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# Role of Universities in Promoting Innovation Policy in Southeast Asian Countries

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**ABSTRACT**

Universities have been widely acknowledged as knowledge producers, contributing to innovation worldwide. They lead in doing research and development (R&D) activities and commercializing R&D outputs to the market. The role of a university is also that of a producer of knowledge for innovation policy. Even so, the university's role in promoting innovation policy is rarely founded in scientific publications. This study is aimed at explaining the role of the university in promoting innovation policy by comparing three countries in Southeast Asia, namely, Thailand, Malaysia, and Indonesia. Three countries were called the "Asian Tiger" in the 1965s, but they have different economic growth rates currently. Thailand and Malaysia are categorized as upper-middle economies, while Indonesia is still a lower-middle economy. This study uses a post-positivistic approach through explanatory and comparative analysis methods. Data were primarily collected from works of literature combined with limited interviews with three informants. The study found that countries with specific study courses in innovation policy at universities, like Thailand and Malaysia, have a higher innovation index rank compared to countries that do not have that course, like Indonesia. This research contributes academically to filling a gap in innovation policy studies and contributes practically to providing policy suggestions to stakeholders in Indonesia.

## I. INTRODUCTION

Numerous studies have revealed the importance of the role of universities in producing knowledge outputs like publications, patents, and prototypes, leading those outputs to the commercialization process (Martin, 2010; Ivanova & Leydesdorff, 2014). Innovation per se is the business activity that converts research and development (R&D) outputs from universities into marketable products (Balachandra et al., 2010). It is the first linear mode of innovation in which the university and business are two entities in creating innovation, with technology pushed by the university and technology pulled by the business (Martin, 2010; Nugroho, 2021; Kurniasih, 2022).

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Several countries have accelerated economic development by optimizing universities' roles in producing science and technology (S&T). Therein lies the popularity of the term knowledge-based economy (KBE). The term KBE refers to how a country can improve economic growth without merely depending on existing natural resources but rather on accumulated science and knowledge asset capital (Schiliro, 2012). The prosperous countries implementing KBE are the newly industrializing economies (NIEs) like South Korea, China, and Taiwan (Kim & Nelson, 2000). KBE involves universities, businesses, and the government as stakeholders. Three actors are commonly called the triple helix model, which means the intersection collaboration of academicians (A), business (B), and government (G) (Ivanova & Leydesdorff, 2014; Guerrero & Urbano, 2017).

In the triple helix model, universities play a role as S&T producers, businesses play a role as S&T users, and the government plays a role as an intermediary and facilitator to bring knowledge from universities to business (Ivanova & Leydesdorff, 2014). In this model, universities satisfy the business demands of commercialized R&D products. They can adapt regulations and science-technology-innovation (STI) programs issued by governmental agencies, and henceforth it is called innovation policy (Asmara & Kusumastuti, 2021). STI, or Innovation policy, is a critical governmental effort to nurture an innovation climate and remove barriers to innovation, leading to regional economic growth (World Bank, 2010). This policy is not part of the government's role as a stakeholder; instead, it needs robust university support to create an innovation system in a country. It is the first role of the university to promote STI, or innovation policy.

The second role of universities is as a knowledge provider for their innovation policies. The widely acknowledged, innovation policy planned and implemented by government agencies is not separated from political decisions (Chaminade & Edquist, 2010). Indeed, innovation policymaking is part of the political process, involving many interest groups dispersed among political groups, businesses, government agencies, non-government organizations (NGOs), and academicians (Mohamed, 2021). A government should consider technology push by academicians and market pull by businesses as inputs in innovation policymaking and accommodate various inputs derived from multiple actors, including political actors (Chaminade & Edquist, 2010; Mohamed, 2021). Therefore, the second role of universities is expected to be to provide the potent substance of knowledge as evidence in policy-making; henceforth, it is called evidence-based policy (EBP) (Sutcliffe & Court, 2005). In this role, universities are a think tank for innovation policy (Seo et al., 2021).

The first role of universities in the triple helix model has become a complicated problem in developing countries (Asmara & Kusumastuti, 2021; Sarpong et al., 2017) and is perceived as an "unaffordable luxury" (United Nations, 2021). Similarly, the second role of universities as think tanks for innovation policy is emerging issues in Asian countries (Asian Development Bank, 2013; Seo et al., 2021). The second role of universities is very limited to studying in Southeast Asia countries (ASEAN). This study uses Thailand, Malaysia, and Indonesia as research sites in Southeast Asia. They were called "The Asian Tiger" since the significant economic growth during 1965-the 1990s (Kozlova & Noguera-Santaella, 2017). Notwithstanding, The Asian Tiger's growth is strikingly different; Thailand and Malaysia are classified as upper-middle income groups, and Indonesia as lower-middle income groups (WIPO, 2022).

Studies of how universities play a role in the triple helix model in ASEAN countries have been published in varying degrees (Asmara & Kusumastuti, 2021; Ghazali & Martini, 2012; Naser et al., 2017; Puangpronpitag, 2019). The presence of universities as policy think tanks is critical to supporting the innovation system (Seo et al., 2021). Unfortunately, no study discusses how universities play a role as a think tank for STI or innovation policy in Thailand, Malaysia, or Indonesia. Hence, this study fills the gap above academically. Think tanks are professional groups doing activities as policy knowledge producers and delivering them to decision-makers (Cheney et al., 2016). In this term, the role of universities as think tanks for innovation policy is closely

related to how many universities in each country have a specific course in innovation studies, especially in innovation management and policy studies. And then how can those universities produce and deliver knowledge of innovation policy to stakeholders in each country? Based on two specific focuses on the second role of universities, this study proposes two questions as follows:

1) What courses on innovation management and policy studies do universities in Thailand, Malaysia, and Indonesia offer?
2) How do universities produce and deliver knowledge of innovation policy to stakeholders in Thailand, Malaysia, and Indonesia?

This study proposes two alternative goals to answer the two questions based on comparative and explanatory research methods, which will be described in the next part. Firstly, this study is aimed at comparing and explaining the current status of universities in Thailand, Malaysia, and Indonesia in terms of a specific course of innovation management and policy. Identifying the position and role of the university in contributing to innovation policy in each country is essential. Secondly, this study is expected to find appropriate ways for universities in each country to produce and deliver knowledge to stakeholders. It is necessary to make robust innovation policy-making by comparing and explaining the cases of Thailand, Malaysia, and Indonesia. However, this study course empirically relates to the importance of universities as critical actors in generating and sustaining evidence-based innovation policy. Particularly for Indonesia, it is aimed at providing scientific input for stakeholders in pursuing economic lag from Thailand and Malaysia.

## II. ANALYTICAL FRAMEWORK

### A. Role of University in Promoting Innovation

The university is identical to an education center, where senior or vocational high school graduates continue their education degrees at the undergraduate, graduate, and doctorate levels. Recently, the role of a university has not been limited to an education center but to an R&D center and an entrepreneurship learning center. As the R&D center (Sakapurnama et al., 2020) mentioned, universities are an integral part of the creation of innovation because they not only produce R&D outputs like scientific publications, patents, and prototypes. Indeed, the R&D outputs of universities are directed to fulfill educational and industrial needs as well.

As an entrepreneurship center (henceforth called an entrepreneurial university), universities can develop entrepreneurship principles based on KBE (Sakapurnama et al., 2019). It is tightly related to the university as an R&D center and the university as an entrepreneurship center. Universities can develop new business models, bear new start-up units, deliver R&D outputs to the business, and do business activities related to KBE (Sakapurnama et al., 2020). Several universities are pushed to produce marketable R&D outputs as entrepreneurial universities. Of those outputs, universities are expected to have many patents, licenses, new start-up units, and others contributing to economic growth (Perkmann & Walsh, 2007; Sakapurnama et al., 2020). The entrepreneurial university plays a prominent role in promoting KBE in a country.

As an R&D center and entrepreneurial university, the role of universities is related to the interlinking among universities, industry, and government in creating innovation. The linkage of academics, business, and government (ABG) in creating an innovation system is called the Triple Helix Model. This model delineates that innovation can occur at the intersection of roles among ABG actors (Carayannis & Campbell, 2010). Universities are the knowledge suppliers, businesses are the ready-use knowledge users, and the government is the knowledge broker, functioning to facilitate needs between universities and industries or users and minimize emerging problems between universities and industries (Asmara & Kusumastuti, 2021). In this context, universities play a leading role in producing basic and applied knowledge profusely, as well as providing R&D outputs to users.

Users of universities are widely defined and are not limited to industries. Another role of the university in promoting innovation is as a knowledge producer for the policy itself, it is known as a think tank. Not all study courses offered by universities can function as think tanks. This role is limited by specific study courses dealing with the closeness of stakeholders. According to Mc Gann (2016) and Shaw et al. (2015), think tanks generate accumulated ideas from scientific and robust evidence, disseminated to targeted stakeholders, particularly in related policy areas. Cheney et al. (2016) describe think tanks as professional groups doing research activities, data analysis, and project assessment to make policy solution alternatives based on scientific evidence and deliver them to decision-makers.

