

Promoting Knowledge-Based Entrepreneurship: A Comparative Study of Triple Helix Regional Outreach in Thai and UK Universities

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ABSTRACT

This article aimed to provide an empirical comparative study of university outreach of two selected universities, one from the UK and one from Thailand, for promoting knowledge-based entrepreneurship (KBE) in local enterprises. This empirical research was a comparative case study employing the triple helix (TH) model of university-government-industry collaborations to create the investigative boundary. This model has been utilized to promote knowledge-based economic development in countries worldwide, including the UK and Thailand. It helps foster economic development following the Industry 4.0 concept adopted in the two countries, in which innovation development and knowledge networks are the key drivers to add value to the economies. Public universities are expected to deliver knowledge through outreach and academic services to help encourage innovation development. However, little attention has been paid to examining how these work in the different systems of developed and developing countries. This qualitative grounded theory research used semi-structured interviews and documentary analysis as the data collection instruments. It was discovered that the UK and Thai universities could promote KBE in local enterprises through the TH regional outreach. However, the different systems led this study to find lessons Thailand could learn from a more developed system to enhance its performance. First, top-down TH implication was suitable for regional outreach for KBE promotion in small local agricultural enterprises. Second, systematic nonlinear institutional organization was essential for developing entrepreneurial university characteristics to help promote the TH implication for university engagement and outreach delivery.

Keywords: Industry 4.0, Knowledge-Based Entrepreneurship, Regional Engagement, Triple Helix Model, University Outreach

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Introduction

The notion of a knowledge-based economy is the basis for various economic development concepts, including Industry 4.0, which focuses on promoting economic growth with innovation (Jones & Pimdee, 2017; López-Gómez, 2021). Countries worldwide, developed and developing systems trying to become an innovative-driven economy, have widely adopted Industry 4.0 for their national economic

initiatives. Under the Industry 4.0 policies, firms of all sizes face challenges to become innovation-driven and recognized as a firm of knowledge-based entrepreneurship (Kanellos, 2011; Moutinho et al., 2016). Small firms with limited resources for research and development to move towards innovative businesses are recommended to tap into the knowledge transfer exchanges and networks to acquire new knowledge (Wiklund & Shepherd, 2003). Knowledge networks are therefore regarded as essential to help create knowledge-based business development. Public universities worldwide are expected to actively foster the success of these policies and play roles as knowledge sources, considering that new knowledge production is a vital key to innovation development required for building a knowledge-based economy (Mensah & Enu-Kwesi, 2018).

Concerning the importance of knowledge exchange networks in innovation development involved by the university, the government, and the public sector, this study adopted the triple helix (TH) model as the basis of its investigation. According to Etzkowitz (2002), a “triple helix” of university-industry-government is “a new institutional configuration to promote innovation.” Cucculelli et al. (2022) point out that this tri-lateral collaboration helps create the institutional hybrid organization to allow support from the government and universities to influence innovation development and knowledge-based entrepreneurial ecosystems for regional innovation systems.

Under the Industry 4.0 concept, creativity and innovation are acknowledged as the principal means by which regions foster economic growth and competitiveness (Etzkowitz & Zhou, 2017). University engagement is essential in regional development as it delivers new knowledge recognized as the critical element of creativity and innovation (Egeren & Laurie, 2022). For small firms, such as regional agribusiness, new knowledge can be obtained when the firm actively taps into knowledge sources, such as universities and entrepreneurial networks. Firms employing this strategy are known as knowledge-based entrepreneurs (Hamdani & Salah, 2018).

By focusing on local agricultural enterprises trying to obtain knowledge through regional networks engaged by local sources, such as regional universities and public authorities, this paper employs the triple helix collaboration model to lay a foundation for its investigation. The triple helix model is internationally recognized as a tri-lateral network and hybrid organization of three parties: academia, industry, and the state (Zhou & Etzkowitz, 2021). As empirically evidenced in countries worldwide, the model develops systematic knowledge transfer engaged by the university, industry, and government parties. Concerning this basis, researchers in countries worldwide have studied the implementation of Triple Helix in a diverse range of contexts, including Thailand (e.g. Chaisuwan et al., 2018; Chanthes, 2022; Nakwa & Zawdie, 2016).

Although the triple helix model has been adopted to promote innovation development in countries worldwide, little attention has been paid to examining how it works in the different systems of developed and developing countries. Additionally, public universities in these countries similarly acknowledge their roles to meet the expectations of both the government and private sectors. This paper attempts to address this gap by comparatively studying the university's role in different systems engaging in knowledge networks for promoting innovative business development. The research question of this study is addressed as “How does the triple helix model of collaboration promote knowledge-based entrepreneurship (KBE) development in regional agribusinesses?” This research project was a

comparative study of the UK and Thailand. It aimed to compare and then discuss lessons a developing system, such as Thailand, could learn from a more developed system of the UK selected for this comparative empirical study.

