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Strategies to enhance university economic engagement: evidence from US universities

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ABSTRACT



In an increasingly innovation-driven economic environment, universities serve as engines of economic growth by igniting innovation, fueling entrepreneurship, and inspiring the next generation of scientists and professionals. While universities are committed to enhancing their economic impact, university 'economic engagement' is in many ways an emerging field. This research investigates key strategies used by US research universities to drive economic engagement by analysing 55 successful applications for the Innovation and Economic Prosperity (IEP) University designation, which consist of extensive self-study exercises, using a grounded theory approach. Six key strategies emerge from this corpus: forming mutually beneficial partnerships with industry, developing collaboration networks with relevant communities, building an innovation culture, supporting researchers in bringing research outcomes to market, promoting the transfer of new technologies to industry, and encouraging entrepreneurial activities. These results can serve as a guide for universities seeking the best-practices to advance their economic engagement.

KEYWORDS

Economic engagement; industry partnerships; community engagement; innovation; Grounded Theory

Introduction

Since land-grant universities were established, they have been committed to having a positive impact on surrounding communities. However, research concerning strategies for improving and evaluating University Economic Engagement (UEE) is still in a relatively early stage of development (Feldman and Desrochers 2003; Goldstein and Renault 2004; Keathley-Herring et al. 2016). Universities contribute to economic development through different activities such as improving workforce development, setting up foundations for discovery and innovation, developing knowledge through cutting edge research, and fostering community and industry partnerships (Tripl, Sinozic, and Lowton Smith 2015; APLU 2019a). There are many studies that report the strategies that universities have used to increase their economic engagement, such as collaborating with industries (Ryan and Heim 1997; Bercovitz and Feldman 2006; Rossi and Rosli 2015), community engagement (Holdsworth and Quinn 2010; Mtawa, Fongwa, and Wangenge-Ouma 2016), building an innovation culture (Bercovitz and Feldman 2006; Lawton-Smith 2006), and supporting efforts related to commercialization (Baycan and Stough 2013; Kauppinen 2014), technology transfer (Feldman and Desrochers 2003;

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Bercovitz and Feldman 2006), and entrepreneurship (Bramwell and Wolfe 2008; Astebro and Bazzazian 2011). However, there are relatively few studies that evaluate multiple strategies across several universities. In addition, far more research is needed to identify best practices that successful universities used to improve their economic engagement and evaluating their impact. This research focuses on university engagement since it directly affects a university's impact on the economic prosperity of their local, regional, and national communities.

The Association of Public and Land-grant Universities (APLU) offers an Innovation and Economic Prosperity (IEP) designation to universities that demonstrate excellence in economic and community engagement. Potential IEP universities submit self-study reports to the APLU to receive this designation, and the APLU reviews reports using panels of peers and experts. The self-studies provide a rich source of evidence regarding the activities that these universities participate in to improve their economic engagement. However, this data is in the form of detailed narratives, making it challenging to interpret and analyse. The purpose of this research is to evaluate the available evidence to inductively synthesize information regarding the approaches that these universities use to advance their economic engagement and increase their economic impact. The following research questions were defined to guide this research:

- (1) What strategies do US research universities use to advance their economic engagement (e.g. forming mutually beneficial collaborations with industry or developing collaboration networks with relevant communities)?
- (2) In what activities do US research universities engage in to drive their economic engagement (e.g. enhancing university partnerships or developing universities education systems)?

This article presents the results of a Grounded Theory (GT) study of 55 IEP University self-study reports that define the underlying dimensions of UEE and identify the activities that IEP Universities use to develop and evaluate their economic engagement strategies. This research identified six primary dimensions of UEE representing key strategies reported by IEP Universities: industry partnerships, community engagement, commercialization, entrepreneurship, innovation, and technology transfer. Further, the activities used to drive advancements in each dimension are investigated to provide guidance to enhance these strategies.

University strategies for economic development

Universities play an important role in regional and national economies (Goldstein and Drucker 2006; Altbach 2013; Donald 2015). Although institutions generally share a common interest in broadening their impact, they approach economic engagement through a variety of activities. These activities include collaborating with communities to develop programs and establishing partnerships that support UEE goals. Universities collaborate with regional industries to develop mutually beneficial relationships (Poyago-Theotoky, Beath, and Siegel 2002; Chen et al. 2017; Kaklauskas et al. 2018). These relationships typically include activities such as securing internships or research opportunities, and engaging industry partners in program development. In addition to collaborating with relevant communities and industries, many universities attempt to leverage their research activities by establishing innovation and entrepreneurship programs (Xu, McDonnell, and Nash 2005; Almeida 2008) and developing their commercialization and technology transfer activities (Sharifi, Liu, and Ismail 2014; Sengupta and Ray 2017). These universities support faculty and students by developing programs and resources to cultivate an innovation culture and facilitate the transfer of academic investigations into businesses, products, and services (Mowery 2005; Kirby 2006; Siegel, Veugelers, and Wright 2007). To champion innovation and entrepreneurship, universities participate in activities such as establishing incubator programs, offices, and research centers, collaborating with other universities to share their achievements and best practices, and maintaining relationships with university alumni. Universities evaluate their economic engagement using several metrics, which consists of

quantitative and qualitative information, that demonstrate the results of their efforts to increase their economic impact (Winn 2002; Katharaki and Katharakis 2010; APLU 2014). For example, universities often track the dollar values of industry-sponsored research by sector, or as a whole. Policy makers sometimes refer to these and other methods to make decisions regarding allocating resources to develop industry partnerships. However, evaluating a university's economic engagement through metrics alone does not necessarily help institutional leaders improve their economic engagement efforts.

The cultivation of knowledge is vital for economic prosperity and, therefore, universities play a crucial role in growing regional and national economies (Eun, Lee, and Wu 2006). To facilitate this, Bercovitz and Feldman (2006) created a framework that demonstrates how universities can deploy their knowledge in useful ways that increase economic growth. In addition, they argued that university partnerships with industries have increased in recent years due to

the development of new, high-opportunity technology platforms such as computer science, molecular biology and material science; the more general growing scientific and technical content of all types of industrial production; the need for new sources of academic research funding created by budgetary stringency; and the prominence of government policies aimed at raising the economic returns of publicly funded research by stimulating university technology-transfer.

Thus, collaborating with industries can be considered a mutually beneficial partnership (Valentín 2000).

