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Sustainability Practices, Policies, and Business Models of Web-Based Innovation Platforms: Lessons Learned for the Ohio Innovation Exchange (OIEx)

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Lessons Learned for the Ohio Innovation Exchange (OIEx)

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EXECUTIVE SUMMARY

The Ohio Innovation Exchange (OIEx) is a web portal that centralizes university resources and information to increase accessibility of available talent, funding, resources, facilities, experts, and knowledge to foster innovation across the state. The goal of this study is to explore the value, growth, and sustainability of initiatives of this kind by investigating expert system web portals similar to the functions and aims of the OIEx. Our focus is on multi-university, statewide programs that connect university resources to industries and companies. We aim to identify the value propositions created for industries generated by these university initiatives, in addition to exploring the usage and sustainability of the programs. We evaluate marketing strategies, staffing, data domains, and incentives associated with the development and use of the initiatives. Based on the results of this study, we provide critical findings and policy recommendations for the OIEx in the subsequent sections of this executive summary. The key findings reveal that learning from demand and planning for sustainability by introducing increased marketing and a sound business model of the OIEx operations will improve the success and reach of the OIEx as a critical contributor to economic development and innovation in Ohio.

Critical Findings

LEARN FROM DEMAND: BE A BROKER

The OIEx's main competitors are industry-oriented initiatives that are company- and product-focused but have no portal. The critical difference is that industry-oriented initiatives respond directly to industry demand rather than promoting university supply of innovative products. The OIEx should learn from these initiatives and subsidize its interactions by focusing on their product offerings. For example, OIEx should follow up on every "deal" it brokers and illustrate all successes on social media and through targeted marketing strategies. Additional avenues of promotion, such as hosting and attending conferences and summits, will raise awareness of the resources the OIEx provides among industry representatives. Additionally, we recommend that the OIEx incentivize universities to offer their resources as inclusions for brokerages by the platform. The OIEx can leverage participation from university leadership and the Ohio Department of Higher Education to communicate the value of the OIEx to universities. These communications must highlight the benefits of the platform for universities that include promotion of faculty achievements, profiles, research, and funding that translates into opportunities for industry collaboration. The OIEx has the opportunity to out-compete demand-driven initiatives in its capacity to generate multiple, cross-sectoral innovations as opposed to exclusively focusing on one sole industry, university, or innovation. Learning from demand allows the OIEx to become more than the sum of its individual resources.

Consequently, this report asserts that universities' web portals, including the OIEx, must respond to the interests of the "demand" side of partnerships. The OIEx has made significant progress developing a concept, building a web portal of resources, and fortifying usage of multi-university information by universities, industry, and other constituencies. However, the OIEx portal should be more explicitly marketed to target potential partners and consumers to increase the likelihood of reaching prospective industry partners with opportunities for collaboration. The adoption of dedicated marketing efforts and strong customer service activities will enhance university and industry relationships by positioning the research on industry terms that encourage comprehension, understanding, and awareness of the key services provided. This strategy will address the inherent organizational differences and bridge the gaps that have historically impeded communications in university-industry collaborations.

EXECUTIVE SUMMARY

BUSINESS PLAN: MARKETING, BUDGETING, AND STAFFING

Business plans accounting for marketing, budgeting, and staffing contingencies will enable heightened sustainability of the platform. Intentional planning and organizational structuring will support opportunities for growth by permitting more demand-driven, rather than supply-oriented, tactics of business development that fulfill the "broker" role of connecting university with industry. Enhancing marketing efforts requires a few key operational structures in place to achieve successful outcomes, and marketing must be targeted and incorporate the use of social media, including X, LinkedIn, and possibly Instagram and Facebook. Based on our findings, a designated staff in marketing, supported by a separate allocated budget, will empower teams to deliver results in communications that more effectively reach potential industry partners. A dedicated team can sustain pipelines for research and development, allow for program growth that can adapt to new conditions and opportunities, improve operations, and foster internal processes of trial and innovation.

We recommend that the OIEx business plan include a budget that identifies clear goals, expenses, and investments. The matrix of success measuring returns on investment and benchmark metrics will track early success, demonstrate the growth trajectory of the platform, and inform subsequent planning processes. The OIEx competes with non-portal and single-university initiatives that spend up to $300,000 per year. An active, single-university initiative usually employs an equivalent of 2–3 full-time staff just to create and maintain a product. Thus, the business plan should also identify a dedicated team supported by an itemized budget for necessary resources such as marketing. Securing continuity of resources to sustain the "business" is key to this aspect of the operating model. Currently, the OIEx spends most of its resources maintaining the product and its underpinning licensed technologies. We suggest following operating models where 40% of the total cost is spent on maintaining products, while the other 60% is spent on marketing, learning from demand, and seed costs for creating and developing new products—a requisite for securing adoption and trust in the ever-increasing pace of information-driven innovations.

Policy Recommendations

The following policy recommendations are informed by the critical findings of our study.

1) **Learn from Demand**: The OIEx should be a broker between demand for innovation inputs from business/industry and supply of university products. By learning from industry-oriented initiatives responding directly to individual industry demands, the OIEx can focus on marketing its offerings, following up on deals, showcasing successes on social media, and attending industry events to raise awareness among potential partners.
2) **Develop a Clear Business Plan:** A well-defined model of the OIEx operations and business plan that includes marketing, budgeting, and staffing is essential for the sustainability of the OIEx initiative and enterprise. Marketing tactics should be targeted through social media, and a dedicated marketing team should be supported by a separate budget. A business plan should also track success metrics and ROI to inform future planning and marketing efforts. The report also suggests that the OIEx should allocate resources differently, with 60% of resources spent on marketing, learning from demand, and developing new products, and only 40% on product creation.

3) **Increase Workforce Development Opportunities:** There is an opportunity for the OIEx to expand its impact by including internships, co-ops, and graduate placements to involve students in processes and projects of research and innovation. This report suggests that the increased inclusion of internships, co-ops, student involvement in research and innovation ideation, and graduate placement schemes can improve workforce development opportunities offered by the web portal, as programs explicitly connecting students from a university to a company serve as a springboard for greater connections and collaboration between the two entities (Østergaard, Drejer, 2022).

4) **Assign Adequate Staffing:** The current staffing situation is minimal, covering only essential functions that keep the licensed information technologies running. Based on reviewing staffing of existing similar (often much smaller) initiatives, we recommend adding 2–3 new staff members to enhance the effectiveness of OIEx operations. One of these staff members should serve as a dedicated IT specialist, responsible for coordinating with software development consultants and managing the flow of information with member universities. Another dedicated position should focus on marketing and promoting the tool itself, events, and success stories. This staff member will be actively engaged in leveraging social media and organizing conferences to boost visibility. Furthermore, we suggest allocating an additional 0.5–1 full-time equivalent (FTE) member of staff focused on product development, concierge services, internal evaluation, and operational management. These roles will ensure growth and amplify the impact of the OIEx platform on Ohio's innovation ecosystem. These staffing add-ons are in addition to leadership positions that will guide the strategic development of the initiative, foster relationships between universities and industries, and promote the benefits of the platform both internally and externally at the executive management level.

5) **Adopt a Sustainability Strategy:** The sustainability of this initiative, as it stands, remains secure with its current funding, setting it apart from its competitors. Many similar endeavors have faltered due to their inability to secure sustainable funding and garner adequate buy-in. Thanks to strong leadership and substantial funding during its initial growth phase, the OIEx has maintained its viability and designed an impressive product. However, to facilitate further growth and development, securing additional consistent funding—including diversified streams from both the Ohio Department of Higher Education and the broader economic development sector—is imperative. While the initiative's origins lie in higher education, its evolving relationships with industry necessitate recognition and support from key players representing Ohio's economic development ecosystem. A sustainability plan should be established and supported by an advisory committee or council representing a diverse range of stakeholders and sectors, including universities, industry partners, and advocates within the broader ecosystem. This council will play a pivotal role in providing guidance and adopting a written strategy outlining long-term sustainability.