In practice, think tanks are universities, R&D institutes, policy advocacy institutes, and other agencies that produce policy knowledge for decision-makers. CIPE (2022) asserts that a think tank is actively involved in creating policy knowledge and delivering it to stakeholders. It is a knowledge broker through which a think tank brings R&D results from universities to policy-makers as users. As such, knowledge becomes a policy recommendation in dealing with public issues.

## B. Innovation Policy

Innovation policy is a specific matter of public policy. Public policy is the result of governmental actions or inactions to address public issues. Governmental actions are influenced by multiple actors and mainly mobilized by the government (Anderson, 2011). Public policy is a joint agreement involving multiple actors, each of whom has self-interests (Wahab, 2008). Public policy results from political decisions at the end, and innovation policy is a public decision resulting from political groups (Chaminade & Edquist, 2010). Referring to the public policy definition, innovation policy is defined as governmental efforts or interventions in addressing innovation matters in a country by involving multiple actors. Innovation policy has a similar meaning to science, technology, and innovation (STI) policy. Notwithstanding, each term has a different meaning in innovation studies. Kim & Lee (2016) said each is associated with close relationships among actors like academicians, business, and government (ABG).

Science is associated with producing scientific knowledge through studies or R&D activities in the fields of the physical and natural worlds and societies. The main actors are academicians, such as researchers or scientists in private and public universities and R&D institutes. In this case, the government does science policy through a government agency responsible for science policies and funding research agencies to manage R&D programs. Technology is associated with the development and application of scientific or R&D results for a given goal. The main actors are engineers, product/service developers, and scientists in developing and applying new technologies in specific fields such as environment, energy, health, agriculture, etc. Business actors are also present to bring and disseminate existing technologies to market. Like in science policy, a government does technology policy to adopt or adapt existing technologies developed by those actors (United Nations, 2021).

S&T policies are common terms in economic and innovation studies literature. S&T policy is a governmental way to promote economic growth based on existing knowledge and technology. Specifically, science policy aims to develop basic and applied research, and technology policy seeks to create and develop new applied technologies (Dodgson, 2000). S&T policy is conceptually used in innovation mode 1, in which the need for S&T is triggered by supply and demand factors. In this case, universities and R&D institutes are the focal actors in producing knowledge (Articulated by Gibbons and Barker by Nugroho, 2021).

The rapidly and globally changing world has prompted governments around the world to make breakthroughs in accelerating national economic growth. There must be more than S&T policy to respond to increasing industrial demands. Across networks and the collaboration of ABG, actors are necessarily strengthened to create KBE, leading to innovation creation. In turn, innovation policy is commonly introduced as governmental ways to develop economic growth involving many actors (ABG actors) through bringing R&D results to

the market, removing barriers to R&D activities, combating barriers to industrial investment, stimulating incentives for industry to do R&D activities, building human resources capabilities and their infrastructures, and creating a proper climate for doing innovation activities (Dodgson, 2000; Kuhlmann et al., 2010; Mani, 2002; World Bank, 2010).

The term S&T policy, reinforced as STI policy, is often interchangeably used as innovation policy only. Referring to Asmara & Kusumastuti (2021), "innovation policy is government intervention involving multiple actors at the beginning stage of doing R&D activities until the end-stage of commercializing R&D products to market". This study refers to STI policy as governmental ways that lead to innovation by comprising S&T policies and as mutually connected networks of ABG actors in developing KBE in a country.

## C. Knowledge, Innovation, and Policy

Knowledge, innovation, and policy (KIP) have distinctive meanings, but all three are related in the context of innovation studies. Knowledge is defined as "a collection of experience, appropriate information, and skilled insight that offers a structure for estimating and integrating new experiences and information" (Mohajan, 2016:1). Human ideas create knowledge and are collectively reinforced and fused in an organizational system through individual and group interactions. Knowledge is separated into objective attributes and subjective attributes. The first is being independent and isolated from the social context. Moreover, the second is related and depends on the social context, so it is difficult to change to another context. Notwithstanding, knowledge can be congested, reserved, diffused, wrapped, and ushered, as with tangible things (Bolisani & Bratianu, 2018).

Innovation is first defined as applying knowledge and new technology to the market. It is a linear process by which innovation is pulled by technology-driven and pushed by the market-driven (Martin, 2010; United Nations, 2021). Innovation is a firm's capability of developing and introducing new products or technologies to the market. Indeed, innovation results from R&D activities conducted in industries, universities, or R&D institutes (Kim & Nelson, 2000). Recently, innovation has not been a linear process. Indeed, it involves ABG actors and social organizations. Each actor has a role in supporting innovation. They collaborate in a unique manner, yielding forms of innovation (Kuhlmann et al., 2010).

The development of innovation theory leads to different types of innovation: new production processes, new technology, new delivery of goods and services, and new business and social organizations (United Nations, 2021). According to the Oslo Manual since 2005 (Gault, 2018), new packaging and marketing of goods and services are part of the innovation type. Innovation aims to make efficient and effective processes and services and generate ideas or culture to nurture creativity (Crumpton, 2012). Innovation moves from the business sector to the public sector, and it is applicable to public administration, especially innovation in public service delivery (United Nations, 2021). All forms of innovation in the business sector, such as new products, production processes, methods, marketing, and organization, can be applied to public sector organizations (PSOs) (Gault, 2018).

Public policy is a government effort to address public issues in a region or country. Public policy emerges when there is a public problem that needs the intervention of the government in dealing with it (Anderson, 2011; Wahab, 2008). To address public issues, the government has policy instruments and specific agencies related to a particular problem that will be addressed. In this context, public policy is clear for addressing innovation issues. Subsequently, it is called innovation policy.

**Table 1.** Relatedness of Knowledge-Innovation-Policy (KIP)

| | Knowledge (K) | Innovation (I) | Policy (P) |
|---|---|---|---|
| **Knowledge (K)** | 1) No meaning (KK) | 2) Knowledge for innovation (KI) | 3) Knowledge for policy (KP) |
| **Innovation (I)** | 4) Innovation for knowledge (IK) | 5) No meaning (II) | 6) Innovation for policy (IP) |
| **Policy (P)** | 7) Policy for knowledge (PK) | 8) Policy for innovation (PI) | 9) No meaning (PP) |

Source: Author's interpretation by referring (A.Y. Asmara & Prasetyo, 2016; Anugerah Yuka Asmara & Kusumastuti, 2021; Mohajan, 2016; Nowacki & Bachnik, 2016; Parson, 2006; Schiliro, 2012; Windrum, 2008)

The relatedness of knowledge, innovation, and policy (KIP) gives rise to nine columns. Each column has unique relationships. Column 2, Knowledge for Innovation (KI), relates to how knowledge can promote innovation. S&T development has become a pivotal part of organizations knowledge management (Mohajan, 2016). KI is the real contribution to economic growth, and applying or commercializing knowledge to the market is called innovation. Therefore, it is popular in the knowledge-based economy (KBE). Schiliro (2012) summarizes the KBE notions of scholars; he explains that KBE emerges because global economic development is not dependent only on natural resources and low skill. Indeed, KBE is an economic growth engine driven by information technology, specialized and high skills, technology, ideas, knowledge, and investment capital. Accumulated knowledge and technology are central to KBE development.

Column 3, Knowledge for Policy (KP), concerns how knowledge can contribute to public policy-making. It is acknowledged that groups and political interests often intervene in the public policy-making process rather than providing robust evidence of knowledge. It leads to an intuition-based policy (Asmara, 2012). Evidence is accumulated knowledge resulting from research activities (Asmara & Prasetyo, 2016). The use of knowledge is beneficial to making robust policy by providing strong and scientific evidence in the policy-making process. Hence, it is called evidence-based policy (EBP) (Parson, 2006).

Column 4, Innovation for Knowledge (IK), regarding how innovation can contribute to knowledge. Fierce competition among firms leads to how firms can survive and catch enormous opportunities. Changing consumer demands, high-risk activities, disruptive technology, and new business ways have changed the business environment and forced firms to redesign their business processes, including knowledge management. Therefore, innovation activities are led by a firm's willingness to introduce innovative knowledge management (IKM) functions and its ability to run this strategy (Nowacki & Bachnik, 2016). It means that IKM is a way for firms to conduct innovation that can improve the knowledge management process in firms, including new products and business models.

Column 6, Innovation for Policy (IP), aims to promote innovative policies coined by government agencies. Innovation policy is a part of innovation in PSOs, comprising the newness of policy instruments, policy directions, and new policy learning (Windrum, 2008). It is related to how the government runs new and innovative policies to address public matters in a region or country. Column 7, Policy for Knowledge, aims to develop basic and applied knowledge from universities and R&D institutes. It is more popular with science (basic knowledge) and technology (applied knowledge), or (S&T) policy (Dodgson, 2000). Last column 8, Policy for Innovation, is an integrated S&T policy to bring R&D results to market (Asmara & Kusumastuti, 2021).