There is a long history of universities partnering with communities to enhance economic opportunities (Laninga, Austin, and McClure 2019). The concept of university engagement with communities, according to Weerts and Sandmann (2010, 632), can be defined as the 'collaboration between institutions of higher education and their larger communities (local, regional/state, national, global) for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity'. Establishing partnerships between universities and communities is a complex process (Sasson 2018). Therefore, it is important for universities to build sustainable relationships with local, regional, and national communities of interest, in order to efficiently advance their economic impact (Weerts and Sandmann 2008; Clifford and Petrescu 2012). According to Hart and Northmore (2011), there are three problems that universities face when they want to assess and develop their collaboration with communities. These are 'a lack of focus on outcomes, a lack of instruments and tools, and the variety of approaches currently being adopted'. Therefore, it is crucial for university leaders to have a comprehensive framework and assessment tool that enables them to evaluate the current status of their UEE activities and leverage the university-community partnership as a strategy to advance their economic engagement (Hart and Northmore 2011).

University innovation activities also play a crucial role in developing the regional and national economy (Bercovitz and Feldman 2006). These innovation activities can be categorized either '... as amounts of research funding, numbers of faculty or scientific personnel, quality of academic programs ...' (Bercovitz and Feldman 2006) or '... research, producing and diffusing knowledge and rules, and training students ...' (Brodhag 2013). Due to the importance of innovation activities, universities report investing in new research centers and infrastructure, as well as offering higher salaries to attract quality academic researchers (Charles 2006). According to Charles (2006),

there is no standard recipe or package that can be recommended for an appropriate role or mechanism for universities in their specific and individual regional innovation systems. Different universities in different national and regional contexts ... will need to adopt different combinations.

Comparing university activities based on their degree of urbanization and enrollment profiles can provide a better understanding of what activities a university should pursue.

Rahal and Rabelo (2006) argue that the '... scientific and technology research [of universities] are an important source of long-term economic growth ...' emphasizing the role of technology transfer activities in UEE (Rahal and Rabelo 2006). However, Feldman and Desrochers (2003) studied how John Hopkins University engaged in technology transfer activities and found that '... despite substantial

academic achievements, Hopkins provides an example of a university that has had little direct effect on the regional economy in terms of reaping the benefits of the university's research in terms of spin-off companies and mutual relationships'. Commercializing scientific and technology research can bring many benefits for universities and industries but is also reported as being challenging for some universities. If done correctly, commercialization activities will ensure that industries understand how they can effectively leverage research outcomes. The technology transfer offices play an important role in 'patenting, licensing, and sponsoring research activities' (Bercovitz and Feldman 2006) and guiding researchers in transitioning their work to practice. As new technologies are transferred to industry and the commercialization of scientific and technology research increase, a methodical understanding of how different universities (based on their enrollment profile and level of urbanization) execute these strategies can assist other universities that seek to advance their economic engagement.

University focus on advancing entrepreneurial activities is another important factor in the growth of the regional and national economy (Nowiński et al. 2019). According to Kuratko and Morris (2018), 'a new wave of economic development is sweeping the world, with entrepreneurship and innovation as the primary catalyst'. Although there is agreement on the importance of entrepreneurship activities, (Kuratko and Morris 2018). Some universities report providing courses or new programs with the aim of advancing entrepreneurship activities but the mission and objectives of such courses and programs are often unclear for academic departments within the universities (Morris, Kuratko, and Cornwall 2013; Kuratko and Morris 2018). Similar to commercialization and technology transfer, most researchers and professionals agree that entrepreneurship activities are important for UEE though many still face significant challenges in practice.

Clearly, there have been many studies that report the types of activities universities' use to advance their economic goals. However, there are relatively few studies that compare activities and strategies across universities as well as a distinct lack of best practices to guide universities in advancing their economic engagement and impact.

Innovation and economic prosperity universities designation

The Association of Public and Land-grant Universities (APLU) is an organization that seeks to support public universities (APLU 2015). The APLU has '235 public research universities, land-grant institutions, state university systems, and affiliated organizations' (APLU 2015, 2) as members and its agenda is developed based on three main standards: 'increasing degree completion and academic success, advancing scientific research, and expanding engagement' (APLU 2015, 2). The Innovation and Economic Prosperity (IEP) Universities program established through the APLU Commission on Economic and Community Engagement (CECE) uses 'chief economic and community engagement officers as well as presidents and chancellors, provosts, senior research officers, government and public affairs leaders, and other administrators with responsibility for planning, executing, or communicating their institution's work in economic and community engagement' (APLU 2019b) to enable universities 'to codify, elevate, and advance their community and economic advancement activities' (APLU 2019b). The goal of the IEP university program is to identify the 'institutions that have demonstrated a meaningful, ongoing and substantial commitment to economic and community development, growth, and economic opportunity.' (APLU 2019b).

To apply for the APLU IEP University designation, a member of the university's senior institutional leadership must undertake a comprehensive self-study that engages both external and internal stakeholders. This self-study must not only describe their institution's definition and vision for impact of economic engagement, but also provide evidence-based examples of accomplishments and areas for growth and improvement. As summarized in Figure 1, the elements of the APLU framework are 'know, measure, tell, and engage' (APLU 2014, vii). Institutions should (a) know what they are doing well and what they need to improve in the area of economic engagement, (b) measure their engagement, (c) explain their contributions to economic engagement, and (d) engage with

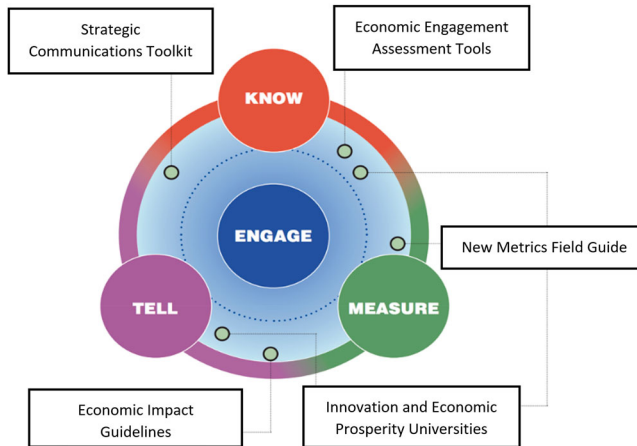


Figure 1. APLU's economic engagement framework (APLU 2014) used by all universities to write their economic engagement self-study report.

external stakeholders consistently using this process of knowing, measuring, and explaining (APLU 2014, vi-vii).