Sustainability Practices, Policies, and Business Models of Web-Based Innovation Platforms

Lessons Learned for the Ohio Innovation Exchange (OIEx)

Innovation policies and initiatives have become increasingly more common at international, federal, state, and local levels in recent years as governments aim to connect stakeholders to facilitate knowledge-sharing, innovation, capacity building, and economic development (Parker, Zilberman, 1993; Cunningham et al., 2017; Selviaridis, Spring, 2021). University-industry collaborations (UICs) have gained interest from academics and policymakers as an approach to encouraging economic innovation and growth amidst pressures of globalization, market competition, and technological change (Rasmussen, Wright, 2015; Skute et al., 2017). This growing interest is supported by evidence indicating that the transfer of academia knowledge to industry improves outcomes of productivity, quality, and economic gains (Marinho et al., 2020). A prominent example of a UIC gaining traction is the concept of connecting university research, knowledge, and resources with industry by way of a consolidated and informational platform that enables collaborative ecosystems of innovation within a region. Statewide innovation ecosystems strive to facilitate collaboration between universities and industries, bridging the inherent cultural disparities between academic institutions and businesses. Universities assume a pivotal role by contributing knowledge-based elements to this innovation ecosystem, nurturing a cumulative knowledge effect through extensive networks. Web tools are useful to enable these connections in their promotion of interactions between university networks and companies.

The OIEx serves as an online platform that brings together the collective resources of various universities to promote access to valuable information that fuels innovation across the entire state. It stands out as one of the pioneering multi-university initiatives in the United States, focusing on the centralization of critical knowledge sources, expert networks, and funding opportunities. Its primary objective is to foster collaboration, which in turn bolsters business growth and economic advancement within Ohio. Developed by the Ohio Department of Higher Education in tandem with universities in Ohio and the Ohio Manufacturing Institute, the OIEx has made substantial strides in its journey, successfully conceptualizing and constructing an interconnected web portal that strengthens the utilization of multi-university information by both academic institutions and industries.

This report identifies opportunities for the OIEx to expand its impact on innovation in the state and beyond by leveraging additional workforce resources such as internships, co-ops, student involvement in research and innovation, and graduate placement programs. Further, the OIEx remains firmly rooted in the supply side of innovation as a provider with a relatively new product that is persistently unknown to many prospective consumers and beneficiaries. The expert system web portal concept, however, has the potential to serve purposes beyond a supply-side summation of university resources; such a portal has the possibility to perform as an open-access innovation resource hub if actionable steps are taken to improve the marketing and sustainability of the platform.

BENEFITS

Previous research conducted by the Center for Economic Development at Cleveland State University found that studies regarding UICs are generally focused on five different aspects:

1) motivations for collaborations and innovation exchange;
2) expected private and public gains associated with UIC;
3) process, activities, and outcomes of UIC;
4) impediments to UIC and challenges involved in the process; and
5) determinants of UIC success and best management practices (Lendel et al., 2016).

The widely noted benefit of UICs is knowledge transfer that increases the sharing of technology, ideas, and innovation across sectors (Ankrah et al., 2013). However, potential academic and industry benefits can arise from UIC on economic, organizational, and social levels of consideration and analysis. Collective innovation ecosystems facilitated by online hubs such as the OIEx also help to connect university researchers to critical data, trends, and knowledge to inform relevant and timely research initiatives and projects (Dooley, Kirk, 2007). These collaborations also explicitly highlight the economic contributions of universities related to workforce development, knowledge creation, innovation, and industry change to increase potential funding opportunities through the connective nature of UIC (Oliver, 2022). Oliver's (2022) research findings from interviews and thematic analysis studying holistic ecosystems conducive to innovation and UIC suggest that "collaborative database[s]" organizing research, briefs reviewing technology and patent listings, and information about staff profiles and projects were a "helpful and highly successful initiative" regarding knowledge-sharing and UIC (p. 10). This research confirms the value of platforms such as the OIEx from the perspectives of university and industry stakeholders.

CHALLENGES

A variety of obstacles limit UIC, most of which stem from the inherent organizational differences, goals, and management methods between the entities. While academia typically engages in longer-term research projects, industry tends to operate on a comparatively fast-paced, day-to-day problem-solving orientation driven by the competitive nature of their "market-determined environment" (Perkmann, Salter, 2012; Hung, 2010, p. 349). The accessibility and openness of university research and operations is incompatible with industry inclinations to safeguard their technologies to protect their competitive edge in the market (Perkmann, Salter, 2012). Further, universities often seek to generate novel research while industry firms may be interested in more specific outcomes, knowledge, technologies, and innovations to improve processes and products relevant to their existing business models and operations (Isaeva et al., 2022). Consequently, these cultural and organizational disparities in industry and university values can introduce complexities into relationships and collaborative opportunities by limiting communication, trust, and mutual understanding (Gerdsri, Manotungvorapun, 2022; Giaretta, 2014).

Overcoming these challenges involves employing researched strategies that weigh these intrinsic differences between university and industry to harness these distinctions as complementary and harmonious rather than contradictory. Gerdsri and Manotungvorapun (2022) introduce a framework

for developing a deliberate roadmap for developing relationships that build effective UIC, comprised of four distinct phases:

1) identification of a Firm's Requirements and Preferable Characteristics of Academic Partners,
2) development of the Assessment Tool,
3) assessment of Academic Partners, and
4) transformation from Numeric Results into a Strategic Roadmap.

Intermediaries of UIC can employ the following actionable goals to improve their utility and results:

1) understand the expectations and interests of companies concerning innovation and economic development;
2) implement processes of evaluation that assess elements of growth, sustainability, and planning;
3) include a variety of universities to enhance representation; and
4) strategically market these efforts to increase awareness of the value of these platforms.

Additionally, relational confidence, organizational learning, and innovation can be achieved when universities and industries engage in a reciprocal process of transferring knowledge as an integral and continuous element of their partnerships (Oliver et al., 2020, p. 764).

Recognition and clarity on the commonality of UICs' goal—to translate knowledge, science, and university resources to the commercial space to achieve innovation—can set partnerships on a positive feedback loop of trust built on foundational experiences of positive collaboration, shared motivations, and successful innovations (Oliver et al., 2020). Adopting these principles to form strong working relationships is aided by an intermediary, like the OIEx, that reliably brokers and connects university and industry through streamlined communications that recognize and amplify the needs, interests, successes, and unique operations of the two entities.

GOAL OF STUDY

Given the benefits of UIC in fostering innovation and economic competitiveness, intermediary platforms like the OIEx bridging connections between industry and universities possess significant potential to positively contribute to the economic prosperity of communities, cities, and regions. Intermediaries that address the challenges outlined above will be most successful in their goals of translating academic research and knowledge to a diverse array of businesses to increase innovation and economic growth. The objective of our study was to investigate the utility and sustainability of similar expert system web portals to the OIEx by analyzing their aims, operations, structures, experiences, and challenges. Focusing on multi-university, statewide initiatives linking university resources to industries and companies, we researched the value propositions, usage, and sustainability of the university programs.

In our research methodology, interviews served as a valuable instrument in allowing us to gather insights from successful and failing initiatives. We examined the marketing strategies, staffing, data domains, and incentives informing the goals and development of the platforms to understand the extent to which these various platforms are able to mitigate, or transcend, the cited difficulties of UIC. The results of the study inform the policy implications for the OIEx. They provide evidence-based

recommendations for strengthening the influence, sustainability, and success of the platform as an intermediary linking university and industry in the state of Ohio to affect innovation and economic development.

Growth and Sustainability Path for the OIEx

THE OIEx POSITION

The OIEx represents a small group of multi-university initiatives that have designed and/or deployed a web solution connecting university resources and industry representatives to contribute to a statewide innovation system. Many of the initiatives interviewed reported the absence of a clear business plan, marketing strategy, or social media presence. Responses varied widely on the extent to which the organizations understood and tracked ROI and usage data, the involvement of an advisory board, or long-term plans for growth and development. The OIEx is ahead of many comparable initiatives in conceptualizing and developing information on university assets and strategically aiming to create a portal supporting a statewide innovation ecosystem. This platform has set the high-bar goal amid limited resources to become a "go to" information resource for seeding university-industry partnerships across the state, and has to some extent achieved this goal, especially in comparison to peer initiatives with similar aims. However, this report identifies critical opportunities for improvement that will enable the platform to reach higher levels of impact, influence, and sustainability.