## D. Operationalization of Concept

This study focuses on the role of universities in producing "knowledge for policy" and contributing to innovation policy-making in a country, henceforth called EBP (column-3/KP). In this case, universities produce, provide, and provoke robust evidence from stakeholders as input on innovation policy-making considerations related to STI issues addressed by the government. As a think tank, the role of universities in providing knowledge for innovation policy will impact EBP practices. EBP is a way to strengthen innovation policy-making by referring to scientific and reliable policy input.

**Table 2.** Operationalization of Concept

| Concept | Variables | Description | Indicators |
|---|---|---|---|
| Evidence-based policy (EBP) on innovation field | Contribution of academicians as think tanks for innovation policy | Universities have specific study course(s) and its activities in innovation management and/or innovation policy fields | Departments/ faculties/schools/ institute of innovation management and policy studies<br>Innovation policy studies promoting to stakeholders |

Source: Authors' interpretation of (Parson, 2006) and (Seo, Asmara, & Kwon, 2021)

Management and policy studies are closely interconnected in STI studies. Both are central parts of disciplinary studies contributing to the STI area. Fagerberg's study in 2013, as cited by Indraprahasta (2022), mentioned that social sciences like the humanities and management are two top contributors to STI study areas. Public policy itself is part of the social science area. The following studies contribute to the STI area: economics, business, geography and development, engineering, planning and development, information and computer science, health, and political science. Herein, this study employs innovation management and innovation policy as main courses offered by universities.

## III. METHODOLOGY

This research uses a post-positivistic approach with explanatory and comparative analysis methods. Post-positivistic is not an antithesis against the positivistic approach; instead, post-positivistic is the answer to social studies that are not more detailed by an epistemological dualistic and independent objective approach or naïve realism ontological perspective. Indeed, it stems from a reality perspective called critical realism. In the post-positivistic world, reality exists, but it is difficult to grasp the whole reality perfectly and probabilistically due to insufficient human intellectual mechanisms and the nature of dynamic phenomena (Guba and Lincoln in Erciyes, 2020). Post-positivistic is a balance between positivistic and interpretative approaches and uses particular pluralism. It does not eliminate quantitative elements, but it adjusts to the social research that reinforces the perspective and understanding of any researcher from multi-dimensions and multi-methods, including using qualitative and quantitative methods in conformity. This approach is comprehensive and rich, with theory used as a lens in gathering and analyzing data; in turn, it is used to make a conclusion and further studies (Panhwar et al., 2017). Therefore, using the explanative and comparative analysis methods with qualitative data is part of the plural method used in this study.

EBP is a theoretical lens to delineate the university's role as a think tank and an analysis framework to limit the direction of analysis. The focus of the study is the universities' role as think tanks in promoting STI or innovation policy in Southeast Asia countries, especially in Thailand, Malaysia, and Indonesia. Those countries were called the Asian Tiger in the 1965s-1990s (Kozlova & Noguera-Santaella, 2017) and represent delineating STI policy in ASEAN countries. In the post-positivistic approach, we use plural data collection and analysis (Erciyes, 2020). This research uses three data collection techniques. Mostly, this research is a literature review and hermeneutics. Action research as a direct participant was also used to enrich research findings. Finally, a discussion with three Indonesian informants was conducted to reinforce the research findings and analysis.

The secondary data in the literature review were from governmental documents, scientific articles (journals and proceedings), books, presentation materials, and workshop materials on STI policy. We used keywords in searching relevant works of literature and then categorized them such as science, technology, innovation, policy, management, competitiveness, commercialization, knowledge, research and development (R&D), economic growth, universities, ranking, think tank, evidence, Indonesia, Thailand, Malaysia, and ASEAN. There were three types of collecting secondary data, viz.:

1) Data from Thailand were derived from tracing online works of literature only.
2) Data from Malaysia were derived from tracing online works of literature and the involvement of a researcher as active participation in the virtual training on STI Policy

for Socio-Economic Development (SPED) from August 30th–September 4th, 2021.

3) Data from Indonesia were derived from tracing online and offline works of literature and the involvement of a researcher as active participation in the Indonesian Science, Technology, and Innovation (STI) Policy Lecture Series I, which was held virtually from October-December 2021.

The data collection and display were conducted from September 2021–September 2022, while October-December 2022 was the analysis stage of the study.

The top 10 universities in each country, Thailand, Malaysia, and Indonesia—were selected according to the QS World University Ranking in 2022. The QS ranking was representative of finding the best universities rapidly on the website. It consists of 11 indicators adjusted to the Asia condition: academic reputation, employer reputation, faculty/student ratio, international research network, citations per paper (10%), papers per faculty, staff with a Ph.D., proportion of international faculty (25%), proportion of international students (2.5%), proportion of inbound exchange students (2.5%), and proportion of outbound exchange students. These last two indicators are specialized and used in Asia (Dymtro, 2022). We use the same link, https://www.topuniversities.com/university-rankings/asian-university-rankings/2022 (QS University, 2022), for searching the top 10 universities respectively in Thailand, Malaysia, and Indonesia.

The search aims to find study courses at ten universities offering innovation management and innovation policy studies in three countries. The search was on the main website of universities offering schools (faculties, departments, colleges, and institutes) related to innovation management, innovation, and entrepreneurship,

**Table 3.** Sequence of Data Collection and Analysis

| Time Period | Activities | Method |
|---|---|---|
| September 2021 | Joining in the training on STI Policy for Socio Economic Development (SPED) (virtual) | Direct observation as participants of training (research action) |
| October 2021 | Joining in the Indonesian STI Policy Lecture Series I (virtual) | Direct observation as participants of workshop (research action) |
| November 2021 | Joining in the Indonesian STI Policy Lecture Series I (virtual) | Direct observation as participants of workshop (research action) |
| December 2021 | Joining in the Indonesian STI Policy Lecture Series I (virtual) | Direct observation as participants of workshop (research action) |
| January 2022 | Coining ideas to research design | Brainstorming ideas (hermeneutics) |
| February 2022 | Collecting and selecting data of Thailand, Malaysia, Indonesia | Tracing literatures on the websites (hermeneutics) |
| March 2022 | Summarizing keywords of STI Policy of Thailand, Malaysia, Indonesia | Coding relevant sentences (hermeneutics) |
| April 2022 | Brainstorming ideas on analysis part | Brainstorming ideas (hermeneutics) |
| May 2022 | Collecting and selecting data of Thailand, Malaysia, Indonesia | Tracing literatures on the website and in the materials of workshop and training (hermeneutics) |
| June 2022 | Summarizing keywords of STI Policy of Thailand, Malaysia, Indonesia | Coding relevant sentences (hermeneutics) |
| July 2022 | Triangulation of data Thailand and Malaysia case | Tracing literatures on the website and in the materials of workshop and training |
| August 2022 | Triangulation of Indonesia case | Discussion with 3 Indonesian informants |
| September 2022 | Providing research results | Displaying data |
| October 2022 | Analyzing research results | Explorative and comparative analysis |
| November 2022 | Completing the research data | Based on literature review, research action, and discussion with triangulation technique |
| December 2022 | Final analysis and conclusion | Based on literature review and previous finding analysis |

Source: Author

science/technology/innovation policy, school of public policy with an innovation study focus; and national, sectoral, and national/sectoral/regional innovation at 30 universities. This search did not use the keywords "science and technology" and "innovation" as a single term because most universities used those terms in their studies but were not related to innovation management and policy (answering question 1). Further, we deepened the search for each university with those study courses to unveil the university's contribution to producing and delivering knowledge of innovation policy to stakeholders in each country. We searched each university's website and other link sources to reinforce this study's finding (answering question 2).

This study aims to explain and compare universities playing the role of think tanks in Thailand, Malaysia, and Indonesia. Each country is analyzed separately, and then all are analyzed simultaneously to find a clear gap in producing policy knowledge and delivering it to stakeholders. The triangulation method reinforces the data accuracy of research findings and their analysis as part of the post-positivistic approach by using multiple methods. The first triangulation was conducted through a literature review, counterchecking previous studies was needed, as was repeating 2-3 times the searching of data from internet sources, especially data from universities. The second triangulation was conducted through a non-structured interview with three Indonesian informants: 1) a senior lecturer from the Faculty of Socio and Politics at the University of Padjadjaran (UNPAD), 2) a professor from the School of Business Management (SBM) at Bandung Institute of Technology (ITB), and 3) a senior researcher of STI policy at the Directorate for Policy Formulation of Research, Technology, and Innovation (PKRTI) at the National Research and Innovation Agency of Indonesia (BRIN). They are senior academicians with high experience in policy studies, representing different perspectives in viewing innovation policy courses. Each discussion with field notes lasted 20–30 minutes in the Bahasa Indonesia language.