The APLU economic engagement framework also encourages institutions to think about their contributions to the economy regarding talent, innovation, and place (Figure 2) and how contributions across these domains can be linked and leveraged for a higher scale of impact.

A university must follow the APLU guidelines to develop the self-study report and submit an application that covers three components (APLU 2019a). The first component is a process narrative with six sections: introduction, process experience, the economic engagement enterprise, economic engagement planning, promotion and communication, and advancements of UEE. This section provides self-reported evidence of strategies used by these universities including detailed information about their



Figure 2. APLU's economic engagement framework (APLU 2015, 5) used by all universities to write their contributions to the economy across talent, innovation, and place.

execution. The second component contains a summary of accomplishments describing three areas of strength identified during the self-study. Finally, the third component contains a growth and improvement plan describing three areas of improvement identified during the self-study. These sections provide evidence for best practices identified by the universities and important information regarding key gaps and areas for future study.

Methodological approach

This research investigated the activities and strategies used by IEP universities to advance their economic engagement by analysing 55 successful IEP designation applications using a Grounded Theory (GT) approach (Strauss and Corbin 1990; Saldaña 2015; Santos, Goldman, and de Souza 2015). The applications (i.e. university self-study reports) consisted of over 2,500 pages of rich, descriptive narratives about the structures, processes, and outputs of UEE activities. As discussed previously, these reports were created by university leaders to address criteria defined by the APLU which were considered similar to structured interview data for the purpose of this study. The GT approach applied was adapted from Santos, Goldman, and de Souza (2015) and consists of five phases as summarized in Figure 3: line-by-line analysis, open coding, axial coding, selective coding, and saturation (Glaser and Strauss 1967; Santos, Goldman, and de Souza 2015). This iterative, inductive analysis was conducted by a team of three researchers with one primary coder to ensure methodological rigor and reduce potential influence from biases.

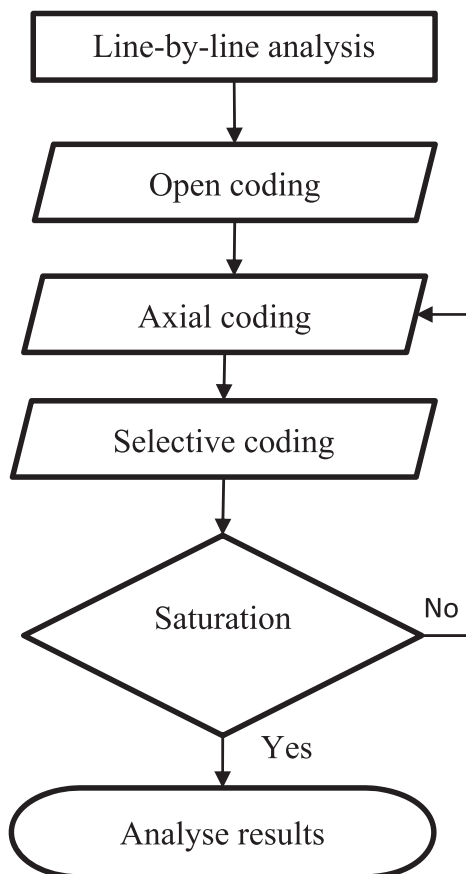


Figure 3. Grounded Theory Technique (adapted from Santos, Goldman, and de Souza 2015)

Using the GT approach, the analysis began with a line-by-line analysis to become familiar with the structure and content of the data, and to gain preliminary insights into the major themes related to UEE. Next, the open coding process was conducted to extract any important statements, figures, or tables from the documents, and to provide an initial coding structure for the extracted data. The extracted data was then evaluated by labeling concepts to define initial codes (Khandkar 2009; Charmaz 2014). The open coding process was completed in iterations with inter-rater agreement exercises to evaluate the data being extracted and to ensure alignment among the team. A minimum of 90% agreement among the three researchers was required for both the extracted data and the assigned codes.

Once the initial data was extracted and preliminary codes were defined, the research team conducted axial coding through iterative reviews of the coded data. This included using constant comparison to define categories and refine the code definitions and structure. The emergent themes and preliminary codes were also evaluated against the research questions to ensure that they were aligned with the goals of the analysis, and to address any conceptual gaps in the coding (Glaser and Strauss 1967; Strauss and Corbin 1990). Selective coding was then conducted to evaluate the code definitions and structure by revisiting the original documents to ensure that all relevant data had been extracted, while continuing to conduct constant comparison and inter-rater agreement exercises. This iterative process continued until the research team reached saturation, where additional reviews of the 55 applications did not result in revisions to the code definitions or structure (Santos, Goldman, and de Souza 2015).

Once the results of the GT approach were obtained (i.e. themes and sub-themes), subsequent analyses were conducted to provide additional context for interpreting the results. First, the emergent themes were interpreted, and a preliminary framework was defined. Next, the results were compared against three dimensions (i.e. basic classification, degree of urbanization and enrollment profile) of the Carnegie Classification of Institutions of Higher Education, which classifies universities in the United States based on a range of factors (The Carnegie Classification of Institutions of Higher Education 2019). This analysis provides additional insights regarding the variations in approaches based on the type of university, operational environment (i.e. towns, suburbs, or cities), and undergraduate population (i.e. majority, high, or very high). Finally, activities were evaluated across the emergent themes to investigate current practices and areas for development.

Results

The GT analysis resulted in a set of themes (strategies) and sub-themes (activities) representing the breadth of approaches IEP universities engage in to improve their economic engagement. The results identified six primary themes, summarized in Table 1, that describe the underlying principles reported by the IEP universities. This table also provides the number and percentage of universities whose self-study reports contained each theme.

These six primary themes span most of the activities reported in the current literature and provide a comprehensive framework for interpreting the evidence contained in the self-study reports. It is important to note that the themes were coded independently and often co-occurred within the IEP universities self-study reports. The results show that approximately one-half of the self-study reports discussed industry partnerships and community engagement as drivers of their economic engagement. Evaluation of the coded data suggests that the most common strategies employed focus on leveraging networks and developing mutually-beneficial collaborations to support UEE activities. The results also show that a significant number of the reporting universities (45%) cited innovation, including establishing innovation programs, as a strategy to improve their engagement in the economy. Finally, establishing formal programs and activities to promote and support commercialization, technology transfer, and entrepreneurship efforts were reported. In each of these three themes, the IEP university activities primarily focus on leveraging ongoing research activities and developing programs to support students, faculty, staff, and members of the community in

Table 1. Summary of six emergent themes of university economic engagement and the number (and percentage) of universities reporting each theme.