SUPPLY OF PRODUCTS FOR INNOVATION: EFFECT OF CUMULATIVE KNOWLEDGE

University resources fulfill the knowledge-based component of statewide innovation systems through their consistent contribution of new ideas, talent, technology, and the knowledge economy (Reddy, 2011). University networks share these common goals of knowledge generation that in turn create a cumulative knowledge effect fostering cross-sector innovation (Schaeffer et al., 2020). Thus, online platforms like the OIEx can be conceptualized as technology solution providers that organize and publicize information to overcome "knowledge hurdles" and facilitate firms' adoption of new and innovative strategies, products, and tools (Weigelt, Sarkar, 2009, p. 37). In addition to enhancing awareness and accessibility of the cutting-edge research consistently produced by universities in Ohio, the OIEx provides codified innovation through technology transfers of patents, licenses, and information that is consumed by businesses and produces revenue from the deployment and commercialization of such innovations. Universities also supply contracted research for businesses that result in product and process innovations that boost revenue, in addition to the provision of physical infrastructure utilized by both universities and businesses. As a result, universities' web portal platforms are consistently rooted in the supply side of industry partnerships and collaborations, firmly positioned in their roles of producing knowledge, talent, and workforce developments that result in outcomes of increased innovations and revenue enjoyed by industry stakeholders (Markman et al., 2009).

According to our research, supply-driven initiatives, often universities and university networks, primarily use a web tool supported by 2–3 software engines ranging from standard to custom-built. The main goals of these initiatives can vary but are ultimately to promote research, connect people,

encourage university-university and university-industry collaboration, and facilitate opportunities for innovation as a primary liaison of information. A significant portion of these supply-driven initiatives perceive their programs and web tools as a public good, in effect guiding leadership to refrain from imposing any fees for accessing their services. Consequently, the value of the tool is not gauged through explicit revenue generation but rather by its cumulative impact in enhancing shared knowledge of university research, resources, and utility that expectedly promotes economic development outcomes and innovation opportunities. This model is arguably short-sighted, missing out on opportunities to produce revenue that could be invested in the growth, sustainability, design, and heightened monetary contributions and impact of an intermediary platform enabling UIC.

The interviewees reported that the general audience of these initiatives is researchers using the portal as a promotional or evaluation tool, while university leadership, governments, students, and economic development organizations are secondary audiences, followed by intermittent industry engagement. However, one initiative noted that industry usage is "still largely untapped at this point," with another interviewee communicating that while industry outreach was taking place, industry actors just "haven't bought in yet." Various initiatives cited industry representation as a newer and smaller portion of their user base and use cases, but most expressed interest in growing this partnership area in recognition of the potential impacts of innovation. The policy recommendations to follow include researched strategies for bolstering industry appeal that empower platforms such as the OIEx to meet the demand, establish itself as a broker of collaborative relationships, and achieve sustainability.

Policy Recommendations

Portals such as the OIEx hold the capacity to serve as statewide, open-access innovation resource hubs that fulfill goals of enhancing UIC and economic development within a state. This objective requires promotion, marketing, and a clear business model that includes identifying revenue streams. The OIEx has the opportunity to significantly contribute to economic development and innovation in Ohio by connecting universities and industries and preventing collaborations from "falling through the cracks," as one interviewee described the goal of their portal. To achieve this potential, the OIEx should focus on marketing, customer service, and business planning to better meet the demands of industry partners and ensure its long-term sustainability. The subsequent paragraphs, drawing on our learnings from interviews with comparable initiatives, provide explanations for policy recommendations that OIEx leadership can implement to advance the growth, sustainability, and performance of the platform in achieving the goal of heightened innovation and economic development in Ohio.

BECOME A BROKER

A common theme apparent in our interviews was the subject of relating to partners and ensuring that the initiatives' messaging was reaching potential collaborators; for example, one interviewee expressed, "We didn't anticipate how difficult it would be to reach the businesses." This challenge is explained by a variety of factors ranging from insufficient staffing dedicated to developing targeted and appropriate messaging, budgetary constraints restricting relevant outreach, marketing and customer service practices, or limited abilities to evaluate existing platform structures to identify opportunities for improvement and expansion. These practices are necessary if the difficulties of UIC, such as the inherent institutional differences in mission and culture between universities and companies, are to be addressed and effectively surpassed.

To fulfill the goals of acting as a successful facilitator of cross-sector collaboration, the OIEx needs to transition into a broker that bridges the gap between the demand for innovation inputs from businesses and industries and the supply of university products. Currently, the OIEx primarily functions as a product provider, offering a valuable resource that remains relatively unknown to a wide audience. Furthermore, it has a superior product in terms of design, quality of information, and inclusion of various major universities throughout the state; success is achieved through strong initial planning, support, and investment. The OIEx is arguably the superior product, publishing a comparably robust network of reliable information and resources supporting opportunities for innovation, although the platform persistently lacks consumers because of the site's limitations in marketing and communications. In a saturated market where information promoting innovation resources is prevalent, even the best product may struggle to gain traction due to its novelty and lack of sufficient marketing efforts. While the OIEx's pricing is attractive, capturing a larger share of the market will require an improvement in communication strategies to gain a competitive edge in a crowded marketplace of information. In order to achieve the goal of becoming the go-to resource hub for seeding university-industry partnerships across the state, the OIEx must invest in promotion, marketing, and a business model to increase market share and leverage its comparative advantage. This strategy will permit the OIEx to become the primary broker connecting the supply and demand for university products in Ohio.

To stand out among its competitors, the OIEx must focus on its product with consistent marketing, publicity, and communication regarding deals and their associated value. One initiative noted that they had encouraged researchers to reflect on whether their work was presented on "too scholarly" terms to ensure that industry collaborators were able to understand the potential applications and capabilities of the research instead of obstructing comprehension with overly technical explanations and terminology. Various interviewees also reported different strategies to encourage faculty to keep their profiles up to date for industry viewing, such as including them in yearly and tenure reviews, highlighting the benefits of research promotion, and ensuring ease of use of the platform. Further, following up with deals; showcasing successful outcomes; generating buzz on social media platforms; hosting, participating in, or presenting at conferences; and implementing targeted marketing strategies are actionable goals that will support the mission of increasing long-term sustainability and competitiveness, topics explored in greater depth in the paragraphs to follow. The OIEx has a distinct advantage in that it offers more than just a collection of resources—the platform serves as a catalyst for cross-sectoral and multidisciplinary innovation through its inclusion of multiple universities and business applications that boosts industry relevance. This element sets the OIEx apart from its competitors, who tend to focus on single deals, industries, or transactions.

LEARN FROM PEERS

The OIEx can gain valuable insights by observing its peers, most of which are subsidized, non-portal initiatives with a strong industry-oriented, demand-driven, and product-focused approach. Markman et al. (2009) assert that while universities continue to justify that their role as crucial suppliers of new knowledge is their primary indicator of value to society and industry, more attention must be paid to communicating their contributions on more explicit terms of revenue and return on investment (ROI). This communication will protect their relevance, inclusion, and viability in the increasingly fast-paced and competitive marketplace of technology and science and allow them continuity in their missions of producing high-quality and novel research within demand-oriented environments (Markman et al.,

2009). The inclusion of certain demand-driven qualities such as proving ROI and producing revenue as part of the business strategy will improve the sustainability of university research and university-industry collaborative initiatives.

The OIEx should strategically allocate its research and marketing resources to gain insights from peers and businesses, with a focus on expanding its clientele and cultivating a pipeline of future products to create an innovation pipeline. Establishing mechanisms to encourage universities to contribute their resources to the OIEx—such as faculty evaluation, support from university leadership, assistance from the Ohio Department of Higher Education, and education regarding the OIEx's value proposition—is crucial to essentializing the platform and increasing long-term sustainability. To showcase its impact, the OIEx should provide research impact reports to universities, demonstrating how the platform can identify areas of strength and research, as well as opportunities for growth.