## IV. RESULTS

### A. Innovation Capability in the ASEAN Countries

Innovation capability is crucial for firms to increase their competitive advantage in a dynamic business environment. It is related to generating innovation through learning continuation, transforming knowledge and creativity, and exploiting internal and external resources in the firm (Iddris, 2016). In the context of a country, innovation capability refers to the innovation foundation of the country and how the country can create innovation by itself. It can realize physical/tangible, intangible, and institutional attributes from internal and external factors (Ambashi, 2017).

Innovation capability has multiple measurements to show a country's degree of innovative activity. Each measurement has different variables and diverse evaluation methods to determine the degree of innovation in a country. Fagerberg and Srholec, cited by Ambashi (2017), mention four measurements of innovation capability: innovation system, governance, political system, and openness. Nowadays, innovation capability is closely related to the innovation system established in a country, and GDP is the most visible measurement. Besides, the Ranking of the Global Innovation Index (GII) released by WIPO (2022) shows the degree to which the country is engaging in innovation activities. Indeed, it uses measurement through economic improvement resulting from innovation activities in each country.

In this review, innovation capability refers to a firm's ability to generate innovation through continuous learning, knowledge transformation, creativity, and the exploitation of internal and external resources available to the firm. GDP is one of the macroeconomic growth measurements in a country, Maradana et al. (2017) use GDP as a variable of per capita economic growth and innovation to reveal their relationship. As a result, innovation and economic growth are mutually interdependent (reinforcing the innovation-growth nexus), and both are independent. We assume that GDP is a country's macroeconomic accomplishment triggered by innovation and non-innovation activities.

**Table 4.** The Gross Domestic Product (GDP) in the ASEAN Countries 2021-2022

| Country | 2021 | April-2022 | September-2022 |
|---|---|---|---|
| ASEAN countries | 3,3 | 4,9 | 5,1 |
| Brunei Darussalam | -1,6 | 4,2 | 2,2 |
| Cambodia | 3,0 | 5,3 | 5,3 |
| Indonesia | 3,7 | 5,0 | 5,4 |
| Lao PDR | 2,3 | 3,4 | 2,5 |
| Malaysia | 3,1 | 6,0 | 6,0 |
| Myanmar | -5,0 | -0,3 | 2,0 |
| Philippines | 5,7 | 6,0 | 6,5 |
| Singapore | 7,6 | 4,3 | 3,7 |
| Thailand | 1,5 | 3,0 | 2,9 |
| Vietnam | 2,6 | 6,5 | 6,5 |

Source: (ADB, 2022)

Singapore has the highest GDP growth rate among ASEAN countries. That country outperforms the ASEAN average in GDP. Thailand, Malaysia, and Indonesia's GDPs are increasing from 2021 to 2022, but the values are stationary enough during 2022. At the same time, Malaysia will lead Indonesia and Thailand in 2022. While, Vietnam and the Philippines have higher GDP scores than Malaysia, Besides GDP, the Global Innovation Index (GII) is the global indicator to overview and rank innovation degrees in countries around the world. In the GII 2022, for example, dashboard trackers measure innovation indexes like science and innovation investments, technological progress, technology adoption, and socio-economic impact (WIPO, 2022).

**Table 5.** The Global Innovation Index in the ASEAN Countries 2013-2018 and 2022

| Country | 2013* | 2014* | 2015* | 2016* | 2017* | 2018* | 2022** |
|---|---|---|---|---|---|---|---|
| Brunei Darussalam | 78 | 88 | - | - | 71 | 67 | 92 |
| Cambodia | 110 | 106 | 91 | 95 | 101 | 98 | 97 |
| Indonesia | 85 | 87 | 97 | 88 | 87 | 85 | 75 |
| Lao PDR | - | - | - | - | - | - | 112 |
| Malaysia | 32 | 33 | 32 | 35 | 37 | 35 | 36 |
| Myanmar | - | 140 | 138 | - | - | - | 116 |
| Philippines | 90 | 100 | 83 | 74 | 73 | 73 | 59 |
| Singapore | 8 | 7 | 7 | 6 | 7 | 5 | 7 |
| Thailand | 57 | 48 | 55 | 52 | 51 | 44 | 43 |
| Vietnam | 76 | 71 | 52 | 59 | 47 | 45 | 48 |

Source: *Cornell University in Kimura et al. (2019), ** WIPO (2022)

Singapore has the top rank (1st) of GII among ASEAN countries, followed by Malaysia (2nd) and Thailand (3rd). Indonesia's GII score is below Vietnam and the Philippines. Singapore and Malaysia are stationary during 2013–2022, while Vietnam and the Philippines show rapid innovation improvement during 2013–2022. As such, Thailand and Indonesia have improved innovation degrees, though they are not as prominent as Vietnam and the Philippines. Moreover, the rank of Indonesia's GII is stationary enough in the 70–80 ranks.

## B. Comparation of Courses on Innovation Management and Policy at Universities in Thailand, Malaysia, and Indonesia

EBP results from a scientific contribution by academicians in universities functioning as think tanks. In innovation policy, each university should have a specific study course in innovation management and policy. This section elaborates on the study course in innovation management and policy studies according to the top 10 universities' versions of the QS Asian University Ranking in Thailand, Malaysia, and Indonesia.

### *1) Thailand*

**Table 6.** The Top 10 Universities in Thailand in 2022

| Universities | Rank in Thailand | Rank in Asia | Value | Ownership status |
|---|---|---|---|---|
| Chulalongkorn University | 1 | 36 | 72,4 | State-owned |
| Mahidol University | 2 | 43 | 70,2 | State-owned |
| Chiang Mai University | 3 | 88 | 48,1 | State-owned |
| Thammasat University | 4 | 111 | 42 | State-owned |
| Khon Kaen University | 5 | 133 | 35,6 | State-owned |
| Kasetsart University | 6 | 138 | 34,8 | State-owned |
| Prince of Songkla University | 7 | 171 | 30 | State-owned |
| King Mongkut's University of Technology Thonburi (KMUTT) | 8 | 196 | 26,4 | State-owned |

| Universities | Rank in Thailand | Rank in Asia | Value | Ownership status |
|---|---|---|---|---|
| King Mongkut's Institute of Technology Ladkrabang (KMITL) | 9 | 281-290 | No definitely valued | State-owned |
| King Mongkut's University of Technology North Bangkok | 10 | 351-400 | No definitely valued | State-owned |

Source: Compiled from (QS University, 2022)

The top 10 universities in Thailand are state-owned institutions. Chulalongkorn University ranks first in Thailand and 36th among Asian universities. The latest ranking is for the King Mongkut's University of Technology North Bangkok (10th) in Thailand, which ranks 351-400 among Asian universities.

Thailand has six reputable state-owned universities in innovation management and policy. There are five innovation management studies, namely Thammasat University, Khon Kaen University, King Mongkut's University of Technology Thonburi (KMUTT), King Mongkut's Institute of Technology Ladkrabang, and King Mongkut's University of Technology North Bangkok. Chiang Mai University offers one study of innovation policy. A research institute for innovation policy is the King Mongkut's University of Technology Thonburi (KMUTT). Those universities offer all education degrees in innovation management and policy in Thailand

**Table 7.** The School/Institute of Innovation Management and Policy in Thailand's Universities

| Universities | Schools (Department/Faculty/College) | Education level | Institute | Link source |
|---|---|---|---|---|
| Chulalongkorn University | - | - | - | (Chula University, 2022) |
| Mahidol University | - | - | - | (Mahidol University, 2022) |
| Chiang Mai University | Public Policy School with specialized innovation field | Master & Doctorate | - | (Chiang Mai University, 2022) |
| Thammasat University | College of Innovation,<br>Course: Innovation and Technology Management | Master | -<br>- | (Thammasat University, 2022) |
| Khon Kaen University | International Technology and Innovation Management<br>Business Administration Program in Intellectual property and innovation management | Graduate school | - | (Graduate School of Khon Kaen University, 2022; Khon Kaen University, 2022) |
| Kasetsart University | - | - | - | (Kasetsart University, 2022) |
| Prince of Songkla University | - | - | - | (Prince of Songkla University, 2022) |
| King Mongkut's University of Technology Thonburi (KMUTT) | Graduate school of Innovation management | Master | Science Technology and Innovation Policy Institute (STIPI) | (KMUTT University, 2022; STIPI, 2022) |
| King Mongkut's Institute of Technology Ladkrabang | College of innovation and industrial management | Unidentified course in the website | - | (King Mongkut's Institute of Technology Ladkrabang., 2022) |
| King Mongkut's University of Technology North Bangkok | Innovation Management for Business and Industry | Master | - | (King Mongkut's University of Technology North Bangkok, 2022) |

Source: Compilation of research findings

at the master's and doctorate levels. In this case, the King Mongkut's University of Technology Thonburi (KMUTT) is the leading university in Thailand that provides two corresponding fields: innovation management as a study course and innovation policy as a policy think tank institute as well.