Theme	No. (%)	Definition
Industry Partnerships	27 (49%)	Forming formal, mutually beneficial collaborations with industry representatives at both the individual and institutional level.
Community Engagement	26 (47%)	Networking, collaborating with or directly affecting relevant local, regional, or national communities.
Innovation	25 (45%)	Encouraging or supporting innovation development including both building an innovation culture as well as pursuit of innovative ideas.
Commercialization	19 (34%)	Supporting in the process of bringing new technologies, innovations, and other research outcomes to market.
Technology Transfer	18 (33%)	Facilitating the process of protecting intellectual property and transferring skills, knowledge, technologies, methods, or other materials from the university to industry or other organizations.
Entrepreneurship	17 (31%)	Encouraging or supporting entrepreneurial activities both of university personnel and members of the surrounding community.

these efforts. Although much of the literature seems to be in agreement that these activities are important to UEE, the results show that none of the themes are prominent across all universities, emphasizing the need for more in-depth study and development of the best practices (Meyer et al. 2011; Rossi and Rosli 2015; Wise et al. 2018).

Industry partnerships

The most commonly reported activities were related to industry partnerships, which consist of individual and institution-level collaborative relationships with members from various industries in the surrounding communities. The aim of these partnerships in IEP universities is to secure opportunities for students and faculty (e.g. internships or faculty fellowships), and to elicit feedback from industry partners to improve university activities such as workforce development and updating program curriculum. Table 2 summarizes the four emergent sub-themes of industry partnerships.

The activities reported by the IEP universities focused both on exploring and establishing new relationships with a variety of external stakeholders (e.g. industry professionals and local businesses), as well as engaging internal stakeholders (e.g. students and faculty members) in identifying, leveraging, and developing existing relationships. This includes maintaining relationships with alumni and establishing formal partnerships with other institutions. These activities also promote opportunities for students and faculty such as internships, jobs, and research opportunities. Partnerships with regional industries or local businesses are not only for research or business purposes, but also to inform curriculum and workforce development to ensure that graduates are prepared for their industry. These types of strategies are illustrations of the overlap between innovation and talent contributions (See Figure 2) for economic development. Finally, some universities cited the establishment of centers or divisions as a driver of their advancement in economic impact.

Table 2. Summary of the four emergent sub-themes of industry partnerships and the number of universities reporting each sub-theme.

Sub-Theme	No. (%)	Definition
Partnership Infrastructure	17 (63%)	Establishing programs to support university collaborations with industry partners including establishing centers, consortiums, or clusters.
Resources for Partnerships	16 (60%)	Strategies for securing adequate funding to support faculty members, students, programs, and centers in their collaborations with industry.
Research Development	21 (78%)	Research-focused collaborations including joint research endeavors and participation in field studies.
Industry Development	21 (78%)	Practice-focused collaborations including supporting the development or function of partner organizations.

Community engagement

Other common activities reported by IEP universities were related to community engagement, in which universities either provided a service to a local or regional community, or partnered with community representatives to expand the impact of university activities. The analysis identified six sub-themes related to community engagement, which are summarized in [Table 3](#).

The results show that IEP universities reported establishing formal infrastructures to promote and manage community engagement activities; the results also show a distinct trend for universities to define formal champions to provide strategic direction for these efforts. The IEP universities often report establishing community engagement centers and formal collaborations with other universities in the region to share achievements, knowledge, and resources. Establishing centers and programs in the university's home city strengthens their connection to the community and improves their contribution to regional workforce development and local economy. A review of the coded data suggests that many of the IEP universities focus on serving relevant communities through activities such as providing health maintenance, or educational resources and opportunities (e.g. teaching hospitals, seminars, workshops, professional development events, volunteer events, fundraising, etc.). Additionally, many of the activities also focus on leveraging relationships with some community segments (e.g. local businesses, local government agencies) to bring additional funding, resources, and opportunities to support faculty and students. Many of the IEP universities that reported participating in community engagement activities emphasized the important role of these activities in expanding impact of the university.

Innovation

Another prominent theme that is reported by the IEP universities was innovation, which consists of promoting and supporting innovation development within the university and in relevant communities. These activities generally focused on either building an innovation culture, or supporting researchers and entrepreneurs in developing innovations and obtaining patents. [Table 4](#) summarizes the four emergent sub-themes related to innovation.

The most common innovation activity reported by the IEP universities was identifying and supporting innovative research conducted within the university. Furthermore, they reported attempts to develop their relationships with alumni, leveraging their experiences and networks to build a better innovation ecosystem for the university. Additionally, some universities reported developing innovation programs to enable students and researchers to more effectively implement their ideas and create solutions that can add value to local, regional, or national economies. Although less prevalent than in industry partnerships or community engagement, some universities also discussed

Table 3. Summary of the six emergent sub-themes of community engagement and the number of universities reporting each sub-theme.

Sub-Theme	No. (%)	Definition
Engagement Infrastructure	15 (58%)	Forming groups, programs, offices, or centers established to support activities that aim to engage, support, serve, or collaborate with relevant communities.
Establishing Champions	4 (15%)	Creation of formal university positions or titles that focus on facilitating or managing community engagement activities.
Community Partnerships	22 (87%)	Forming formal, mutually-beneficial partnerships with representatives of relevant local, regional, and national communities.
Engaging through Education	13 (50%)	Activities focused on community service as part of the university curriculum as well as educational programs offered to members of the community.
Engaging through Business	7 (27%)	Activities focused on establishing mutually beneficial business partnerships.
Engaging through Innovation	4 (15%)	Leveraging innovations being developed at the university to bring value to relevant communities.

Table 4. Summary of the four emergent sub-themes of innovation and the number of universities reporting each sub-theme.