Research Objectives

1. To identify elements of knowledge-based entrepreneurship development in agribusiness through triple helix regional outreach and university engagement.
2. To compare the knowledge-based entrepreneurship development through triple helix regional outreach and university engagement in developed and developing systems.

Research Methodology

This empirical research was a comparative case study employing a qualitative grounded theory. The researcher conducted the study as follows:

1. Designing a Qualitative Multi-Site Case Study Research

This research project was jointly funded by two funding agencies, one from the UK and one from Thailand. The project aimed to comparatively study the role of public universities in the two countries as they deliver knowledge services to impact regional economic development. The researcher designed the study using a simultaneous and interactive approach (Yin, 2011), which allowed her to clarify the topic, the data collection method, and the data source in parallel, given the research focus identified. In the initial stage, in search of the research sites, the researcher reviewed public documents and official websites of various economic and educational authorities of the two countries. The researcher chose two universities as the research sites in two countries with different systems: the UK's developed system and Thailand's developing system, as classified by the United Nations (2017). This empirical study was conducted in both countries: the UK fieldwork was from January to February 2017, and the Thailand fieldwork was from April to May 2017.

The two universities were similar in terms of the institutional profile in their countries. The first university was a leading public UK university in North West England. Another university from the North East region of Thailand was also a leading public university in the country. The two regions similarly presented agriculture as their important economic sector. This study, therefore, chose local agricultural enterprises to include in the investigation as the "industry" partner of the triple helix model, while the two universities were regarded as the "university" or the academic partner (Etzkowitz, 2002). According to the specific selection of the research sites, this study was considered a multi-site case study. According to Cassell et al. (2021), case study research requires a bounded system for designing what is to be studied as it focuses on "the in-depth investigation of a phenomenon in its real-world context."

2. The Sampling Procedures and Data Collection

The central focus of this research was to examine the components of the KBE development through the university delivery of their regional engagement. Its unit of analysis was the engagement programs for promoting innovation development through the knowledge network collaborated by the three parties of the university, the industry, and the government, which is the fundamental concept of the triple helix collaborative model (Etzkowitz & Leydesdorff, 2000).

This study used a purposive sampling method for its data collection. According to Miles et al. (2014), purposive sampling is suitable for qualitative research, which usually works with small samples where the researcher selects the participants purposively based on the predefined selection criteria concerning the research objectives. The KBE concept focuses on entrepreneurial development through knowledge networks (Hayter, 2013). This research, therefore, precisely sampled such activities delivered by the management schools of the two selected universities.

In search of the sampling population, the researcher visited the official websites of the two selected business schools and searched for outreach programs to deliver academic services to promote the entrepreneurial development of local enterprises. The researcher thoroughly studied the details of these programs, which were publicly presented on the schools' websites, showing diverse engagement activities. Considering the triple helix model requires the inclusion of state or government support, the researcher specifically searched for activities that were either sponsored or co-organized by public authorities or funding agencies. Then, with the central focus on entrepreneurial development in local agricultural enterprises, regarded as an important economic sector of the regions of the two universities, the researcher ultimately sampled the data collection sources using the following criteria:

- 1) Outreach programs to promote entrepreneurship development.
- 2) Outreach programs to offer knowledge services for local or regional enterprises.
- 3) Outreach programs publicly advertised participants from local farming or agricultural enterprises.
- 4) Outreach programs publicly advertise academic members of staff leading the programs.
- 5) Outreach programs sponsored by or collaborated with public authorities or government agencies.

As a result, the researcher purposively selected six outreach programs for its investigation: three from the UK and three from Thailand.

3. The Grounded Theory Method (GTM)

This study employed the grounded theory method (GTM) for its investigation. According to Charmaz (2014), GTM allowed social researchers to construct a theory to explain the phenomenon grounded in the emerging conceptualized empirical data. The outcomes of the GTM method are either a formal or a substantive theory; the former requires a study in multiple settings to deliver a higher level of theoretical generalization, while the latter is usually a result of studies in specific contextual conditions, such as case studies (Merriam & Tisdell, 2015). Given that this research was designed as a case study with an investigative boundary, as outlined earlier in Figure 1, its results were considered a substantive theory. This type of GTM result is a hypothetical explanation applicable to specific research settings and cases with specific contextual conditions (Merriam & Tisdell, 2015).