### *2) Malaysia*

The top 10 universities in Malaysia are seven state-owned universities and three private-owned universities, namely Taylor's University, UTP, and UCSI University. The University of Malaya (UM) ranks 1st in Malaysia and 8th in Asian universities. The latest ranking is The University of Teknologi Mara (UiTM) (10th), which ranks 105 among Asian universities.

Malaysia has three reputable state-owned universities in innovation management and policy. There are two studies of innovation entrepreneurship, one study of innovation management, and one study of innovation policy. The University of Kebangsaan Malaysia (UKM) has a faculty of innovation and entrepreneurship; the University of Teknologi Malaysia (UTM) has a graduate school in innovation management and policy; and Universiti Utara Malaysia (UUM) has a graduate school of innovation and entrepreneurship. Commonly, those universities provide courses for master's and doctorate degrees. In Malaysia, UTM is the leading university in providing STI policy and management courses.

**Table 8.** The Top 10 Universities in Malaysia in 2022

| Universities | Rank in Thailand | Rank in Asia | Value | Owner-ship status |
|---|---|---|---|---|
| University of Malaya (UM) | 1 | 8 | 94,9 | State-owned |
| University of Putra Malaysia (UPM) | 2 | 27 | 81,4 | State-owned |
| University of Kebangsaan Malaysia (UKM) | 3 | 33 | 76,8 | State-owned |
| University of Sains Malaysia (USM) | 4 | 35 | 74,6 | State-owned |
| University of Teknologi Malaysia (UTM) | 5 | 38 | 72,2 | State-owned |
| Taylor's University | 6 | 53 | 59 | Private-owned |
| University Teknologi PETRONAS (UTP) | 7 | 72 | 51,6 | Private-owned |
| UCSI University | 8 | 77 | 50 | Private-owned |
| University of Utara Malaysia (UUM) | 9 | 98 | 45,1 | State-owned |
| University of Teknologi MARA - UiTM | 10 | 105 | 43,3 | State-owned |

Source: Compiled from (QS University, 2022)

**Table 9.** The School/Institute of Innovation Management and Policy in Malaysia's Universities

| Universities | Schools (Department/Faculty/ College) | Education level | Institute | Link Source |
|---|---|---|---|---|
| University of Malaya (UM) | - | - | - | (Universiti Malaya, 2022) |
| University of Putra Malaysia (UPM) | - | - | - | (Universiti Putra Malaysia, 2022) |
| University of Kebangsaan Malaysia (UKM) | Faculty of Innovation and entrepreneurship | Bachelor, Master, & Doctorate | - | (Universiti Kebangsaan Malaysia, 2022) |
| University of Sains Malaysia (USM) | - | - | - | (Universiti Sains Malaysia, 2022) |
| University of Teknologi Malaysia (UTM) | Graduate School of Technology and Innovation Management<br><br>Perdana Centre of Science, Technology, and Innovation on Policy Studies at Razak Faculty of Technology and Informatics | Master and Doctorate | - | (Department of Management of Technology – UTM, 2022; Razak Faculty of Technology and Informatics - UTM[a], 2022) |
| Taylor's University | - | - | - | (Taylor University, 2022) |
| University of Teknologi PETRONAS (UTP) | - | - | - | (UTP, 2022) |
| UCSI University | - | - | - | (UCSI University, 2022) |
| Universiti Utara Malaysia (UUM) | Innovation and Entrepreneurship | Doctorate | - | (Universiti Utara Malaysia, 2022) |
| Universiti TeknologiMARA - UiTM | - | - | - | (Universiti Teknologi Mara, 2022) |

Source: Research findings

### *3) Indonesia*

**Table 10**. The Top 10 Universities in Indonesia in 2022

| Universities | Rank in Indonesia | Rank in Asia | Value | Ownership status |
|---|---|---|---|---|
| University of Indonesia (UI) | 1 | 56 | 58,1 | State-owned |
| University of Gadjah Mada (UGM) | 2 | 59 | 57,3 | State-owned |
| Technology Institute of Bandung (ITB) | 3 | 67 | 52,5 | State-owned |
| University of Airlangga (Unair) | 4 | 110 | 42,6 | State-owned |
| Bogor Agricultural University (IPB) | 5 | 112 | 41,7 | State-owned |
| Technology Institute of Sepuluh November (ITS) | 6 | 160 | 31,5 | State-owned |
| University of Padjadjaran (Unpad) | 7 | 192 | 26,7 | State-owned |
| University of Diponegoro (Undip) | 8 | 209 | 24,9 | State-owned |
| University of Bina Nusantara (Binus) | 9 | 220 | 23,4 | Private-owned |
| University of Brawijaya (UB) | 10 | 239 | 22,2 | State-owned |

Source: Compiled from (QS University, 2022)

The top 10 universities in Indonesia are nine state-owned universities and one private university, namely Binus University. The University of Indonesia (UI) ranks first in Indonesia and 56th among Asian universities. The latest ranking is the University of Brawijaya (UB) (10th), which ranks 239 among Asian universities.

**Table 11.** The School/Institute of Innovation Management and Policy in Indonesia's Universities

| Universities | Schools (Department/Faculty/ College) | Education level | Institute | Link Source |
|---|---|---|---|---|
| University of Indonesia (UI) | - | - | - | (Universitas Indonesia, 2022) |
| University of Gadjah Mada (UGM) | - | - | - | (Universitas Gadjah Mada, 2022) |
| Technology Institute of Bandung (ITB) | - | - | - | (Institut Teknologi Bandung, 2022) |
| University of Airlangga (Unair) | - | - | - | (Universitas Airlangga, 2022) |
| IPB University | - | - | - | (IPB University, 2022) |
| Technology Institute of Sepuluh Novem-ber (ITS) | - | -- | - | (ITS, 2022) |
| University of Padjadjaran (Unpad) | Regional Innovation | Master | | (Graduate School of Universitas Padjadjaran[a], 2022) |
| University of Diponegoro (Undip) | - | - | - | (Universitas Diponegoro, 2022) |
| University of Bina Nusantara (Binus) | Innovation and entrepreneurship | Master | - | (Binus University, 2022) |
| University of Brawijaya (UB) | - | - | - | (Universitas Brawijaya, 2022) |

Source: Research findings

Indonesia has two reputable universities offering the course of innovation, namely regional innovation at the University of Padjadjaran (state-owned) and innovation and entrepreneurship at the University of Bina-Nusantara (private-owned). The courses are offered at the master's degree level. Unlike Thailand and Malaysia, Indonesia does not have a specific course or institute on innovation policy studies at a university.

## C. Producing and Delivering Knowledge for Innovation Policy by Universities in Thailand, Malaysia, and Indonesia

Studies of technology management, innovation management, and industrial technology management are related to how an enterprise is managed innovatively (Haneda & Ito, 2018; Medcof, 2017; Nowacki & Bachnik, 2016), how universities and R&D institutes produce knowledge, make its commercialization to market, and develop technology to improve business competitiveness (Christensen, 2002; Nowacki & Bachnik, 2016; Sakapurnama et al., 2020). In comparison, innovation and entrepreneurship studies are close to new start-ups, new small and medium enterprises (SMEs), and new businesses created innovatively by involving advanced technology facilities and creative design (Kardoyo et al., 2018; Sulistyo & Siyamtinah, 2016).

Producing and delivering knowledge for innovation policy are identified explicitly in study courses such as public policy specializing in innovation fields and science-technology-innovation (STI) policy or innovation policy. Studies of STI or innovation policies are related to how universities or R&D institutes produce knowledge and deliver knowledge to stakeholders (Asmara & Kusumastuti, 2021; Seo et al., 2021). In this case, a university and a R&D institute play roles as think tanks for innovation policy. Further, innovation policy studies offered by universities are explored and compared in three countries: Thailand, Malaysia, and Indonesia.

### *1) Thailand*

Thailand has a school of public policy specializing in innovation policy at the University of Chiang Mai. Thailand also has the STI Policy Institute (STIPI) under King Mongkut's University of Technology Thonburi (KMUTT). Both literary agencies play a similar role in producing

and delivering knowledge of innovation policy to stakeholders.

**a) The Chiang Mai's School of Public Policy**

The Chiang Mai's School of Public Policy is the first school of public policy (SPP) established in Thailand (SPP-Chiang Mai Universitya, 2022), focusing on three areas, namely; 1) policy innovation; 2) urban innovation; and 3) social innovation (SPP-Chiang Mai Universityb, 2022). SPP's approach is multi-scale, pluralistic, and inter-disciplinary by attracting national and international students, offering master's and PhD education levels propelled by civic and civil challenges, and combining multiple branches of knowledge to provide solutions. The typical courses are politics, public administration, economics, social science-based theories, multi-level governance, qualitative and quantitative research methodology, and the application of interdisciplinary studies. Again, SPP covers Sustainable Development Goals (SDGs) as the central part of the study course (SPP – Chiang Mai Universitya, 2022).

SPP provides academic and practical education for students by considering advanced knowledge, fundamental socio, and policy problems through coursework and research work.