Sub-Theme	No. (%)	Definition
Innovation Partnerships	19 (36%)	Establishing innovative or novel relationships as well as inter-institutional support of innovation activities both within the universities and in regional economies.
Innovation Infrastructure	17 (25%)	Forming formal groups, programs, divisions, or centers focused on promoting and supporting an innovative culture or the development of innovative research.
Resources for Innovation	16 (64%)	Strategies for securing adequate resources and supporting infrastructure to support innovation activities.
Innovation Education	15 (60%)	Programs, courses, or events to educate students, faculty, staff, or members of the community regarding innovation approaches or resources.

establishing formal infrastructure and collaborations with local businesses, industry representatives, and government agencies to secure funding and opportunities. Although much of the innovation discussion focused on innovative products, programs, or services, many universities also discussed developing an innovative culture or innovation ecosystem to both promote creativity and create a space for innovative thinking. Many also sought to develop programs and courses to educate students, faculty, staff, and members of the community on innovation skills and resources.

Commercialization

Approximately one-third of IEP universities reported activities related to commercialization, which focus on supporting faculty, students, and members of the community in bringing their innovations and research outputs to market. These efforts help researchers navigate the complex tasks needed to effectively commercialize a product or service. Although IEP universities report generating some revenue to support innovation or economic engagement, the primary goal of these activities is to realize the societal benefit of discoveries and to support economic growth. The commercialization activities were coded into six sub-themes as summarized in Table 5.

The most common commercialization activities focused on supporting researchers in commercializing their developed technologies. Many of these universities reported that these efforts brought additional resources to the university that further supported their economic engagement activities. For example, several universities reported establishing specific programs to support scientists in obtaining patents for their work. In addition, IEP universities reported goals to improve their own knowledge of commercialization processes. This includes formalizing efforts to inform researchers at their institutions of the effective techniques, opportunities, and available resources, which include the development of formal programs to educate or support relevant stakeholders. Unlike some of the other main themes, such as innovation and entrepreneurship, commercialization processes and procedures appear to be relatively well understood by most of the reporting institutions.

Table 5. Summary of the six emergent sub-themes of commercialization and the number of universities reporting each sub-theme.

Sub-Theme	No. (%)	Definition
Commercialization Partnerships	9 (47%)	Establishing formal, mutually beneficial partnerships to support commercialization education and activities.
Commercializing Research Outcomes	9 (47%)	Leveraging ongoing research activities and supporting researchers in commercializing their work.
Commercialization through Education	4 (21%)	Programs, courses, or events to educate students, faculty, staff, and community members regarding commercialization processes and resources.
Resources for Commercialization	8 (42%)	Strategies to secure resources to support commercialization activities.
Intellectual Property	4 (21%)	Programs and processes to support researchers in securing Intellectual Property (IP) rights.
Commercialization Infrastructure	8 (42%)	Establishing formal programs, offices, or centers to promote and support commercialization activities.

Many cite securing adequate resources and increasing research activities as strategies for advancement, but only 34% report these activities.

Technology transfer

Activities related to technology transfer focus on bringing value to relevant communities or industries by facilitating access to emerging technologies. This includes protecting intellectual property and transferring research outcomes from the university to industry, and, in some cases, further development to move them to a viable state of commercial readiness. Similar to commercialization, approximately one-third of IEP universities reported leveraging ongoing research activities or developing programs to support or educate students, faculty, staff, or members of the community on the most valuable practices, opportunities, or resources. [Table 6](#) summarizes the sub-themes identified in IEP university technology transfer activities.

Establishing a formal technology transfer office was the most commonly discussed strategy, which reportedly helped IEP universities to develop the best practices for their unique situation. This includes having a dedicated team within the office that facilitates the technology transfer process, explores approaches for technology development and potential partnerships with regional businesses, collaborates with internal and external stakeholders, and communicates with alumni to gain support for technology development. Much of the technology transfer work discussed was focused on establishing resources and infrastructure to support these activities.

Entrepreneurship

The final theme identified in IEP UEE activities was entrepreneurship, which focuses on developing support programs for start-up companies, such as incubators. [Table 7](#) summarizes the five sub-themes identified in IEP university entrepreneurship activities.

The results show that many universities reported establishing programs such as start-up incubators to support local and regional entrepreneurs. Universities also foster entrepreneurs internally by supporting students and faculty in pursuing their ideas. Further, many universities reported establishing training programs or courses to educate appropriate stakeholders on entrepreneurship processes, opportunities, and resources, which includes not only faculty and students at the university, but members of the local community. Many of the reported activities also focus on securing resources to support entrepreneurship, with many universities reporting that they received funding from institutions such as the National Science Foundation to develop their entrepreneurship programs.

Dimensions of university economic engagement

These six identified themes represent the breadth of approaches and practices reported in the literature, and can be interpreted as key dimensions of UEE. [Figure 4](#) summarizes the six dimensions and

Table 6. Summary of the four emergent sub-themes of technology transfer and the number of universities reporting each sub-theme.

Sub-Theme	No. (%)	Definition
Commercializing Technology	15 (28%)	Leveraging commercialization as an approach to make technologies that emerge from research conducted at the university accessible to relevant industries.
Resources for Tech. Transfer	11 (61%)	Strategies to secure resources to support activities related to technology transfer.
Tech. Transfer Infrastructure	13 (72%)	Establishing groups, programs, offices, or centers to promote and support technology transfer activities.
Tech. Transfer Partnerships	5 (28%)	Forming formal, mutually beneficial partnerships to provide additional support for technology transfer efforts.

Table 7. Summary of the five emergent sub-themes of entrepreneurship and the number of universities reporting each sub-theme.

Sub-Theme	No. (%)	Definition
Entrepreneurial Education	12 (70%)	Programs, courses, or events to educate students, faculty, staff, and community members regarding entrepreneurship processes and resources.
Engaging in Entrepreneurship	11 (65%)	Programs and activities that engage in entrepreneurship activities such as start-up incubator programs.
Resources for Entrepreneurship	7 (41%)	Strategies to secure resources to support activities related to entrepreneurship.
Entrepreneurship Infrastructure	7 (41%)	Establishing groups, programs, offices, or centers to promote and support entrepreneurship activities.
Entrepreneurial Partnerships	2 (12%)	Forming formal, mutually-exclusive partnerships to support entrepreneurial activities and local start-ups.

their associated sub-themes. In this figure, the size of the six main nodes (represented in blue) is proportional to the number of self-study reports that contained that theme. Further, the thickness of the lines that connect the main themes nodes to the sub-theme nodes (represented in black) is proportional to the number of self-study reports that contained each sub-theme. Finally, the analysis showed that there are indirect relationships among the six dimensions, as opposed to direct parent-node relationships between themes and sub-themes, which are represented with dotted-lines that occurred when activities in one dimension leveraged advancements made in another dimension.