ADOPT A SUSTAINABILITY MODEL

Achieving sustainability and growth requires proactivity and a multi-faceted approach involving components of marketing, staffing, budgeting, planning, and preparation. Similar to other initiatives, the OIEx's current operations are at capacity, allowing only for the coverage of the essential functions of the platform instead of enabling growth and development. One interviewee summarized the experience:

"Nobody was going to pull the plug . . . however there's a difference between still operating and actually having an impact . . . and I would say we were probably treading water for a while, and we were treading water even before the pandemic because . . . we had [leadership] who had inherited us and weren't exactly sure how to use us, and they had a lot of competing interests for their time."

Assessing total value of the OIEx's brokerage should include measuring the benefits of both private and public goods created by OIEx products. Additionally, setting attainable goals for growth through the development of a business plan will guide the OIEx platform as steps are taken to support efforts in budgeting, marketing, and communications. Innovation requires continuity of investment and a demand-oriented approach, including reliable buy-in over time from senior leaders at the state, university, college, and department levels. Numerous interviewees said they experienced uncertainty and threats to sustainability amid leadership changes, as the value of the tools was not always consistently understood or prioritized. In a similar vein, many interviewees claimed that strong advocates and engagement at the administrative level would have been helpful in maintaining the steady support required to sustain and grow the influence of the platform. Nominating a board comprised of cross-sector representatives encompassing universities, large employers, industry trade associations, state agencies, and regional economic development professionals willing and able to advocate for its success is an essential contribution to a long-term sustainability model for the platform.

APPOINT SUFFICIENT STAFFING

Sufficient staffing dedicated to the operations and mission of the OIEx will vitally support the sustainability, reach, growth, and success of the platform by delivering on the essential requirements of marketing and customer service. This sentiment is encapsulated in the following quote shared by a participating interviewee in our study:

"Even though our goal is to automate as much as possible, I think that there's always going to need to be a real person behind it who's helping to make some of these matches and helping to build some of these relationships."

As previously stated, the inherent organizational differences between industry and university have been cited as a "relational barrier," hindering communication between the institutions (Alexandre et al., 2022, p. 23). The OIEx must embrace and leverage targeted marketing strategies to engage with potential partners, lower barriers to communication, and strengthen its role as an intermediary of cross-sector collaboration. This is particularly relevant for attracting smaller enterprises with limited absorptive capacity, or the ability to incorporate new learnings, compared to larger firms; smaller firms also have much to gain in terms of business growth and development from relevant research and education on innovation and best practices (Alexandre et al., 2022; Cohen, Levinthal, 1990.)

Furthermore, networks, relationships, and knowledge accessibility established in the early stages of a small enterprise have been cited as crucial indicators of the firm's capacity to engage with opportunities for innovation throughout the business's growth and development (Jørgensen, Ulhøi, 2010). This finding is reinforced by previous studies asserting that the social component is especially important to smaller-sized companies seeking involvement in innovation, research, and development practices (Etzkowitz, Klofsten, 2005; Alexandre et al., 2022). Relatedly, Østergaard and Drejer (2022) emphasize the importance of social connection in forging partnerships suitable for strong collaboration and continuous knowledge-sharing. For example, the researchers find that alumni at companies are positively associated with sustained connections and collaborations with their universities post-graduation. Therefore, portals also promote opportunities for students to position themselves to create university talent pipelines that establish stronger relationships that, in turn, increase opportunities for collaboration with specific academic institutions (Østergaard, Drejer, 2022).

Achieving the goals of reliable and competent customer service and expanded outreach to students and other consumer bases requires sufficient staffing. As one interviewee expressed, "Expecting a volunteer at a university to keep everything updated won't work." Appointing compensated staff equipped to maintain university data and platform resources is better suited to enhancing the growth and development of the program. Another interviewee noted that the designation of an FTE to lead growth processes would have promoted faster and better program development. This finding is consistent with the results of Micozzi et al.'s study (2021) asserting that the allocation of additional members to the operations of technology transfer offices demonstrates a statistically significant and positive effect on enhancing conditions of innovation and invention for small, medium, and large-sized universities as a direct result of increasing networking and contact with researchers. Sufficient staffing will enable the platform to do more than remain operational but permit capabilities to increase marketing that can engage a variety of audiences including researchers, universities, industries, business leaders, students, and recent graduates.

The OIEx currently allocates approximately 0.5 FTE of its dedicated staff resources to technical support and administration, with an additional 1 FTE dedicated to marketing and outreach efforts. Considering the scale of the OIEx, the provision of technical support for university data collection and management ideally should require 1 FTE. We draw this conclusion based on our observations of similar systems. Innovative product development and the establishment of a product pipeline should be allocated one additional FTE. To maintain a balanced approach, it is recommended that approximately 40% of the OIEx's total budget be allocated to product development and maintenance, while the remaining 60% should go toward research and marketing, which would require an additional 2 FTEs and sufficient

marketing funding. Marketing and research efforts can be implemented through a distributed marketing model.

EMBRACE DEMAND-DRIVEN VALUE AND SUCCESS

Our research reveals that a majority of industry-focused, demand-driven initiatives lack an online tool beyond a website. Therefore, facilitating the connection between companies or industries and university resources is the responsibility of a designated staff member. These initiatives target companies, industries, and organizations seeking specific services. Typically, these initiatives are project-oriented and follow a fee-for-scope-of-work structure. They often have a distinct economic development objective related to a specific industry, type of organization or service, or geographical region. Initial goals are generally conservative, with the intention to expand over time. This type of initiative also establishes specific success metrics, usually including ROI measurements. Funding adheres to a "lean model," meticulously outlined through a precise budgeting process, with the overarching goal to achieve sustainability within a defined timeframe.

In line with these lessons learned and best practices followed by demand-driven initiatives, the OIEx should define economic development goals that are specific, measurable, attainable, relevant, and timely (SMART). The ability to identify, describe, and know the audience and typical customers of OIEx products will enable the platform's team to engage with prospective partners and a diverse array of collaborators with confidence. Building a business-type budget with essential categories, specific expenditures, personnel information, marketing tactics, and technical elements—in addition to developing specific matrices of success inclusive of ROI—will guide the team's approach and set them up for success. Assuming a business-like approach will be attractive, comprehensive, and appreciated by businesses and industries in turn. Further, a common theme among the initiatives interviewed was that the lack of a separate, secured budget supporting programmatic activity was challenging sustainable growth and development. As innovation and economic development are long-term goals, securing the continuity of investments and resources is critical. Additionally, tracking early success to inform the program's trajectory will ensure an ROI in the long term. Maintaining records of ROI and value creation will also serve to protect the initiatives during times of reported instability, such as changes in leadership and administration.

ENHANCE USAGE AND MARKETING

The use of social media platforms such as X, LinkedIn, Instagram, and Facebook is critical. The OIEx has been using social media for the last two years; efforts are underway to build a new working group representing university marketing and communication colleagues to amplify messages internal and external to the university—this is to enhance collaboration and input of universities. Marketing to academics and businesses and increasing communications and representation across conferences, blogs, podcasts, newsletters, and emails are additional opportunities to boost awareness and business development. Tracking the levels of viewership, engagement, and reach of emails and web pages with evaluation tools such as Google Analytics will enable an increased understanding of topics that connect with the user base and potential partners, areas of strength, and areas in need of improvement. Increased awareness of messaging that is either resonating with users or not enticing usership will enable staff to refine outreach, value propositions, and connections with industry, student, and university collaborators and innovators. As reported by one interviewee, releasing profiles and

increased material covering collaborators, partners, and outcomes can create an element of "peer pressure" as unrepresented universities and institutions seek out inclusion in the platform's offerings. This example is one of the various possible reverberations of marketing strategies that can benefit the growth and inclusivity of the platform through enhanced awareness of the initiative.