> "The qualified students are expected to gain real-life experience, tangible skills, and a life-supporting network. Again, SPP's students grow toward an acquired capacity for seeing critically beyond known facts, which merely support status quo worldviews and socio-political systems ……. Graduates move forward in life equipped with insight into and mastery about how sound public policies can be utilized for inclusive, innovative, progressive, and sustainable solutions to the most prominent public problems" (SPP – Chiang Mai University[a], 2022).

SPP also provides policy knowledge to stakeholders through policy consultation and policy training for the stakeholders and civil apparatus in the Thai Government. In addition, the stakeholders closely connect with research, leading to attention to the deliberative process and collaboration in decision-making. The research issue is not merely establishing theories and concepts; it influences public policy, generating practical impacts on laws and encouraging improved public service. Due to dynamic and ever-changing public issues, collaboration with multiple actors like business, civil society, and the government is interweaved to make sound public policies coherent (SPP – Chiang Mai Universitya, 2022).

The leading governmental partner of SPP is the National Innovation Agency (NIA) of Thailand. Analyzing the Global Innovation Index, designing the Innovation Index for Inclusive, Sustainable, and Connected Cities (ISCC), designing Thailand's regional innovation plan, and providing policy recommendations to the Thai Government are the main activities conducted by the SPP (SPP – Chiang Mai Universityc, 2022). SPP applies an interdisciplinary team of practitioners and academics (lecturers and students) to work as a policy think tank for government and non-government organization(s) to respond to contemporary public issues (SPP – Chiang Mai Universitya, 2022).

The SPP trains local city managers in capacity building to understand and implement inclusive innovations (SPP – Chiang Mai Universityc, 2022). The training is not for public officials per se; it is open to those interested in increasing their minds and skills in leadership and supporting well-informed public policies. It aims to increase the number of citizens who are aware of and involved in the decision-making process deliberatively. This school has leading leaders who are well-informed about public policy. The SPP pushes data-driven evidence-based policy-making through understanding the social and public narratives comprising social and public issues like ineffective public policy, ongoing corruption, etc. (SPP – Chiang Mai Universitya, 2022).

The research areas of SPP are innovation, energy, inclusiveness, intelligent and livable cities, transnational air pollution, and sustainability (SPP – Chiang Mai Universityd, 2022). Specifically, the SPP collaborates with Thailand's Science Research and Innovation (TSRI) agency to study new frameworks to drive science, research, and innovation in Thailand. Innovation

can reduce inequalities, empower stakeholders, and promote resilient communities (SPP – Chiang Mai Universityc, 2022).

The SPP collaborates with global and national partners. Ten international partners are the Asian Pacific (AP) Public Policy Network (PPN), Lee Kuan Yew School of Public Policy, Northern Illinois University, the Global Standard in Public Service Education (NASPAA), the United Nations Development Program (UNDP), International Public Policy Associations, Critical Policy Studies Networks, the Journal of Comparative Policy Analysis, Fraunhofer, and the Climate Heritage Network. For 27 national partners are Thailand Public Policy Network, Ministry of Higher Education, Science, Research, and Innovation, Chiang Mai Province, Chiang Mai Municipality, Ministry of Energy, National Innovation Agency, National Housing Authority, Digital Economy Promotion Agency (DEPA), National Broadcasting and Telecommunication Commission (NBTC), Thailand Science Research and Innovation (TSRI), Commission of Higher Education of Thailand, Office of Public Sector Anti- Corruption Commission (PACC), National Research Council of Thailand (NRCT), Thailand Greenhouse Gas Management Organization, The Thai Chamber of Commerce, The Federation of Thai Industries Chiang Mai Chapter, Food and Innovation Packaging Centre, Energy Research and Development Institute-Nakornping Chiang Mai University, Science and Technology Park, Biomedical Engineering Institute Chiang Mai University, Innovation Foresight Institute, Global Campuses Foundation, City Green, AGATA, City Farm, and two national institutes in Thai language (SPP – Chiang Mai Universitye, 2022).

**b) STIPI at the King Mongkut's University of Technology Thonburi**

Science Technology, and Innovation Policy Institute (STIPI) at King Mongkut's University of Technology Thonburi (KMUTT) is a faculty-level unit of KMUTT, established by the Resolution of the University Council on June 1st, 2016. It is Thailand's first institute focusing on policy research in science, technology, and innovation (STI). STIPI aims to construct a body of knowledge and produce knowledge through research activities (STIPI, 2022). The institute is an STI policy think tank in Thailand. Unlike Chiang Mai's SPP, STIPI does not offer education courses to students. Still, it is a particular research institute functioning to produce knowledge of STI policy and deliver its knowledge to stakeholders in Thailand (STIPI-KMUTT, 2022).

STIPI builds STI policy research areas to address STI issues and challenges in Thailand and ASEAN countries (STIPI-KMUTT, 2022; STIPI, 2022). Again, this institute builds the STI capacity of the nations by offering consultancy and world-class policy research (School and College Listings, 2022). STIPI has collaborated with many partners in Thailand and ASEAN countries. For example, in Thailand, it collaborates with the National Research Council of Thailand (NRCT) in providing STI policy training (NXPO, 2022). In ASEAN, this institute has collaborated with the University of Technology - Malaysia (UTM), Malaysia, and the Indonesian Institute of Sciences (LIPI), Indonesia, since 2019 through the 2nd South East Asian Conference on Science, Technology, and Innovation Policy and Management (SEAC-STIPM) Conference held in UTM, Kuala Lumpur, Malaysia (UTM, 2019).

STIPI's collaboration continues in 2021 through the 3rd SEAC-STIPM conference, joining the 17th ASIALICS conference held online (BRIN, 2021). In 2022, the partnership of STIPI involved the Vietnam Institute of Science, Technology, and Innovation (VISTI) in Vietnam, UTM-Malaysia, and BRIN-Indonesia (previously LIPI) in effectuating the 4th SEAC-STIPM conference in Hanoi, Vietnam (VISTI, 2022).

***2) Malaysia***

Malaysia has the Perdana Centre of Science, Technology, and Innovation (STI) Policy Studies at the Razak Faculty of Technology and Informatics, University of Technology Malaysia (UTM). The STI policy school was established in June 2010 (Razak Faculty of Technology and Informatics - UTMa, 2022). The Perdana School of STI Policy Studies offers master's and doctorate degrees. The master's degree focuses on STI policy programs by course, and the doctoral

degree in STI philosophy by research. Publication of the Journal of Science, Technology, and Innovation Policy (JoSTIP) allows academicians and practitioners to publish their works like research, reviews, reports, etc. It publishes as a biannual publication (JOSTIP-UTM, 2022).

The UTM Perdana School commits to producing experts in analyzing policy issues at the intersection of STI. This institute is an STI policy training center for the next STI policy leaders (Razak Faculty of Technology and Informatics - UTMa, 2022). This institute has collaborated with various national and overseas institutes. For example, in global collaboration, this institute signed a Memorandum of Understanding (MoU) with the Korea Institute of Science and Technology Evaluation and Planning (KISTEP) related to STI policy planning, national R&D budget coordination and allocation, R&D program evaluation, a future S&T roadmap, etc. (KISTEP, 2016).

In ASEAN, Perdana School - UTM has collaborated with the Indonesian Institute of

**Table 12.** Program and Outcome of The Perdana School of STI Policy Studies

| | Master* | Doctorate** |
|---|---|---|
| Program | Strong observational, analytical, synthesizing skills<br>Able to demonstrate effective communication skills and practice professional and societal responsibilities<br>Demonstrate adaptability in different roles to contribute and lead in their organizations and society.<br>Able to manage the scholarship of STI policy studies to benefit humankind and aware of related potential entrepreneurial opportunities and higher-order thinking skills necessary to solve research problems through innovation and creativity | Producing knowledgeable, skillful and expert STI policy makers and researchers. This program trains graduates to create a continuous flow of innovative ideas by leveraging on the existing stock of knowledge in STI related policies that will benefit industry and the research community. |
| Outcome | Ability to relate STI knowledge to interpret professional behavior appropriate to the process of policy implementation and formulation<br>Ability to formulate original policy, design and organize research scientifically to solve problems and evaluate current STI policy model<br>Ability to analyse a situation, rationalize and response effectively verbally and write in scholarly publications<br>Able to demonstrate professionalism ethically in research and explain ethics related to STI policy<br>Able to analyse and apply current knowledge independently and manage information effectively to produce innovative research<br>Able to show managerial skills and recognise entrepreneurial opportunities in STI policies. | Exploring the various knowledge and theories suitable for the particular research context.<br>Identifying and analysing the research problem critically and creatively and producing well thought research proposal.<br>Justifying and verifying the research proposal or solution using various related fundamental theories.<br>Performing the research in a systematic/scientific manner.<br>Adapting lifelong learning.<br>Writing and publishing their research work in both national and international refereed and high impact factor journals.<br>Presenting and defending their research work in national and international conferences,<br>Demonstrating practicing ethical code of conduct professionalism |

Source: *Razak Faculty of Technology and Informatics -UTM[b] (2022); **Razak Faculty of Technology and Informatics – UTM[c] (2022)

Sciences (LIPI), Indonesia, since 2018 through the 1st South East Asian Conference on Science, Technology, And Innovation Policy And Management (SEAC STIPM) held by LIPI in ICE BSD, Serpong Indonesia (LPPMI, 2018), the 2nd SEAC-STIPM Conference held by UTM in Kuala Lumpur, Malaysia (collaboration among UTM, STIPI-KMUTT, and LIPI) (UTM, 2019). They continued their partnership in 2021 through the 3rd SEAC-STIPM conference, joining the 17th ASIALICS conference held online (collaboration among UTM, STIPI-KMUTT, and LIPI) (BRIN, 2021). In 2022, the partnership of UTM involved VISTI-Vietnam, STIPI-KMUTT, and BRIN-Indonesia (last name is LIPI) in effectuating the 4th SEAC-STIPM conference in Hanoi, Vietnam (VISTI, 2022).