As shown in the figure, industry partnerships were the most commonly reported type of activity, and each of the five other dimensions also defined activities or strategies related to developing networks or partnering with other institutions to support advancements. While the activities related to

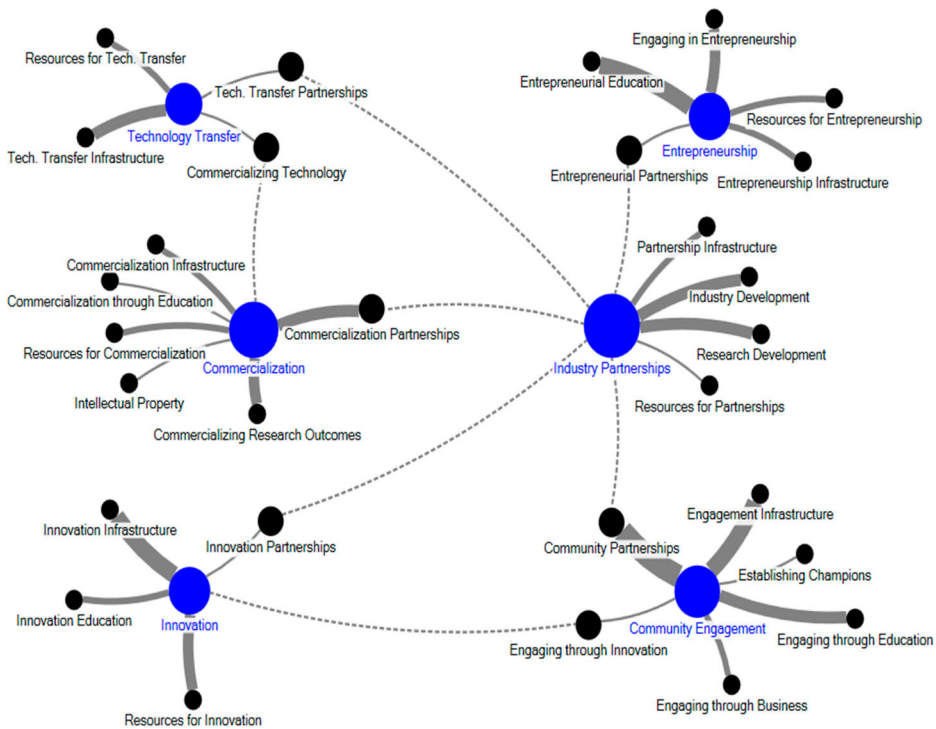


Figure 4. Network diagram of the six emergent dimensions of university engagement shown as blue nodes linked using solid lines to their associated sub-themes, shown as black nodes. Shown as dashed-lines are the indirect relationships observed among dimensions.

industry partnerships focus specifically on forming relationships based on the connection between the industry and the work being conducted at the university (either research or educational programs), partnerships in other dimensions are also focused on supporting development in those areas. For example, IEP universities that discussed community engagement activities often utilized strategies related to building and leveraging networks through establishing official partnerships with informal entities, such as community representatives and advocacy groups, to facilitate activities such as providing services for the community, or volunteer opportunities for students. There is also a link between commercialization and technology transfer, as some IEP universities reported using commercialization practices to facilitate the transfer of new technologies to industry. Finally, within community engagement, it was found that previously developed innovations were leveraged by universities to connect with and serve surrounding communities. These activities often focused on reaching out to underrepresented groups, educating community members, or increasing the reputation of the program.

Investigation of university characteristics

As mentioned previously, a review of the literature suggests that the six identified dimensions of UEE are expected to have a large effect on economic engagement and impact and are thus regularly studied. However, none of the six dimensions were reported across all of the 55 IEP universities, suggesting that there may be different focus areas based on aspects such as the university type, operating environment, and undergraduate population. Therefore, the Carnegie Classification system was used to define three characteristics of the IEP universities (basic classification, degree of urbanization, and enrollment profile) to provide a deeper understanding of trends in their economic engagement activities. The Carnegie Classification is a commonly accepted framework for 'recognizing and describing institutional diversity in US higher education' (The Carnegie Classification of Institutions of Higher Education 2019). This framework, which was first used in 1970, classifies US universities using several dimensions to support university strategic development as well as researchers who study these environments. First, the basic classification characteristics were investigated, and the results show that all 55 IEP universities are classified as doctoral universities, with 17 (30%) defined as having high research activity, and 38 (70%) having very high research activity. This demonstrates the strong research-focus of the 55 IEP universities, and explains the high focus on leveraging ongoing research activities to drive UEE. Next, the degree of urbanization (defined as a university located in a town, suburb, or city) was investigated; the results are summarized in [Figure 5](#).

The results show that IEP universities in large cities were more likely to report activities related to industry partnerships, commercialization, innovation, and technology transfer. These universities tend to emphasize technology-based economic development and workforce development activities. When considering the framework of university economic impact provided by the APLU, this suggests that IEP universities located in large cities are focusing more on the areas of innovation and talent. Universities located in large cities have more potential partners, which may lead them to pursue these activities more often. As a result, these universities bring in more funding and opportunities to enhance their programs. However, IEP universities located in smaller cities tend to focus more on community engagement and entrepreneurship activities, suggesting that these universities are focusing more on fostering development of new businesses (innovation) and community development (place). Universities in small cities develop their community engagement through establishing new programs and centers either on their campus or in the local community.

Next, the six main themes were compared by enrollment profile, i.e. majority undergraduate (up to 25–49% graduate students), high undergraduate (24%–10% graduate students), and very high undergraduate (<10% graduate students); the results are summarized in [Figure 6](#). Although all of the IEP universities had a research focus, most of them also were classified as either having high or very high undergraduate populations. The universities with the highest graduate population (i.e. those classified as only majority undergraduate) were more prominently represented in activities