The researcher collected the primary data using semi-structured interviews. Semi-structured interviews are suitable for qualitative data collection as they allow the researcher to use prior questions given the research inquiry and ask open-ended questions to enable the participants to provide their views freely (Creswell & Creswell, 2017). Following the ethical approval granted by the internal review board (IRB) of the Educational Research Department of Lancaster University, the host institution of this international research project, the research invited interview participants from the university and

industrial sectors to provide the available information on the official website indicating the responsible academics and the participating businesses and enterprises of the outreach programs. For the government, only the information for sources of financial support was provided. Considering the limitation, the researcher did not invite government officials as the interview participants. Nonetheless, the researcher employed the data triangulation technique and used multiple data sources to strengthen the qualitative data analysis and interpretation (Denzin & Lincoln, 2017). Secondary data sources included funding details, project reports, and public information provided on relevant official and university websites. Details of the 16 interview participants are presented in Table 1 and Table 2.

Table 1 Interview participants (the UK site)

Participant	Profile	Profession	Organization
1	Senior university manager	Director of Engagement	University
2	University engagement staff	Engagement Liaison	University
3	Senior academic	Professor of Entrepreneurship	University
4	Mid-career academic	Senior Lecturer of Management	University
5	Early-career academic	Lecturer of entrepreneurship	University
6	Family business	Owner/manager	Dairy farm
7	Community enterprise	Manager	Organic vegetable farming
8	Local farming business	Owner	Livestock

Source: the author.

Table 2 Interview participants (the Thailand site)

Participant	Profile	Profession	Organization
1	Senior university manager	Director of Engagement	University
2	University engagement staff	Engagement staff	University
3	Senior academic	Associate Professor of Engineering	University
4	Mid-career academic	Assistant Professor of Accounting	University
5	Early-career academic	Lecturer of Marketing	University
6	Local cooperative	Owner/manager	Handcrafted cotton fabric
7	Community enterprise	Manager	Organic rice
8	Local farming business	Owner	Rubber farming

Source: the author.

This study employed GTM coding for its data analysis and method with the steps outlined in Figure 1. It started from the lowest to the highest conceptualizing levels, namely open coding, axial coding, selective coding, and theoretical coding, respectively (Corbin & Strauss, 2012). Following these coding steps, this multi-site case study delivered the research results as a substantive conceptualization explaining the university engagement in the triple helix collaborative model to deliver the KBE development in local agricultural enterprises. The following section will present these results.

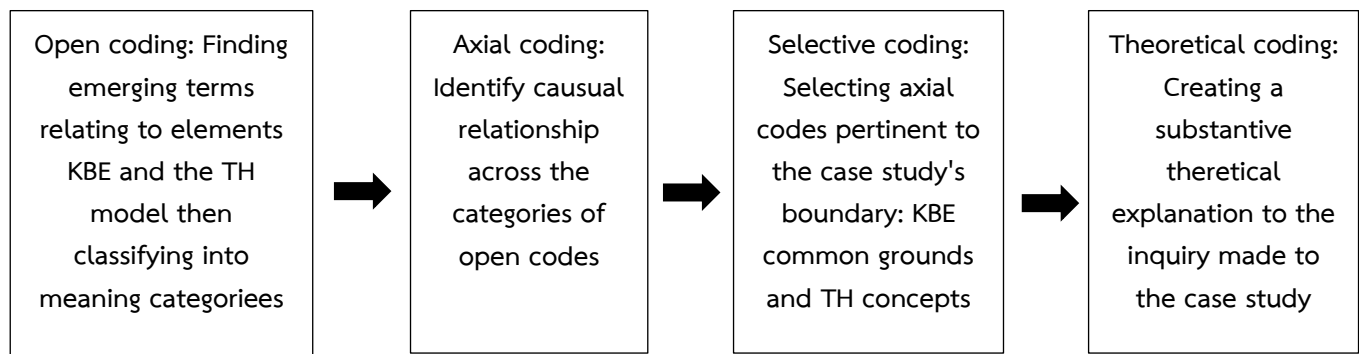


Figure 1 The steps of coding for grounded theory data analysis

Source: designed by the author based on Charmaz (2014) and Corbin & Strauss (2012).

The Conceptual Framework

Concerning the scope of this research being bounded within the KBE and the triple helix model concepts, the bounded system of this multi-site case study is outlined in Figure 2