***3) Indonesia***

Indonesia has yet to have a specific course on STI policy at a university. The closest study is related to regional innovation and held by the graduate school of the University of the Padjadjaran (UNPAD). This course focuses on educating students, whether they are fresh graduates, public officials, businesspeople, etc. It was established on May 16, 2016, to respond to ever-changing conditions, contemporary innovation, and sustainable development issues. It will lead a multi-disciplinary study program in regional innovation based on local wisdom in 2024 (Graduate School of Universitas Padjadjarana, 2022). This study's main agenda is to develop a high-qualified research-based university, improve S&T advancement based on local wisdom, and promote community engagement in applied research (Graduate School of Universitas Padjadjaranb, 2022).

The graduate school of regional innovation widens its networking on a national and international scale through student exchange, lecturer exchange, guest lecturers, seminars, joint research, joint publications, and training programs (Graduate School of Universitas Padjadjaranc, 2022). For national networks, this graduate school invites local government officials or staff to study as master students in this school (BKPSDM, 2021). The learning of regional innovation is also offered through online teaching or long-distance learning (Independensi, 2018).

An informant of the University of Padjadjaran said that the name "regional innovation" is aimed at attracting many master's students, especially from the local government apparatus, to continue their studies at the UNPAD. This course is similar to local development planning and is not specific to innovation policy or research commercialization in industry. Therefore, this institute is limited to offering a course on regional innovation knowledge and not delivering knowledge of innovation policy to stakeholders. Another informant from Bandung Institute of Technology (ITB) said that the School of Business Management (SBM) – ITB focuses on innovation and entrepreneurship for business organizations, not government policy. Indonesia has needed an STI policy study course recently. In the future, studies of STI or innovation policy are prospective, and SBM-ITB is ready to support this course. It is clear that no university has a specific role in producing knowledge for innovation policy and delivering it to stakeholders in Indonesia.

## V. DISCUSSION

The ASEAN innovation overview of Thailand, Malaysia, and Indonesia delineates that Malaysia is the leading country rather than Thailand and Indonesia. The GDP growth and the GII index show that Malaysia has a higher score and rank than both countries. Especially for innovation, Malaysia ranks 2nd after Singapore in the 1st rank, and Thailand ranks 3rd after Malaysia. Indonesia ranks 6th after Vietnam in the 4th position and the Philippines in the 5th (See Tables 4 and 5. previously). Innovation capability is critical for ASEAN countries to move from the middle-income class to the upper-income class.

ASEAN countries focus on unleashing closed-dependent foreign direct investment (FDI) and optimizing natural resources in innovative and sustainable ways. ASEAN countries should be competitive, dynamic, and innovative in their economic growth. Therefore, innovation capability is required, and an effective innovation policy to achieve it is a challenge in ASEAN countries

(Ambashi, 2017). This study finds that Malaysia and Thailand have higher innovation capabilities than Indonesia. Both countries show that innovation policies are part of universities' influence.

As widely acknowledged, the role of universities is significant in leveraging innovation. Even Thailand, Malaysia, and Indonesia have reputable universities leading to KBE. Malaysia and Thailand have shown that domestic universities contribute greatly to economic development. The role of universities is not limited to research and entrepreneurial universities, by which they produce knowledge of R&D activities and then commercialize them to markets or industries, but also as a policy think tank, by which they make knowledge of innovation policy and deliver it to related stakeholders. Malaysia and Thailand have universities offering specific study courses and research about innovation policy studies that function as STI policy think tanks. In contrast, Indonesia has yet to have a university like that.

Before 2021, in Indonesia, public R&D institutes conducted innovation policy and R&D management. The names are the Research Centre for Innovation Policy and Management Studies (PPKMI) at the Indonesian Institute of Sciences (LIPI) and the Centre for Specific Technology Area and Innovation System (PTKSSI) at the Agency for Technology Assessment and Application (BPPT). Since the middle of 2021, both have been integrated into the National Research and Innovation Agency (BRIN). Currently, the Directorate for Policy Formulation Research Technology and Innovation (PKRTI) under the Deputy of Research and Innovation Policy (DKRI), and the Research Center for Public Policy under the Research Organization for Government Governance, Economy, and Prosperity (TKPEKM), both under the structure of BRIN, are the national STI policy think tanks in Indonesia. They conduct STI policy and management research and its analysis in the Indonesian context. Though, it does not provide study courses offering STI policy and management for Indonesian and international students.

Indonesia has no specific university with specific STI or innovation policy study courses. A researcher of STI policy in BRIN revealed that more than the support of R&D institutes in STI policy is needed to make continuous improvements in the innovation ecosystem in Indonesia. The involvement of universities is required to create a universal system for STI policy-making. Therefore, studies of STI in universities are strongly suggested. Based on his experience, it is a limited STI discussion partner in universities, even at the first-ranking university in Indonesia, like the University of Indonesia. Currently, STI policies are rare research topics at universities.

In dealing with the STI field, Thailand, Malaysia, and Indonesia have collaborated to organize an international conference about STI policy and management, subsequently known as the Southeast Asian Conference on Science, Technology, and Innovation Policy and Management (SEAC-STIPM) since 2019 up to now. Thailand's representative is the STIPI-KMUTT (R&D institute at the university), Malaysia's representative is the Perdana School of STI Policy of UTM, and Indonesia's representative is LIPI (public R&D institute of Indonesia, since 2021, LIPI has changed to become BRIN). In 2022, the committee of the SEAC-STIPM involved Vietnam, represented by the Vietnam Institute of Science, Technology, and Innovation (VISTI), (public R&D institute in Vietnam.

**Table 13.** SEAC-STIPM Collaboration

| SEAC STIPM Series (Year) | Venue and Host | Organizing committees |
|---|---|---|
| SEAC-STIPM I (2018) | ICE BSD Serpong, Indonesia held by LIPI | LIPI and UTM |
| SEAC-STIPM II (2019) | UTM Kuala Lumpur, Malaysia held by UTM | LIPI, UTM, STIPI-KMUTT |
| SEAC-STIPM III (2021) in parallel with ASIALICS conference | Online, Bangkok, Thailand held by STIPI-KMUTT and the Asialics committee | LIPI, UTM, STIPI-KMUTT and Asialics committee |
| SEAC-STIPM IV (2022) | Ministry of Science & Technology, Hanoi, Vietnam, held by VISTI | BRIN, UTM, STIPI-KMUTT, and VISTI |

Source: For further information about SEAC-STIPM collaboration, see (BRIN, 2021; LPPMI, 2018; UTM, 2019; VISTI, 2022)

As knowledge producers, universities can play the roles of research universities, entrepreneurial universities, and think tanks. A research university is aimed at producing knowledge based on research results; an entrepreneurial university is aimed at bringing scientific knowledge to market; and a think tank is aimed at producing and delivering policy knowledge to related stakeholders. Importantly, each university needs to have equal capacity to fill those roles. It will influence how each university conducts R&D activities and produces R&D outputs at the upstream level. In turn, it will influence how the government formulates and implements policies promoting innovation in a country. Of those roles, R&D institutes play the same role in producing knowledge based on research, bringing knowledge to market, and delivering knowledge to stakeholders. Notwithstanding, R&D institutes do not have a function to educate and mold fresh graduate students in particular fields.

Thailand and Malaysia have specific study courses in innovation policy. And Thailand has STI policy institutes under the university structure. In contrast, Indonesia has an STI policy research center in the ministry structure, not at the university. Malaysia and Thailand have an enormous opportunity to mold the subsequent STI management and policy leaders because both countries have specific studies in STI areas. At the same time, Indonesia is limited in its STI research. The continuation of STI programs in Thailand and Malaysia is more predictable than in Indonesia. In both countries, researchers, stakeholders, communities, and managers of STI fields are graduates of universities specializing in STI fields. In Indonesia, those actors are graduates from universities with general majors (not specific STI courses).