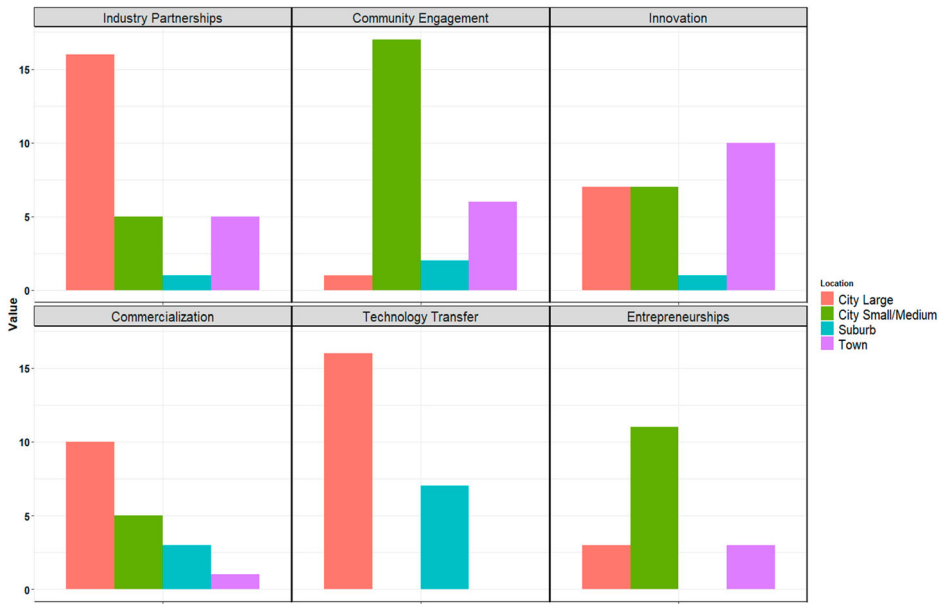


Figure 5. Frequency of dimensions reported by university degree of urbanization. While large city universities focus on industry partnerships and technology transfer, small and medium city universities focus on community engagement and entrepreneurship.

related to industry partnerships, commercialization, and technology transfer. These universities focus on leveraging ongoing research activities to promote advancement in these areas and to drive their economic engagement. The results also showed that universities with high or very high

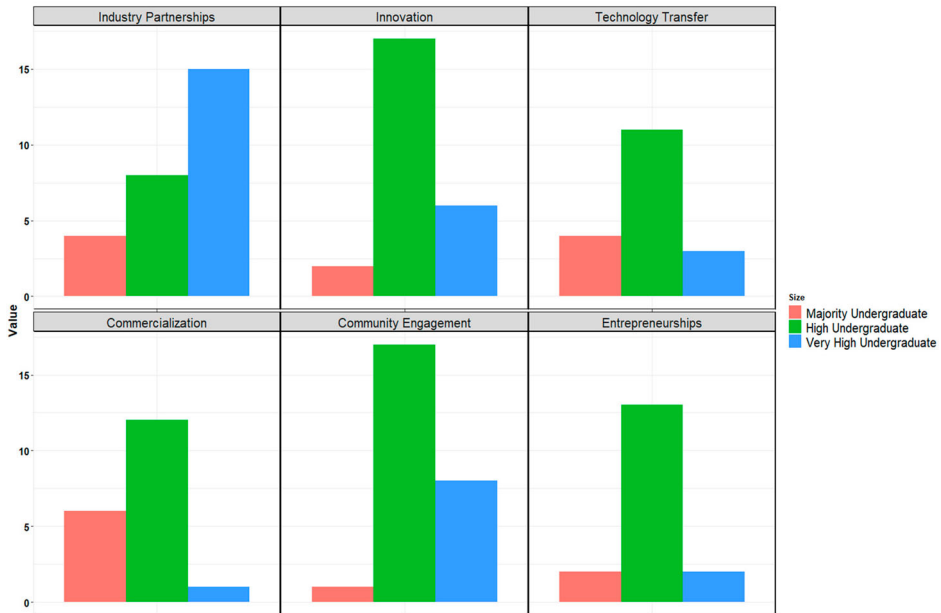


Figure 6. Frequency of dimensions reported by university enrollment profile. While very high undergraduate universities focus on industry partnerships and community engagement, universities with large graduate student populations (majority undergraduate and high undergraduate) focus on community engagement, innovation and commercialization.

undergraduate populations were more strongly represented in activities related to industry partnerships, community engagement, and innovation. A review of the coded data suggests that this is due to the increased need for internship opportunities and the importance of engaging local industry leaders in curriculum development and workforce development efforts in these institutions.

The results showed that universities located in both highly and low populated areas participate in industry partnership activities, with those in larger cities reporting a slightly higher rate, likely due to the increased access to potential partners. Further, IEP universities with lower undergraduate populations tend to focus more on leveraging research partnerships, while IEP universities with higher undergraduate populations focus more on educational program development and internship opportunities for students. Analysis of the community engagement activities showed that universities participated in this activity consistently, regardless of the type of community that they reside in. Most IEP universities were from smaller cities or towns; these universities reported focusing on community engagement, supporting previous claims that there is an increased importance of community support and interaction for IEP universities in small cities. It was often claimed that collaboration with other universities and available business partners enabled universities to better develop the local workforce and engage in the local economy.

Results regarding innovation activities show that all universities but those in suburban areas focus on leveraging innovation strategies to improve their economic engagement. The focus on innovation may be due to a lack of other opportunities such as fewer local partners, or due to the abundance of research and innovation that many of these institutions produce. This is another important gap as fostering an innovative culture in an undergraduate-focused institution may improve the transfer of innovation skills into the workforce.

The commercialization results suggest that public universities located in large cities are successful in obtaining funding from external sources to commercialize technologies developed from ongoing research. However, a comparable number of universities located in small cities and towns and those with 'high' or 'mainly' undergraduate populations are also participating in these activities. The wide use of commercialization may be due to the fact that all universities, regardless of location or size, ultimately can use commercialization of research to both encourage the growth of research itself and to improve funding. As funding can be used in a variety of ways to assist in any other strategy, this is essential in the growth of any university.

Similar to commercialization, the results show that IEP universities in large cities or suburban areas are more active in technology transfer activities. These universities report sharing their achievements with partnering institutions, such as other universities and business centers, to obtain funding and support for technology transfers. The larger size of the location of universities leads to more connections with those they would participate in technology transfer with. These collaborations between universities, communities, and industries encourage researchers within the universities to share their own findings; this brings additional opportunity including securing funding for faculty members or internships for students.

Finally, the results related to entrepreneurship show that IEP universities located in small cities are supporting start-up business from their partners as well as from internal stakeholders (i.e. researchers, students) through formal programs such as incubators. They also establish courses and programs within the universities so that students become familiar with the entrepreneurship process. Smaller cities are likely in periods of growth which may cause the university focus on starting new businesses in these areas.