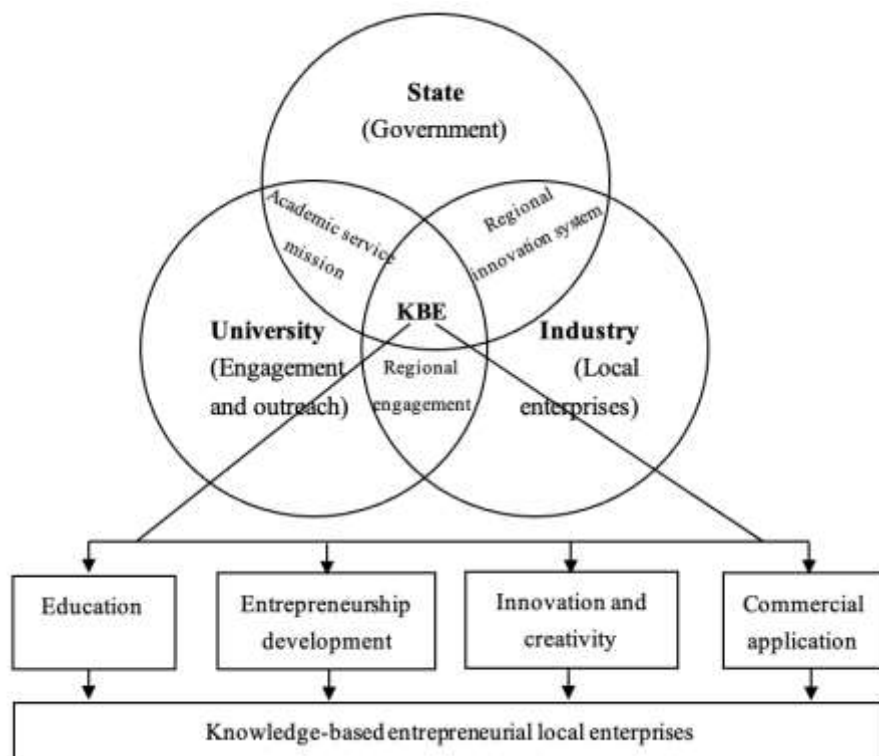


Figure 2 The case study's bounded system depicting the conceptual framework

Source: illustrated by the author, based on the KBE common grounds suggested by Akuhwa et al. (2015, p.466) and the triple helix model by Etzkowitz and Leydesdorff (2000, p.111).

Note. KBE denotes knowledge-based entrepreneurship. This framework hypothetically outlines that the triple helix model comprises three bilateral relations of the participating parties initiating the organizational interactions relating to the academic service mission, the regional innovation system, and regional engagement. Then these relations function as a precursor of the tri-lateral synergy all three parties engage to result in KBE development. The underlying hypothesis is that if the KBE elements are found in all the intersecting spheres of the TH model, there is the existence of the KBE development in the university outreach to be examined and evaluated.

As outlined in Figure 2, the triple helix model is a tri-lateral hybrid network of university-industry-state collaboration for innovation development (Etzkowitz & Leydesdorff, 2000). Given that this study focuses on employing this model for KBE development, the model creates four intersections for innovation development: three bilateral relations and a central tri-lateral collaboration, creating the KBE development sphere.

The first bilateral relation is between the university and the state; they relate via the academic service mission, one of public universities' three fundamental missions: research services (Egeren & Laurie, 2022). Secondly, the state relates to the industry with public innovation promotional policies. The recent national economic development schemes in the two countries are both based on the Industry 4.0 initiative; that of the UK is known as "made smarter" (López-Gómez, 2021), and that of Thailand is "Thailand 4.0" (Jones & Pimdee, 2017). Both schematic policies suggest creativity and innovation as the key economic driver. The final bilateral relation is regional engagement, which links the university to its region's industrial sector or local enterprises (Benneworth & Fitjar, 2019). Examining these bilateral relations was required as "a precursor to trilateral interactions" Etzkowitz (2002, p.13), which this study then scrutinized for the elements of the KBE common grounds. This study follows Akuhwa et al. (2015) in choosing the four common grounds for developing the KBE concepts: (1) education, (2) entrepreneurship development, (3) innovation and creativity, and (4) commercial application.

This research chose a qualitative approach because it required an in-depth investigation of the interactions of participating parties in the identified spheres of the case study's bounded system. Miles et al. (2014) recommend qualitative methods as suitable for studying a phenomenon nested in the defined specific context, and the aim is to study in-depth the research inquiry. Therefore, The qualitative approach was suitable for this study for scrutinizing the KBE elements and the complex collaborative mechanisms of the hybrid organization of the triple helix model.

Research Results

1. Elements of KBE Development in Agribusiness Through University Outreach and Engagement

Following the GTM coding procedure, the research constructed results based on the open, axial, selective, and theoretical codes as defined earlier in Figure 1. These codes were organized to serve the presentation purposes, see Table 3. Also, throughout the coding procedure, the GTM required the researcher to constantly revisit its literature review to analyze the conceptualization of its data with those already discussed in previous studies and the existing knowledge in the related fields (Chanthes, 2023; Charmaz, 2006). Given the case's investigative boundary, as outlined earlier in Figure 2, the researcher performed the procedure focusing on the practical implications of the KBE and TH concepts.