There are many actors involved in the knowledge of STI policy that universities produce, not just academicians. The collaborative conference, which involved two universities (Malaysia and Thailand) and one public R&D institute (Indonesia), is an actual practice by which academicians, businesses, the government, and the community (ABGC) can actively participate in that conference. In this case, universities will be prominent because they always have much information, vast networks, and new ideas coined by students in the STI policy and management graduate school. In public R&D institutes, the information, networks, and ideas are limited to senior and junior researchers involved in research activities. However, the existence of STI policy and management as study courses in universities is necessary for developing countries, like Indonesia and ASEAN countries, to make robust innovation policies that lead to national innovation capability in each country.

As displayed in the table above, Thailand has a university and a research institute for innovation. Malaysia has a university that delivers STI policy courses. While, Indonesia has an STI policy research center, not a university. Three countries have similar ways of conducting STI policy and management research. STI policy courses at master and doctorate levels delivered by universities in Thailand and Malaysia provide more fruitful benefits than STI policy research institutes. University learning activities lead to generating new graduates from various student backgrounds and bringing up STI policy practices in their institutions. Also, connectivity to academicians, businesses, government, and society is more profound for delivering knowledge for policy (KP) or evidence-based policy (EBP) to STI stakeholders. The university is a robust institution to support knowledge for innovation (KI) or knowledge-based economy (KBE) since this institution has alumni networks and global collaborations to reinforce KBE. Unlike Thailand and Malaysia, access to STI policy networks in Indonesia is minimal and needs university support.

## VI. CONCLUSION

Thailand and Malaysia have shown increasing economic growth during the 2020s, and their rankings on the global innovation index are linearly related to economic growth. Though there is no quantitative study that shows a relationship between global innovation index ranking and study course of STI policy in ASEAN countries, this study delineates that the countries having study course of STI policy, in the case of Thailand and Malaysia, have higher innovation levels compared to a country that has no study

**Table 14.** Comparison of Current Status of the Role of Universities as Innovation Policy Think Tanks in Thailand-Malaysia-Indonesia

| Functions of Universities /Institutes / Countries | Conducting Research Activities of Innovation Management and Policy | Providing Course of Innovation Management and Policy | Moulding Experts on Innovation Policy and Management | Producing Innovation Policy Knowledge | Creating Evidence-based Policy (EBP) to Stakeholders | Widening Collaboration of ABG Networks (Triple Helix) | Disseminating Innovation Policy to Society (Quadruple Helix) | Continuing programs of Knowledge-Based Economy (KBE) |
|---|---|---|---|---|---|---|---|---|
| Thailand | The research activities are conducted by public universities and a STI policy research institute (STIPI-KMUTT) | The course is delivered at master and doctorate level degree by public universities. Course of innovation policy is delivered by a public university (Chiang Mai University) | Highly potential to generate experts of STI policy and management through learning activities to students and its alumni | Innovation policy knowledge is produced by a public university and a STI research policy institute | Innovation Policy Knowledge through EBP concept is delivered by a public university and a STI research policy institute | Largely opened to widen triple helix networks from learning activities in a university and from research activities in a STI research policy institute | Wider dissemination to introduce and socialize STI policy and management to society through learning activities and its application by universities | Potentially sustaining development of KBE by involving universities, STI policy research institute, and their various networks (including alumnus) |
| Malaysia | The research activities are conducted by public universities | The STI policy course is delivered at master and doctorate level degree by a public university (UTM) | Highly potential to generate experts of STI policy and management through learning activities to students and its alumni | Innovation policy knowledge is produced by a public university | Innovation Policy Knowledge through EBP concept is delivered by a public university | Largely opened to widen triple helix networks from learning activities in universities | Wider dissemination to introduce and socialize STI policy and management to society through learning activities and its application by universities | Potentially sustaining development of KBE by involving universities their various networks (including alumnus) |
| Indonesia | The research activities are conducted by the research center for public policy | No existing | No existing | Innovation policy knowledge is produced by the research center for public policy | Innovation policy knowledge through EBP concept is delivered by the Deputy of Research and Innovation Policy (DKRI- BRIN) | Limited access to widen triple helix networks from research center to users | Limited access to disseminate to society widely | Continuation of KBE program needs support from vast universities (not BRIN alone) |

Notes: According to Table 1 in the literature concept:

Knowledge for Innovation (KI) is also called as Knowledge-based Economy (KBE)

Knowledge for policy (KP) is also called as Evidence-based Policy (EBP)

Source: Author's analysis

course of STI Policy, in case of Indonesia. As The "Asian Tiger", Indonesia has lagged behind Malaysia and Thailand, and the situation since the 1990s and 2020s is quite different in the context of KBE. Malaysia and Thailand are in the upper-middle class, while Indonesia is in the lower-middle class. Therefore, Indonesia must catch up to Malaysia and Thailand in ASEAN countries before catching up to NIEs countries like South Korea or China.

The Government of Thailand and the Government of Malaysia promote innovation policy by opening study courses on STI policy at the master and doctorate levels at universities. It is an opportunity for the university to play the roles of an education center, research center, and policy think tank. In the last role, universities promote innovation policy by providing knowledge for STI policy, which is then delivered to stakeholders in both countries. Through STI policy study courses at universities, the STI networks at the national and global levels will be robust, more comprehensive, and more sustainable. The reason is that the university has a special duty to educate and graduate many students. They will bring STI policy knowledge to their wider networks, not limited to cross-university networks, but also to business and government networks through which they work. Practically, this study helps to provide policy suggestions to stakeholders of the Government of Indonesia in collaboration with the university and businesses to co-create the study courses of STI policy at state-or-private-owned universities in Indonesia to catch up with the global innovation rankings of Malaysia and Thailand.

This study uses a post-positivistic approach with multi-methods to gather primary and secondary data and analyze it. This research limitation is due to the use of most literature reviews through the explanative and comparative description (hermeneutics method). The study course of STI policy and innovation index in Malaysia, Thailand, and Indonesia is limited in this study. In the future, interviews with more than three Indonesian informants should also be conducted to reinforce this study's findings. The Chiang-mai's SPP, the STIPI-KMUTT in Thailand, and The Graduate School of STI Policy at UTM in Malaysia are representative examples to study empirically. Also, the study can be comparatively conducted through quantitative methods to prove the relationship between STI policy study courses and innovation index or economic growth in ASEAN member countries.

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## APPENDIX

**Table 15.** The Ranking of Top 10 Universities in Thailand, Malaysia, and Indonesia

| Name of University | Country | The University Ranking in Asia | The University Ranking Among Thailand, Malaysia, and Indonesia |
|---|---|---|---|
| University of Malaya (UM) | Malaysia | 8 | 1 |
| University of Putra Malaysia (UPM) | Malaysia | 27 | 2 |
| University of Kebangsaan Malaysia (UKM) | Malaysia | 33 | 3 |
| University of Sains Malaysia (USM) | Malaysia | 35 | 4 |
| Chulalongkorn University | Thailand | 36 | 5 |
| University of Teknologi Malaysia (UTM) | Malaysia | 38 | 6 |
| Mahidol University | Thailand | 43 | 7 |
| Taylor's University | Malaysia | 53 | 8 |
| University of Indonesia (UI) | Indonesia | 56 | 9 |
| University of Gadjah Mada (UGM) | Indonesia | 59 | 10 |
| Technology Institute of Bandung (ITB) | Indonesia | 67 | 11 |
| University Teknologi PETRONAS (UTP) | Malaysia | 72 | 12 |
| UCSI University | Malaysia | 77 | 13 |
| Chiang Mai University | Thailand | 88 | 14 |
| University of Utara Malaysia (UUM) | Malaysia | 98 | 15 |
| University of Teknologi MARA (UiTM) | Malaysia | 105 | 16 |
| University of Airlangga (Unair) | Indonesia | 110 | 17 |
| Thammasat University | Thailand | 111 | 18 |
| Bogor Agricultural University (IPB) | Indonesia | 112 | 19 |
| Khon Kaen University | Thailand | 133 | 20 |
| Kasetsart University | Thailand | 138 | 21 |
| Technology Institute of Sepuluh November (ITS) | Indonesia | 160 | 22 |
| Prince of Songkla University | Thailand | 171 | 23 |
| University of Padjadjaran (Unpad) | Indonesia | 192 | 24 |
| King Mongkut's University of Technology Thonburi (KMUTT) | Thailand | 196 | 25 |
| University of Diponegoro (Undip) | Indonesia | 209 | 26 |
| University of Bina Nusantara (Binus) | Indonesia | 220 | 27 |
| University of Brawijaya (UB) | Indonesia | 239 | 28 |
| King Mongkut's Institute of Technology Ladkrabang (KMITL) | Thailand | 281-290 | 29 |
| King Mongkut's University of Technology North Bangkok | Thailand | 351-400 | 30 |

Source: Sorted from QS University (2022) – Retrieved from https://www.topuniversities.com/university-rankings/asian-university-rankings/2022.