Further, the OIEx brand needs to be defined in more depth through the conceptualization of the design, colors, fonts, logos, jingles, and slogans showcasing the identity of the platform and improving the attractiveness of the OIEx to potential customers and partners. In the spirit of relating with industry partners, delivering relevant and state-of-the-art user experiences, as well as competent customer service, is an additional essential component to OIEx usage. These elements include strong performances in loading time, advanced search, downloadable reports and visualizations, and the maintenance of an overall stable and user-friendly web experience. These strategies support the retention of users as well as attracting new visitors. They also meet the expectations of industry users of the platform while also pushing back against the stigmatized assumption that universities function on comparatively guarded, slower, or bureaucratic levels of operation. Strong customer service and user experiences meet the expectations of larger firms and industry partners while engaging, sociable employees representing the platform will be encouraging to small enterprises, emerging entrepreneurs, and developing businesses seeking to leverage the services of the OIEx and similar platforms to achieve innovation and competitive footholds in the market during their early stages.

Additionally, a key component of strong customer service is the dependability of the platforms' access and communications. For example, one interviewee shared that while they had been contacted by an industry representative who was interested in the expertise of a specific researcher publicized in their initiative, that researcher was not available for or interested in a partnership. Subsequently, this experience diminished expectations and reputational strength of the platform for this industry representative going forward. Another interviewee acknowledged that affirming industry expectations for collaboration was a comparative strength of the OIEx, as researchers who have worked with industry often have that experience explicitly noted in their public profiles on the platform, increasing the reliability of that faculty's interest in industry collaboration.

DEVELOP LONG-TERM STRATEGY

The OIEx is a valuable component of the statewide innovation ecosystem and has the potential to become even more integral in the future. Having a solid foundation of design and operations, the next goal should be ensuring the sustainability of the platform. To maintain its strong foothold in the field, the OIEx must continually evaluate its products to foster innovation, enhance existing offerings, and develop new opportunities. The current moment is perfectly timed, as the innovation is widely noted as a federal and state priority for funding and development. To make the most of this moment and secure its future relevance, the OIEx should focus on constructing a long-term strategy. **To remain respected and trusted in the field of innovation, the OIEx must itself remain at the forefront of innovative practices.**

To develop and ensure long-term sustainability, the OIEx must procure the necessary core resources. Typically, an "active" initiative at a single university involves employing 2–3 FTE to create and support a product. In contrast, the OIEx currently relies on just one temporary staff member who is primarily focused on marketing and outreach, undermining the sustainability of the platform. For example, while one interviewee reported producing press releases and news articles about the platform's

industry exchanges, their team "never really had a champion" leading a comprehensive marketing plan, which was chronically limited by insufficient human resources. The interviewed representative echoed this logic, expressing that "at the end of the day, you build a portal for whoever's going to champion it . . . what I would do differently is make sure they're as involved as possible every step of the way."

The OIEx should continue to invest in marketing efforts, expand its market share, cultivate a client base, and effectively "sell" its product. This encompasses various activities such as strategic marketing, content creation, event organization, business model development, planning, sustainability measures, user follow-up, results analysis, and ongoing innovation. One interviewee relayed that "having continuity . . . basically having the same core people on staff" supported by "dependable funding definitely helps keep things moving along." Monetization coincides with awareness and communication of the information and resources available on the platform. The OIEx initially did amazing work developing the platform; now, the selling must commence. A well-defined business plan with specific objectives supported by dedicated staffing, detailed budgets, and marketing strategies is conducive to the OIEx's sustainable growth and success.

Conclusion

As one participant noted, universities are a valuable network of institutions in a state that can be harnessed for greater benefits when aligned with industry. With innovation on the forefront of many policy agendas on the national, state, and local levels, university resources will increasingly be called upon to leverage their research, knowledge, facilities, labs, and equipment in service of innovation. Further, it is evident that many long-standing, complex challenges affecting society today—such as climate change, food insecurity, and artificial intelligence—require new and innovative solutions informed by rigorous research and evidence, in addition to equal buy-in from the public and private sectors. The OIEx has the potential to play a crucial role in fostering innovation and economic development in Ohio. By implementing the recommendations outlined in this report, the OIEx can further strengthen its position as a valuable intermediary platform connecting universities and industries, ultimately contributing to the prosperity of the state and region.

This policy report explores the sustainability practices, policies, and business models of web-based innovation platforms, with a particular focus on lessons learned for the Ohio Innovation Exchange (OIEx). The report highlights the importance of university-industry collaboration (UIC) as a catalyst for economic growth and innovation and underscores the vital role of platforms like the OIEx in facilitating these collaborations. Throughout the report, we have explored the benefits and challenges associated with UICs, emphasizing the significance of knowledge transfer, economic contributions, and the role of online platforms in connecting researchers to industry needs. It is clear that the OIEx has made significant strides in its mission to centralize critical knowledge sources and foster collaboration within Ohio. Now is the time to look beyond initial goals of program development and logistical viability and make progress on growth and sustainability.

This report identifies areas where the OIEx can enhance its impact and sustainability. The policy recommendations presented emphasize the need for the OIEx to transition into a broker that bridges the gap between industry demand and university supply. This shift will require improved marketing, communication, and the development of a clear business model. The OIEx can learn valuable

lessons from its peers, particularly in terms of adopting a demand-driven approach and proving its ROI. Additionally, the report stresses the importance of staffing and adequate budgetary resources to support the OIEx's operations and mission. A smoothly operating platform will also minimize stigmas characterizing universities as slower-paced institutional environments. Marketing efforts, user experiences, and customer service must be prioritized to engage a wide range of partners, from small enterprises to larger firms. The OIEx's long-term strategy should focus on innovation, enhancing existing offerings, and securing the necessary resources for sustainability.

Background Research Findings

The OIEx is a web tool that consolidates university resources to facilitate improved access to information that enables statewide innovation, representing a small group of multi-university initiatives in the United States. By centralizing key sources of knowledge, experts, and funding, the site strives to enhance opportunities for collaboration that ultimately support business and economic development in Ohio. The OIEx has achieved significant progress in developing a concept and building a connected web portal of resources in fortifying university and industry usage of this multi-university information. Further, the portal is ahead of many similar peer initiatives—specifically, the gains made in conceptualizing and developing information related to university assets, and strategically aiming to create a comprehensive resource that improves and encourages an ecosystem of innovation at the state level.

University resources are understood primarily as a knowledge-based component of the innovation ecosystem. University networks create a cumulative knowledge effect influencing the ecosystem by informing cross-sector innovation. The OIEx is a multi-product platform that offers knowledge, codified innovation, contracted research, and physical infrastructure and facilities. Universities produce new knowledge with revenue from external research dollars. Consumers of this product include universities and other research institutions, including companies. Codified innovation includes patents, licenses, and knowledge of best practices. Companies consume and deploy this innovation to produce revenue. Contracted research consumed by companies produces product and process innovation, which lead to revenue. Finally, physical infrastructure is leveraged by universities and industry, and assists in producing new knowledge and innovation by providing space for work, discovery, and collaboration.

ASPIRATIONAL FRAMEWORK

The desired outcome of a statewide innovation ecosystem is the facilitation of UIC, bridging the inherent differences in cultures between academic institutions and businesses. Universities play a pivotal role by contributing knowledge-based components to this innovation ecosystem, fostering a cumulative knowledge effect through extensive networks. To facilitate these connections, web tools are essential and serve both as bridges for university resources and as facilitators of connections between university networks and companies. It is vital to evaluate the costs and benefits associated with university networks, web tools, and the ultimate goal of UIC within this ecosystem. In our research approach, interviews served as a valuable tool, ensuring representativeness and enabling us to gain insights from both successful and unsuccessful ventures.

BACKGROUND RESEARCH FINDINGS

Methodology

The goal of this study is to explore the value, growth, and sustainability of statewide innovation initiatives using expert system web portals similar to the OIEx. Our focus is on multi-university, statewide innovation initiatives that connect university resources to industry and companies. Given that a key recommendation of this report is advising OIEx policymakers to improve marketing efforts, the research also aims to uncover the value propositions of the innovation initiatives. The study examines the patterns of usage and sustainability of programs by inquiring on the marketing strategies, staffing, data domains, and incentives to develop, use, and sustain initiatives.

The research team identified comparable web portals and innovation growth initiatives in other states to inform our analysis. The research investigates 10 university initiatives connecting their respective institutional resources to industry. The research explores the following questions:

1) What is the value proposition that innovation initiatives create for industry and companies?
2) How are innovation initiatives used and sustained?
3) How do innovation initiatives use marketing, staffing, data domains, and incentives to develop, use, and sustain themselves?
4) How can the OIEx benefit from lessons learned from other innovation initiatives?