Table 3 Elements of KBE emerged from the empirical evidence from both UK and Thailand sites

KBE common grounds ¹	The bilateral relations ²			The trilateral interactions ² (university-industry-government) for KBE development
	Academic service mission (university-government relation)	Regional innovation system (government-industry relation)	Regional engagement (university-industry relation)	
Education	Disciplinary knowledge services	Regional innovation policies	Outreach and engagement delivery	1. Research-based academic services 2. Knowledge exchange networks for regional innovation development
Entrepreneurship development	Business relations	The Industry 4.0 paradigm	Knowledge-based economy	
Innovation and creativity	knowledge transfer networks	Supports and resources	Research-based outreach	
Science and Technology	Academic entrepreneurship	Public-funded research and development (R&D)	Knowledge commercialization	3. Systematic institutional organization for university outreach delivery
Commercial Application	Social capital experience	Innovation promotional schemes	Entrepreneurial university characteristics	

Source: the author, based on the GTM data analysis procedure for examining the empirical data while constantly revisiting the related literature in the fields.

Note. ¹ As guided by Akuhwa et al. (2015).

² As guided by Etzkowitz (2002), who suggests that the bilateral relations form a precursor for the trilateral intersections in the center of the TH collaboration.

The terms shown in Table 3 under the column bilateral relations are the categories of open codes from the GTM open coding that emerged from the empirical data. The organization of rows and columns is based on the axial codes conceptualizing the KBE and TH evidence that emerged from the data. The matrix of the roles and columns guided the selective coding as the researcher scrutinized the evidence from the UK and Thailand hypothetically. Finally, the trilateral interactions were formed as the theoretical conception for KBE development through the triple helix collaboration. This coding level was based on the selective codes confirming the existence of KBE regardless of the different contexts of developed and developing systems. Based on this coding construction, the researcher also analytically compared the empirical results nested within the two research sites' different contexts and engagement practices.

The final process of the GTM data analysis led the researcher to develop a substantive theoretical explanation comprising three factors signifying the university outreach to deliver knowledge services to promote the KBE development through the trilateral interactions of university-industry-government: (1) research-based academic services, (2) knowledge exchange networks for regional innovation development, (3) systematic institutional organization for university outreach delivery.

1.1 Research-Based Academic Services

Both the UK and Thai universities regarded the service mission as obligatory concerning their “public university” status. They acknowledged that the government and the general public expected them to impact societal and economic development. The research findings showed that the academic service mission of both research sites filled the KBE common grounds with disciplinary knowledge and services, business relations, knowledge transfer networks, academic entrepreneurship, and social capital experience. However, their perceptions towards the knowledge production for serving this role differed: the Thai university performed their service following the traditional Mode 1 concept for knowledge production. In contrast, the UK university followed the Mode 2 university characteristics as Scott (2020) explains; Mode 1 universities focus on political and organizational evolutions as higher education teaching and scientific research institutions with academic service seen as the third mission. Mode 2 universities, on the other hand, while focusing on academic and scientific knowledge, also focus on more profound socio-economic, technological, and cultural changes.

The research results showing the different perceptions support Nakwa & Zawdie (2016) that seeing academic service as the third mission is a constraint to the TH development in Thailand as it was the prevalence of limited networking experience and weak social capital among the triple helix actors. On the other hand, the Mode 2 perception of the UK university supports Etzkowitz & Leydesdorff (2000) that this concept promotes entrepreneurial university characteristics in public universities in most developed systems and allows them to develop nonlinear innovation models for TH collaborations. According to Kalar & Antoncic (2015), entrepreneurial universities value strong ties to industry and encourage the entrepreneurial activities of their academics. This paper, therefore, suggests a lesson the Thai university may learn from the UK university regarding the academic service mission: it is recommended to move towards the Mode 2 university to promote entrepreneurial academics, which are essential elements for promoting KBE of the regional industry and the TH collaboration.

1.2 The Knowledge Exchange Networks for Regional Innovation Development

The study results showed that the academia of the UK and Thai universities recognized the institutional support to help promote the regional innovation systems (RISs) under the National Industry 4.0 scheme. Given the focus of this project examining the outreach programs delivered to promote the KBE in local agricultural enterprises, the two universities met the public expectations for their roles. This study discovered the KBE common grounds in the findings, which helped shape the TH model of the universities, including the acknowledgement of the regional innovation policies, the Industry 4.0 paradigm, supports and resources, activities involving publicly funded research and development (R&D), and their engagement in innovation promotional scheme.