Table 8 summarizes the six dimensions of UEE according to their characteristics based on Carnegie Classification as well as the associated APLU contributions.

Analysing the six dimensions of UEE according to three characteristics of the Carnegie Classification (i.e. basic classification, degree of urbanization, and enrollment profile) provides a better understanding of how IEP universities leverage these strategies to enhance their economic engagement. This can provide useful information that universities can use to design effective strategic plans for developing their economic engagement.

Table 8. Summary of the six UEE dimensions according to Carnegie Classification characteristics and areas of contribution

Strategies	Degree of Urbanization	Enrollment Profile	Related Activities	Economic Contribution
Industry Partnerships	Large cities	Very high undergraduate	Workforce development and technology transfer activities	Innovation and talent
Community Engagement	Small cities and towns	High undergraduate	Business and community development	Innovation and place
Innovation	Large cities	High undergraduate	Workforce development and technology transfer activities	Innovation and talent
Commercialization	Large cities	High undergraduate	Workforce development and technology transfer activities	Innovation and talent
Technology Transfer	Large cities	High undergraduate	Workforce development and technology transfer activities	Innovation and talent
Entrepreneurship	Small cities	High undergraduate	Business and community development	Innovation and place

Discussion

This research applied a Grounded Theory (GT) approach to investigate the main activities and strategies that 55 IEP universities use to drive improvement in their economic engagement and impact. The GT analysis identified six strategies that US research universities use to advance their economic engagement: industry partnerships, community engagement, innovation, commercialization, technology transfer, and entrepreneurship. In addition, as shown in Figure 7, the results show that IEP universities mainly focus on three main activity types to drive their economic engagement strategies: increasing institutional support and resources, leveraging partnerships and networks, and developing their education systems.

Each of these three major activities are associated with all six of the emergent themes of UEE. The development of education systems is the most common activity that IEP universities use for developing their industry partnerships, community engagement, commercialization, technology transfer, and entrepreneurship. This finding is aligned with previous research from Bercovitz and Feldman (2006) and Eun, Lee, and Wu’s (2006) on the crucial role of universities as a source of knowledge cultivation to grow regional and national economies. Bercovitz and Feldman (2006) created a framework that showed how universities can deploy their knowledge in an economically useful way to play a better role in growing regional and national economies. However, it is important to assess whether universities succeed in deploying their knowledge. The results of this study demonstrate that universities develop education activities, such as programs and courses, to support faculty, students, and members of the community in pursuing their ideas and ensuring the impact of their work.

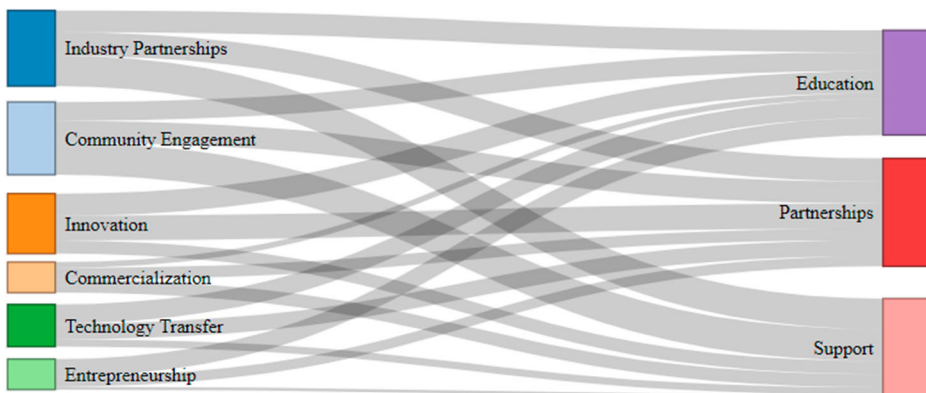


Figure 7. Summary of proportion of underlying strategies used to drive economic engagement in each of the six emergent themes.

Further, these activities can provide opportunities to support on-going research and the development of a robust workforce. In addition, developing the university's educational programs enable university researchers to better collaborate with representatives from relevant industries and communities to establish new research areas and enhance their role in economic growth.

Establishing partnerships (e.g. business, government agencies, community representatives, other universities, etc.) were also found to be connected with all six of the emergent themes. As mentioned by Sasson (2018), university partnerships with organizations, such as businesses, government agencies, community representatives, and other universities, are complex. As discussed previously, Hart and Northmore (2011) investigated the most common problems faced by universities when developing partnerships. The results show that partnerships can enhance university community engagement and ensure that the region's workforce needs are met. In addition, these partnerships are often reported to provide additional funding and opportunities to develop innovation, technology transfer, and entrepreneurship programs. This provides a clearer view on how US research universities leverage partnerships to advance UEE. In addition, this research categorized the universities based on their enrollment profiles and degree of urbanization, which helps to narrow the focus of possible approaches for other universities based on institutional characteristics. Furthermore, partnerships also help IEP universities to strengthen the connection between their on-going research and the needs of the industry in order to develop innovative research outcomes, transfer those technologies into industry, and commercialize the results.

Finally, generating and maintaining support for these activities was associated with all six emergent themes and consists of strategies to obtain funding and resources, as well as establishing formal infrastructures to support these activities. As with any major effort at a higher-education institution, proper support and leadership of these activities is critical for their overall success and impact. The results of this study showed that the reported establishment of infrastructure varied in sophistication, but the need for strategically managing these activities was clearly demonstrated.

Conclusions

The results of this analysis can be used as a guide for other universities seeking effective strategies to advance their economic engagement. As with all inductive, qualitative studies, the limitations of this research are centered on the sample and nature of the coding process, which were mitigated by selection of in-depth, self-study reports and use of team-based alignment exercises, respectively.

It was shown that there are six main strategies that US research universities use to advance their economic engagement along with three main activities: education, partnerships, and support (i.e. resources & infrastructure). The trends were further analysed to investigate the proportion of universities that reported activities related to each dimension, as well as the trends in the reporting universities based on the Carnegie Classifications related to base classification, degree of urbanization, and enrollment profile. Finally, the co-occurrence of strategies was investigated, which showed that improving IEP universities' education systems, collaborations and partnerships, and institutional support (i.e. resources and infrastructure), play an important role in developing their economic engagement. These results of this study identify six key dimensions of UEE that policy makers and university leaders can focus on to improve their own economic engagement. Further, the dimensions of UEE provide a framework to support future research into advancing the economic impact of universities.

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