SELECTION CRITERIA

The selection of the 10 university initiatives was guided by a set of criteria defining statewide technology and innovation ecosystems. The initial criteria set a preference for initiatives that

- bring together experts (i.e., university researchers), technology, or facilities from at least more than one university to remain definitionally closer to statewide innovation;
- include a searchable portal comprised of experts, technology, or facilities provided by the institutions;
- connect universities and talent for research projects;
- connect university experts, technology, and facilities with businesses;
- identify goals of economic development as part of their missions; and
- serve the entire state.

COMPLETED INTERVIEWS

The research team reviewed 90+ initiatives across all 50 states in addition to programs at the national and international levels to find initiatives that met the above criteria. This review included web portals already identified in the Cleveland State University Center for Economic Development's prior study of innovation exchange portals (Lendel et al., 2016). Of the seven portals interviewed in the prior study, four no longer exist (Michigan MCRN, Arizona Experts, North Carolina's Reach NC, and Texas Influuent). While the California Technology Transfer program still exists, program representatives did not provide an interview for this current study. However, the program appears to still be functioning as described in the prior study. This specific initiative is comprised of several University of California campuses and focuses on the licensing of technology developed in University of California labs.

The goal of the initiative is to allocate licensable technology to industry and provide guidance on intellectual property. It is unclear whether the sustainability issues identified in the prior study have been addressed. The initial review of innovation growth portals resulted in very few candidates who met all the criteria. The research team thus selected initiatives that met as many of the criteria as possible and strove for a well-balanced mix of interviewees with regard to the existence of a web portal, whether the initiative was industry-oriented, etc. The research team also frequently opted for those initiatives in states most comparable to Ohio in size and location.

Invitations were sent to 21 initiatives, and 11 of them consented to interviews. In addition to New York FuzeHub and Florida ExpertNet, described earlier, the following initiatives gave interviews: University Research Corridor; University of Texas Medical Branch; Texas A&M; Oklahoma State University; Manufactured in North Carolina; Ohio Innovation Exchange; University of Illinois Chicago; Illinois Innovation Network; and Indiana Innovation Institute. Of those 11 initiatives, 8 had web portals, 3 of which were custom-built. Seven of the initiatives are industry-oriented, and 3 of those have web portals (see list of initiatives in Appendix A). The final 2 initiatives from the prior study, FuzeHub and ExpertNet, completed new interviews with the research team. FuzeHub continues to be funded by the state of New York and the National Institute of Standards and Technology. It is likewise still tasked with supporting small and medium-sized manufacturers.

INTERVIEW INSTRUMENT

Once the initiatives were selected, the team conducted semi-structured interviews with responsive initiatives as well as representatives from the OIEx. The goal of the interview instrument is to examine usage and sustainability of the innovation initiatives and to inquire about marketing strategies, staffing, data domains, and incentives used to develop and sustain the initiatives. The interviews contained four sets of questions. The first set pertained to general information about the initiative and its goals, the second set focused on funding and sustainability, the third set asked for information on marketing and usage, and the final set contained concluding questions about acquired knowledge and next steps.

Results

FRAMEWORK

Universities and their extensive networks are a foundational component of innovation, primarily contributing to the supply side of the ecosystem. Within this context, university resources have a cumulative impact on the innovation supply, serving as a valuable knowledge base. Web portals emerge as essential tools, not only for internal use within the university networks but also for enhancing the utility of university resources for industry and company stakeholders. In contrast, industry-oriented initiatives operate on a demand-driven model, aligning their objectives closely with the specific needs of businesses and industries. These initiatives tend to adopt project-based and company-focused approaches, reflecting the prevailing strategies within this demand-driven segment of the innovation ecosystem. These findings are consistent with the arguments of Perkmann and Salter (2012), who assert that academia is usually associated with longer-term research, which inherently contrasts with the faster-moving pace of companies subject to the influence of market competition

and innovations. As a result, these "mismatches" of industry and university values and operations can complicate relations and collaborative efforts (Gerdsri, Manotungvorapun, 2022, p. 5).

HISTORY AND ASPIRATIONS

The interviewed initiatives were founded as early as 1999 and as recently as 2020. The amount of start-up funding available to the initiatives ranged from $10,000 to $900,000. These funds were made available for single-year campaigns or intended as investments covering multiple years, but no funding surpassed a three-year time span. Staffing ranges from 1 part-time employee to 3 full-time employees and depends on the complexity of the initiative and the type of web tool used. Aspirational goals for creating initiatives or web tools included interests in the ability to use university resources for single or multiple universities and economic development of a company, industry, or region. All initiatives considered themselves to be successful and to have reached their initial goal(s). The initiatives measured their value based on criteria ranging from continuity of operational status to the number of jobs created and high ROI.

VALUE AND SUCCESS: SUPPLY SIDE

Supply-driven initiatives, i.e., the universities and university networks, primarily use a web tool engaging two to three software engines, which are either standard or custom-built. The primary audience of these initiatives is researchers, who use the web portal as a promotional or evaluation tool. The initiatives mention university leadership, governments, and economic development organizations as secondary audiences, and industry usage is also mentioned intermittently. Yet, as one initiative noted, industry usage often is "still largely untapped at this point." The principal goals of these initiatives are to promote research and facilitate opportunities for collaboration.

A predominant number of the supply-driven initiatives value the initiative and web tool as a public good and subsequently do not charge any fee for accessing their services. Thus, the value or ROI of the tool is not measured by its lack of explicit revenue generation, but rather its creation of a cumulative effect of value creation by way of enhancing common knowledge of university research, resources, and utility that in turn fosters outcomes of economic development and opportunities for innovation. In other words, for these initiatives, utility and funding are not directly connected to matrix measurement or measurement of ROI. Funding is built into a budget of funding entities such as a state, university, or network of universities. This funding is usually aspirational and uses broad economic impact as a testimony of success. Future budgets are also usually aspirational; budgetary goals are set towards using additional resources to illustrate the supply.

VALUE AND SUCCESS: DEMAND SIDE

A majority of the demand-driven initiatives, i.e., those with an industry focus, do not have a web tool beyond a website. Connecting a company or industry to university resources is assisted by a staff person. The primary audience is companies, industries, and organizations that can benefit from specific services. These initiatives are usually project-oriented with a fee-for-scope-of-work structure. These initiatives generally have a specific economic development goal related to a particular industry, type of organization/services, or region. One initiative, for example, identified its goal as to "help strengthen and build our domestic supply chains." The initial goal is usually conservative and intended

to grow. These initiatives have specific matrices of success, which sometimes include ROI. Funding is built on a "lean model" through a very precisely identified budget and budgeting process. They usually aim for sustainability with set timing.

SUSTAINABILITY AND GROWTH

Supply- and demand-driven initiatives aim for sustainability in different ways. Supply-driven initiatives see sustainability as stability of the budgeting process and funding of the organization. Expansion of the initiative is seen as a method to increase budgeted funding. Demand-driven initiatives, however, measure revenue and return with the goal of expanding the initiative. These organizations recognize that "when there is no separate budget or separate operational programmatic activity available, those would probably be the biggest challenges" to sustainability. Despite these differences, both the supply-driven and demand-driven initiatives rarely have a formal plan or advisory tool guiding them in achieving sustainability.

MARKETING AND USAGE

Most initiatives do not prioritize marketing as a specific goal in the budget. Supply-side marketing is driven by promoting the university and the institution's research in general. Promotion of the web portal itself, if it exists at all, is limited to internal encouragement for faculty to keep their profiles up to date. Demand-driven initiatives' marketing methods are like marketing for project-driven initiatives. These initiatives recognize as "critical" the need "to dedicate a lot more time to marketing and analyzing who is using the system and how." Among supply-side initiatives, measuring performance and usage is rarely a priority. Supply-driven initiatives usually do not measure performance beyond Google Analytics and occasional custom reports. Some initiatives do obtain a very detailed analysis from Google Analytics. However, as one initiative summarized, "We have the Google tag manager set up and we look at those analytics, but we don't do it systematically." Demand-driven initiatives, on the other hand, may track more than these analytics, such as "how much income may have been generated for a company through their participation."