Despite the two universities playing a role in the knowledge exchange networks of their regional innovation development, however, the Thai university appeared to show less entrepreneurial university characteristics than the UK university concerning that their institutional structure for outreach and service did not support nonlinear innovation models, which Etzkowitz and Leydesdorff (2000) suggest as suitable for the TH collaboration for innovation development. The Thai university was trapped in the perception of seeing academic service as “the third role” mission having less significance and separate from the other two missions, teaching and research. Chanthes & Taylor (2010) points out

that most Thai universities commonly express this perception. In addition, Nakwa & Zawdie (2016) regard the view towards service as a constraint for Thai universities to interact in the institutional spheres of the TH collaboration. As a result, outreach activities in the Thai university depended mainly on individual experiences based on personal connections between the interacting entities, such as individual academics and the farmers. See an example illustrative quote as follows:

“Only those who personally want to join the project would do it [outreach project]. We have a heavy teaching workload already. Take me as an example. I teach six classes per week. I started delivering this program [accounting consultation to a local handcrafted cotton fabric cooperative] because I knew the manager. She asked if I could help her with the accounting system, so I agreed to help at no cost because she is a good friend of mine. Then, I claimed in the record of my KPI [the institution's key performance indicators recorded as part of the academic evaluation]. Luckily, a colleague at my [Management] school told me that the UIC (University-Industry Cooperation Center) offers some public funding. So I applied and secured some financial support for the project under the scheme.” (An Assistant Professor of Accounting from Thailand).

Compared to the results from the UK university, the knowledge-exchange networks for regional innovation development could be constructed based on not only individual experiences of the academics or personal connections; there were also activities initiated from the support initiatives of the university. See an example illustrative quote as follows:

“We offer various supports or the academics. We have a variety of connection channels to promote them to engage with the industry and the public sectors. Sometimes, we got contacted by the academics and others by the departmental staff who worked on such projects. We also organize business matching events to connect those businesses to our academics. We also have engagement liaisons who do a great job creating connections with the public and private sectors. We have thirty staff working in this office [at the institutional level].” (The Director of Engagement from the UK).

1.3 Systematic Institutional Organization for University Outreach Delivery

The two universities had an institutional workflow for academic service delivery. The research findings showed that the academic service mission of both research sites filled the KBE common grounds with outreach and engagement delivery, the attention to a knowledge-based economy, the performance of research-based outreach, the ability of knowledge commercialization, and entrepreneurial university characteristics. However, due to the less entrepreneurial university characteristics, the Thai university showed limited capacity to systematically manage the university outreach at both the institutional and departmental levels in a nonlinear pattern.

Findings from the UK university showed that the Engagement Department of this university had a 17-year history of developing the entrepreneurial organized institutional structure for engagement. Similar to the entrepreneurial university characteristics suggested by Kalar & Antoncic (2015) and Olo et al. (2019), this university created an organizational structure to allow entrepreneurial actions of its academics and staff to work non-linearly and creatively to engage and make impacts on the regional development. The Engagement Department was established in 2000 and only dealt with GBP20,000 per year engagement funding with a handful of regional industrial partners. Over the years, the university has put significant efforts into promoting industrial collaborations, sponsored by both

external financing, such as public grants and public fundraising schemes, and internal sources, such as social enterprise funds. In 2017, which was the UK fieldwork of this study, the department oversees hundreds of engagement and outreach projects with an accumulative of two million pounds per year.

This type of entrepreneurial university engaged in the TH model is recognized as a Mode 2 university (Etzkowitz & Leydesdorff, 2000; Leydesdorff & Ivanova, 2016). This paper, therefore, discusses the area of improvement for the Thai university as the institutional development to become a Mode 2 entrepreneurial university. As Etzkowitz & Leydesdorff (2000) emphasize, networking and Mode 2 entrepreneurial university are the critical features for successful TH collaboration performance. This paper, therefore, recommends a lesson the Thai university may learn from a more developed system of the UK that it should design and construct an institutional workflow to support a more systematic nonlinear model for innovation, known as a systematic hybridization of collaboration (Etzkowitz, 2002), with suitable staffing of supporting engagement personnel.

2. Comparing the KBE Development through Triple Helix Regional Outreach and University Engagement

The empirical evidence showed that university engagement delivered by the studied UK and Thai universities showed the capability to promote KBE in local agricultural enterprises through the triple helix collaborative model for university engagement. This study discovered essential elements of four KBE common grounds, namely education, entrepreneurship development, innovation and creativity, and commercial application (Akuhwa et al., 2015), in both universities. Also, the studied “industry” part, or the six local entities of this study, showed a positive recognition of entrepreneurial improvement as they engaged in the outreach; they all confirmed the enhancement of the three indicators of knowledge-based firms, as suggested by Kanellos (2011): innovation, growth, and competitiveness. See examples of illustrative quotes as follows:

“I have joined the EiR [Entrepreneurs in Residence] for three years. Every month, the [Management] school organizes a forum inviting experienced academics and EiR members, and sometimes postgraduate students, to join a talk about interesting business management and economic issues. These events are beneficial for meeting people. They also organize training programs from time to time, about three or four trainings annually, which are good too. Joining the program is beneficial for my business. I learned new techniques through not only those useful training but also the meeting with many experienced people.” An owner/manager of a dairy farm from the UK

“I started this organic community about seven years ago. At first, we only had five members struggling to grow the rice correctly to meet the organic standard as we wanted to register for the Certified Organic Production certificate. Then, in the third year, these academics came. They offered various help with farming and business management at no cost. They said the services were part of their government-funded research project. After these years, thanks to their initiation during the first three years since we met, we now have 45 membered farmers, already awarded the certificate, and the sales have been growing since. With their continuous help, we even started advertising and selling the rice online recently.” A manager of an organic rice community enterprise from Thailand.

The findings showed supportive KBE elements in both studied universities from Thailand and the UK. Furthermore, the evidence showed similar challenges they faced regardless of the different

systems that the research-based services were often initiated from the “academia” part. Most agricultural research-based services and outreach were awarded financial support under the schemes imposed by the funding bodies, such as the Department for Environment, Food & Rural Affairs (DEFRA) of the UK, the Thailand Research Fund (TRF), and the Ministry of Agriculture of Thailand. This finding was consistent with Etzkowitz (2002), who recognizes a top-down normative implication of the triple helix model in Europe, where the policy measures encourage the role of academia, industry, and government.

According to the Etzkowitz (2002), another way to employ the model is the bottom-up TH collaboration. This alternative is commonly adopted in the US that the industrial sector, including the agricultural industry, shows the capacity to be the technical leader in initiating TH collaborations (Etzkowitz 2002). By comparing the two alternatives, the top-down and the bottom-up TH model, this paper recognized that the TH model engaged by the local agricultural sector in the UK and Thailand similarly favoured the top-down practice due to local enterprises' limited capacity to lead the development of science and technology. Additionally, as evidenced in this study, the KBE was found to be a supporting collaborative form allowing the regional university to lead technical development under the updated national schemes.

Discussions

This research discovered that the top-down TH model, rather than the bottom-up approach, was found to be similarly suitable for the studied UK and Thailand contexts. This finding was based on the critical condition that the latter approach requires the industrial sector to lead the innovation development. Regarded as an essential lesson learnt from a more developed system such as the UK, the top-down model could practically be employed in such a developed system for the success of TH collaboration for promoting innovation development; agreeing with Etzkowitz (2002), this TH implication was suitable when the industrial partner in the TH collaboration appeared to have limited research and development resources. Such partner was small local agricultural enterprises such as the selected industry of this comparative study, which this paper has delivered its findings.

However, considering that academia, rather than industry, led the collaboration for innovation development, this paper discusses the possible challenge of the top-down TH model to develop a strategic practice to focus on problem-based outreach. It, therefore, suggested that the university outreach and engagement to help build KBE should have access to knowing the needs of the industry views as the basis for the program development. As Puangpronpitag (2019) points out, outreach and engagement programs targeting engagement with regional farmers or local community enterprises should cultivate personal references with leaders of the farmers' communities to gain access to their needs for innovation development. Similar to another study by Chanthes & Sriboonlue (2021), whose study examines the triple helix implication for KBE promotion in organic rice community enterprises in Thailand, such initial connections could help create a trust to allow the farmers to share their knowledge needs with the academia, who should then be able to develop prominent funding proposals to sponsor their research-based outreach programs, given the imposed financial support sources.

Furthermore, this paper also supports Nakwa & Zawdie (2016) that such personal reference is crucial to attracting the industry to participate in the TH collaboration.

By critically comparing and discussing the results from the UK and Thailand, this study agreed with studies from Portugal by Moutinho et al. (2016), from Thailand by Chanthes (2022) and from European countries by Kalar & Antoncic (2015) that systematic nonlinear institutional organization was essential for developing entrepreneurial university characteristics to help promote the TH implication for university engagement and outreach delivery. This empirical evidence from the UK, which this paper recommends as one of the lessons Thailand could learn from a more developed system, is that the construction of such a nonlinear and holistic systematic organization takes time.

Bearing in mind that public universities in Thailand are obligated to engage and contribute to promoting the knowledge-based economy under the Thailand 4.0 policy, this paper, therefore, motivates not only the Thai university of this research but also other Thai universities outside of this case study to design and construct an entrepreneurial approach to promote systematic outreach management. As evidenced in this study, such an efficient workflow helped the UK university to go from delivering regional engagement of GBP20,000 to multi-million pounds annually in less than two decades.

