sub-Saharan Africa, Triomphe et al. (2016) found that these processes typically included a mix of all of the main actor types listed in our model.

9. Following other authors who have researched innovation systems and entrepreneurship ecosystems, we use the term "role" to refer to the key activities an actor performs for or in the ecosystem. The roles that diverse actors play, in combination with other elements of the system, combine to enable the system as a whole to perform various key functions in support of innovation, such as providing mechanisms for potential solutions to be tested, piloted, and iterated upon within market contexts.

10. See Tedesco and Serrano (2019).

11. See Asayehegan, et al. (2017).

12. See Hoffecker (2018).

13. For more on the role of "innovation brokers" in facilitating innovation and improving the effectiveness and functioning of local innovation ecosystems (particularly agriculturally-oriented systems) see "The Role of Innovation Brokers in Agricultural Innovation Systems" by Lauren Klerkx and Peter Gildemacher (2012).

14. See Hoffecker (2014).

15. For more on Innovation Platforms, see Klerkx, et al. (2013).

16. See: Douthwaite and Hoffecker (2017) and Devaux, et al. (2009).

17. "Innovation domains" refer to the sector or area within which innovation takes place, for example, innovation within livestock production, horticulture, post-harvest processing technology or marketing, each of which are seen as a domain within which innovation can occur.

18. See Woolcock (1998).

19. See Uphoff and Wijayaratna (2000).

20. See Nguyen and Rieger (2017).

21. See UNDP (2008).

22. See Campbell (2019).

23. See Hounkonnou, et. al. (2012).

24. See North (1990).

25. See Crawford and Ostrom (1995).

26. See Wieczorek and Hekkert (2012).

27. For a full description of this model, see Tedesco and Serrano (2019).

28. An overview of this analysis and the resulting network map is presented in Tedesco and Serrano (2019) and a full report detailing the results of the analysis of actor interactions in the ecosystem is forthcoming.

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