ADDITIONAL FINDINGS

The researchers also note a few key findings not outlined in the categories above. First, supply-side initiatives usually do not have a business model, while demand-driven initiatives are more likely to have a business strategy in place. Second, the initiatives with web portals that were interviewed all reported experiencing challenges with maintaining up to date information in their faculty profiles. Several portals found ways to input a base profile to avoid relying on faculty for that stage of the process. One way that some portals manage updates to the base profile is to use faculty profiles as part of the university's mandatory evaluations. Faculty members are then motivated, for example, to add new research and publications. A final piece of critical information is that leadership buy-in is a must and correlates with the success and sustainability of the initiative.

Policy Recommendations

Universities and university networks provide a valuable component of innovation ecosystems. In supplying informative and guiding research that produces new knowledge, universities are continually fostering new ideas that breed innovation. The effects of the cumulative knowledge generated from university networks inform novel approaches and information-sharing that enable the desired outcome of statewide UIC. On the other hand, industry initiatives are demand driven. Moreover, project-based and company-focused approaches prevail among demand-driven initiatives. Web portals showcasing university resources have internal utility in service to the university through the lens of marketing and communications, in addition to external value for industry usage. Based on this aspirational framework and the results of the study, this report recommends that the overarching goal for the OIEx should be to solidify the platform's identity as a broker and connect the supply and demand of university products. To achieve this goal, the team recommends that the OIEx learn from demand, plan for sustainability, create a business model, and embrace marketing.

LEARN FROM DEMAND

The OIEx's main competitors are industry-oriented initiatives. These initiatives are company- and product-focused but have no portal. They respond to industry demand rather than university supply. These initiatives are also subsidized. The OIEx should learn to "subsidize" its interactions by focusing on its products. For example, the OIEx should follow up on every "deal" it brokers. It should illustrate its successes through social media buzz and other targeted marketing. Other avenues of promotion, such as hosting/attending conferences and industry summits, will also help to make industry aware of the resources it provides. Finally, the OIEx should create a mechanism by which universities are encouraged to provide their resources through the OIEx's brokerage. It should leverage support from university leadership and the Ohio Department of Higher Education to educate universities about the OIEx's value proposition. Benefits for universities include assistance with faculty evaluation, promotion of faculty achievements, and improved intra- and inter-university collaboration. The OIEx has the opportunity to out-compete demand-drive initiatives because it creates an opportunity for multiple, cross-sectoral innovations. To learn from demand allows the OIEx to become more than the sum of its resources.

PLAN FOR SUSTAINABILITY

Planning for sustainability requires a multi-faceted approach, including the creation of a pipeline for research and development that will enable programs to adapt to changing conditions, identify new opportunities, improve operational efficiencies, and foster internal processes of trial and innovation. Such efforts should include a business plan, a marketing strategy, and the creation of an engaged advisory board. While there was variation in the creation of advisory boards among the interviewed initiatives, one organization reported that a board was established at the start to support the initiative's launch, while another expressed that "they would have created [an advisory board] from the very beginning and always had one" to guide growth and development and ensure continuity of investment. Measuring revenue and assessing the benefits of the brokerage are also critical for long-term sustainability. While various initiatives communicated using Google Analytics to track traffic to the site, keywords, and clicks, there is limited capacity reported on abilities and plans to leverage the

data and directly apply the information to inform long-term marketing strategy, generate new leads, calculate ROI, or demonstrate greater impacts on economic development.

CREATE BUSINESS MODEL

One critical part of planning for sustainability is to create a business plan, which should include a budget with detailed goals and expenditures. Moreover, the OIEx should develop a matrix of success, including ROI as well as benchmark metrics, to measure early success. The OIEx competes with non-portal and single-university initiatives that spend up to $300,000 per year. An active single-university initiative usually employs an equivalent of 2–3 full-time staff just to create a product. Thus, the business plan should also identify adequate, dedicated staffing and an itemized budget for other necessary resources such as marketing. Securing continuity of resources to sustain operations is key to this aspect of a sustainable business model. Currently, the OIEx spends most of its resources licensing and maintaining products. Creating products should be 40% of the total cost; the other 60% should be spent on marketing, learning from demand, and developing new products.

APPENDIX

LIST OF INTERVIEWED INITIATIVES

FuzeHub

As in the past, FuzeHub continues the unique strategy of connecting industry and university resources through the use of staff members rather than a public web portal. The initiative's web page features a form through which users can request assistance. The FuzeHub portal is entirely internal and relies on its research team to assess and connect users with the resources they need. In this way, staff can ensure that the portal information is accurate and find the best connection for the user. The team continues to use a customized portal. They considered moving to an out-of-the-box platform, such as Salesforce, but are hesitant to lose the functionality of a customized portal. The FuzeHub team measures the portal's success based on the full life cycle of its assistance to users: from an initial request to identifying research partners to reaping the benefits of successful partnerships. Users also submit a survey, the results of which allow FuzeHub to track new job creation, job retention, and cost avoidance.

Florida ExpertNet

Produced by the Clearinghouse for Applied Research at Florida State University in 1999, Florida ExpertNet is a publicly available web portal providing free access to profiles detailing experts and researchers representing multiple universities in Florida. The portal permits users to search faculty, information on funded research, centers, and institutes, in addition to technology licensing and speakers. According to the portal's website, the mission of the initiative is to connect "business, industry, government, and the public with expertise and resources across Florida's universities in order to foster collaborations, create opportunities, and promote economic development for communities in Florida and around the world" (nondisclosed participant, Florida ExpertNet).

University Research Corridor

The University Research Corridor (URC) is an academic research cluster of the state's three research universities (Michigan State University, University of Michigan, and Wayne State University) that supports talent production, academic research, and economic revitalization in Michigan. The URC describes its impact as "making Michigan attractive to business and talent by training the next generation of highly skilled, in-demand workers, finding solutions through innovative research, and fostering an array of international business and academic partnerships" (nondisclosed participant, University Research Corridor).

URC's searchable portal is not available to the public; rather, it is utilized internally among the participating universities. Its public website does provide some access to the research cluster's resources through its Reports, Profiles, and Partnerships pages, but it mainly highlights the accomplishments of URC work through published news stories. This news is categorized by topic, including education, economic development, talent, and more. The Reports section showcases aggregated data on the combined economic impact of the three research institutions and benchmarks against other clusters in the United States. The Profiles section allows users to search by keyword and topic to find stories on researchers, business leaders, and projects that fall within the purview of the URC.

University of Texas Medical Branch — Health Research Expert Profiles

The Health Research Expert Profiles at the University of Texas Medical Branch (UTMB) at Galveston is a searchable portal created to assist the community and outside entities with finding collaborators, research,

and grant awards. Research Profiles are available for all faculty and students enrolled in post-doctoral programs. The portal allows users to see recent publications, view article metrics, identify potential collaborators, analyze text to find researchers with related work, and discover what external funding has been obtained on the UTMB campus.

This portal is publicly available, and its primary feature is a keyword search bar allowing users to explore the database. An advanced search is available to more precisely narrow results, with the unique option to copy/paste text to find the associated author, department, or more. The homepage also organizes the data into the following categories for a more refined search experience: Experts, Departments, Equipment, Projects/Grants, Publications, Activities, and More (Press/Media and Honors). The homepage also outlines the UTMB Research Strategic Plan, its Research Strategic Communities, and an interactive map of its collaborations and top research areas from the last five years.

Texas A&M University — Scholars@TAMU

Scholars@TAMU is a searchable portal of Texas A&M University faculty and research that supports visibility of scholarly expertise, enhances the scholarly identity of researchers, and promotes research collaboration. Faculty profiles are generated using a variety of data from institution-level/enterprise systems, publicly available research, and other authoritative sources. Faculty can edit their profile to best represent their scholarship and expertise.