Originality and Body of Knowledge

This paper recommends areas of improvement for constructing a systematic workflow for outreach and engagement. Considering the research results showing the differences in systematic workflows in the studied UK and Thai universities, this paper suggests areas of development for Thai universities to escape from the third mission trap by learning from a more developed system, such as the studied UK university, to construct a more systematic institutional organization to promote outreach delivery. It recommends to a broader extent that Thai universities must develop towards the Mode 2 university to create entrepreneurial university characteristics. It agrees with Etzkowitz & Leydesdorff (2000) and Mensah & Enu-Kwesi (2018) that promoting TH collaboration in university outreach delivery requires a supportive institutional structure constructed with outreach support units, vertically and horizontally and at both central institutional management and departmental levels.

The enhanced system work is also expected to help eliminate the problem of developing country syndrome caused by the lack of horizontal system work (central level and departmental level) across the university (Yokakul & Zawdie, 2009). Learning from UK findings, the work system construction is recommended to include the following departments as the guidance for the Thai universities to adapt to suit its contexts: engagement office, innovation management office, pre-award and post-award office, and legal support office. Engagement personnel such as engagement liaison is also recommended at both institutional and departmental levels.

Conclusion

This paper confirmed that public universities in both developed and developing systems indifferently presented the promising capability to meet the social expectations for academic services to contribute to regional innovation policy based on the Industry 4.0 initiative. The study results suggest that both countries could implicate knowledge-based entrepreneurship knowledge to promote their

regional economic growth by encouraging their public universities to engage with innovation development by targeting the foster of KBE in local enterprises. Furthermore, by comparing the empirical results from the UK and Thailand, this paper also recommended two critical lessons the Thai university could comparatively learn from the UK university to help promote its engagement performance: first, KBE is suitable for top-down TH implications for regional agricultural entrepreneurial development; and second, a systematic institutional organization for outreach and engagement is essential to promote the regional innovation systems.

Limitations of this research concern the qualitative method and the specific context of the studied case universities and its focus on analyzing the university engagement involving local enterprises in agricultural industries and the implications of the results. The result implementations must bear in mind differences across different industrial contexts, which could impact the explanations this paper offered in the broader range of industrial contexts; the findings' implementation needs to consider the attributes of the universities' specific institutional, regional, and national profiles.

Another limitation concerns the common practice of qualitative research; the researcher conducting the data collection and analysis functioned as part of the research instrument (Corbin & Strauss, 2012). This study is, therefore, inevitably criticized for possible researcher bias (Charmaz, 2014). The researcher, therefore, followed Charmaz's (2014) recommended technique to help increase the theoretical implication of findings in a broader context; a constant comparison procedure was carried out through the GTM analysis process to allow the researcher to repetitively compare the emerging theory from the empirical evidence with those in the related literature to help link its data interpretation and conceptualization to the knowledge in the field.

Therefore, despite this limitation concerning its purposive sampling of the selected case sites and the sampled local agribusinesses and interview informants, the research implication could be extended to other universities outside the sampled universities. Further research implementation could be assembled given the constructive results on the elements of the TH model and KBE concepts, which could be universally shared across the research community in the disciplinary area. The research results from this paper have delivered a substantive grounded theory that could be utilized as the conceptual framework for future studies investigating the interconnecting implications of regional university outreach, KBE, and the TH model to a broader extent.

Recommendations

1. Policymaking Recommendations

This paper has pointed out two essential keys to success for KBE promotion in local agribusinesses through the TH model: top-down TH implication and systematic nonlinear institutional organization of participating partners of industry-university-government. It, therefore, recommends that the policymakers focus on constructing a more systematic organization of TH development for the outreach of Thai universities. Despite indicating the lack of nonlinear organization as an area of improvement for Thai universities, the empirical evidence of this paper confirmed the basis of institutional support for academic service delivery at the institutional level provided to all academic departments. Therefore, it suggests that universities in Thailand have the potential to simultaneously

develop to move from traditional Mode 1 towards Mode 2 entrepreneurial universities while constructing the hybridization of practical TH systems for a broader range of academic disciplines.

2. Recommendations for Future Research

This paper suggests future studies to adopt the three identified elements of KBE that emerged in the triple helix model employed in university outreach, as suggested by this paper, to validate their practical implementation and generalization in promoting the development of local enterprises of the study findings, which was a substantive theory resulting from the empirical boundary of this grounded theory research. This paper recommended future research to investigate further practical strategies to promote research-based academic services, the knowledge exchange networks for regional innovation development and the construction of systematic institutional organization for university outreach delivery as the drivers to promote the TH model for KBE development in local agribusinesses.

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