This web portal is publicly available and categorizes information according to the following pages: Home, People, Organizations, Research, and About. The Home page houses the portal's main search feature, which allows users to search for scholars, organizations, and published research according to name or keyword. The Home page also showcases the most recently updated faculty profiles and an overview of the UN Sustainable Development Goals. The People, Organizations, and Research pages provide collections of the titular information in list view, which can be refined according to additional relevant criteria. The About page provides background on the project, lists its benefits, and outlines new features and data available in the system.

Oklahoma State University — Experts Directory

Experts Directory is a web portal that "provides a single point of organization, presentation, and up-to-date reporting of scholarly activities across Oklahoma State University" (nondisclosed participant, Oklahoma State University). The portal creates and organizes individual researcher profiles and populates them with directory information, teaching activities, scholarships, and grants. A closed, internal Experts Directory system exists for Oklahoma State–affiliated faculty, but those faculty can share selected data to the OSU Experts public directory for widespread consultation.

The public OSU Experts portal is extremely streamlined as its main feature is a search bar that enables users to search for scholars and researchers by name, topic, discipline, or keyword. Users can then refine a search or list of relevant scholars by Department or School, Field of Research, Availability, and UN Sustainable Development Goals. The web page provides a contact address and phone number on the bottom banner, along with general resources about the institution of OSU and its research efforts.

APPENDIX

Manufactured in North Carolina

Manufactured in North Carolina (MNC) is an online directory of manufacturers based in North Carolina. MNC is maintained by NC State University Industry Expansion Solutions and the North Carolina Manufacturing Extension Partnership. The publicly available directory features profile pages for each enrolled manufacturer, providing its location, product types, relevant certifications, and contact information. Profile pages can be linked to a company's website and social media accounts, if applicable. These profile pages "serve to increase peer-to-peer networking and generate exposure and for small- to mid-size NC manufacturers" (nondisclosed participant, Manufactured in North Carolina). Manufacturer enrollment and membership in MNC is free.

MNC organizes its database along the following categories: Home, Request for Quotation, Supplier Opportunities, and Search according to Map, Alphabetical, Industry Category, Sectors Served, or Advanced Search. The Home page provides a general search bar, a menu to search for manufacturers according to industry category, and links to the manufacturer index, supplier opportunities, and news or event postings. Information about MNC, FAQs, a contact page, and more is available on the bottom banner of every page on the site.

University of Illinois Chicago — INDIGO

INDIGO "collects, disseminates, and provides persistent and reliable access to the research and scholarship of faculty, staff, and students at the University of Illinois at Chicago" (nondisclosed participant, University of Illinois Chicago). INDIGO is used by faculty, staff, and students to store and organize their research and scholarship, whether unpublished or published. Departments can use INDIGO to distribute their working papers, data sets, technical reports, or other research material. INDIGO benefits researchers by increasing dissemination, preservation, access, and recognition of their work.

INDIGO is a publicly available web portal that organizes its database of scholarly research according to the following categories: All, Categories, and Groups. The homepage defaults to a list of all publications sorted by posted date. Publications can also be sorted by citations, Altimetric Attention Score, first online date, or publication date. A keyword search function is available for more targeted queries, which can then be filtered according to content type, date, license, category, publication type, group, or source. INDIGO also provides statistics about the portal's activity, particularly publication views and downloads analyzed by change over time, country of origin, and rankings.

Illinois Innovation Network

The Illinois Innovation Network (IIN) is a collaborative effort by the state's public universities to drive innovation and economic growth utilizing a combination of research, public-private partnerships, entrepreneurship, and workforce training programs through a system of connected university-community-industry-based hubs. The IIN convenes committees across these universities for policy, workforce development, and research collaboration. The efforts are led by the University of Illinois System, and the administrative home of the IIN is the system's Office of the Vice President for Economic Development and Innovation.

The IIN does not have a public portal, but its website provides information about the network's 15 hubs, 5 major programs, and working committees. Most of the information provided on these pages is news

releases about awards for and actions taken by the statewide hubs. The website also provides an "About" section containing news, event, and organizational structure information.

Indiana Innovation Institute

The Indiana Innovation Institute (IN3) is a collaboration between more than 200 universities, industry organizations, state and national governments, and nonprofits to create a hub of national security innovations. Originally launched in 2017 as the Applied Research Institute (ARI), IN3 adheres to a goal of creating "an ecosystem of economic growth that speeds new investment and advances partnerships, jobs, and the talent pool in Indiana" (nondisclosed participant, Indiana Innovation Institute). To accomplish this, IN3 focuses on four critical areas: hypersonics, cyber-physical systems, trusted microelectronics, and artificial intelligence. The main activity of IN3 is to manage technology projects and convene research and business teams to solve technical challenges for the U.S. Department of Defense.

IN3 does not provide public access to their portal that connects users to researchers, labs, and other assets in the national security and related fields. The institute's website instead provides general information about who the IN3 is, what they do, events, news, job postings, and a consortium membership application. Information about IN3 leadership-level employees, the board of directors, and members of the strategic advisory group is also readily available. A full directory of the 200+ consortium members is not available, but a partial list is provided with key partners in academia, industry, government, and the nonprofit sector.

OTHER INTERVIEWS

The research team also conducted semi-structured interviews with peripheral organizations that could offer diverse perspectives on innovation portals in general and OIEx in particular. These organizations included Symplectic, the Ohio Manufacturing Extension Partnership, BioOhio, and OhioX.

Symplectic

Symplectic is a research management platform designed to leverage research data by providing a centralized location hosting information on research, publications, and media. The software and service teams identify, manage, and reutilize research to deliver relevant information to a variety of clients, including universities and research institutions. Symplectic offers multiple use cases including capacities to create public profiles showcasing the experiences and expertise of researchers, with their technology ensuring that information is up to date. Additional use cases include government compliance assurance ensuring that sites meet data policy requirements among other standards, as well as tracking faculty activity data, resumes, and reviews, and customer service and support that guides clients during key phases of implementation and learning. These services are not free but rather are provided at cost.

Ohio Manufacturing Extension Partnership

The Ohio Manufacturing Extension Partnership (Ohio MEP) is based in the Department of Development (DoD) within the state government and was established in service of small and medium-sized businesses and manufacturers in the state. The partnership aids, services, and supports the innovation, growth, market viability, and sustainability of the businesses through training, consulting on operations, business planning, automation and process improvement, engineering, and other services. MEP is a network at the national level connecting specialists and coaches with small businesses across the country. The Ohio MEP

is facilitated by the DoD Office of Technology Investments and manages regional organizations such as OSU, TechSolve, and FastLane, which administer the program on a more localized level.

BioOhio, or Ohio Life Sciences

Ohio Life Sciences (OLS) is a nonprofit membership organization based in Columbus, Ohio, in affiliation with Ohio State University. The organization is committed to promoting economic growth and innovation in the state by advocating for industries and workforces ranging from biotech, medical devices, digital health, gene sciences and cell therapy, agricultural technology, pharmaceuticals, research, and universities. BioOhio's mission to enhance the life sciences ecosystem runs parallel to the missions of similar initiatives described in this report, as the organization aims to foster partnerships, policies, funding, and collaborative efforts to build up the innovation and sustainability of the life sciences ecosystem in Ohio that benefits goals of economic development in the state. In terms of functionality, the site publishes directories, communications, and news surrounding the life sciences ecosystem in the state to increase awareness regarding the research, new developments and products, and lobby policymakers, among other projects. Members opt in with a fee to sustain the work and investment enabling the continuity of OLS programs and initiatives. Efforts focused on workforce development include learning programs, partnerships, workforce tours throughout the state, and plans regarding talent pipelines and skill development.

OhioX

OhioX is a nonprofit dedicated to the mission of promoting Ohio as a technology hub. Through a network of members that include companies, research organizations, and universities, among other institutions, OhioX connects advocates of diversifying Ohio's economy as a suitable environment for technology companies by enhancing the state's innovation ecosystem. As a member organization focused on networking, OhioX differs from the previously described web portals comparatively more focused on the provision of research profiles and directories connecting university ecosystems with industries. Through marketing and education, events, networking, and collaboration with policymakers, OhioX aims to build awareness of tech opportunities in Ohio and contribute to statewide innovation and economic development.

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