Research Paper

Proposed Business Models for University Technology Commercialization: Insights from PT Rekacipta Inovasi, Institut Teknologi Bandung

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Abstract

The current commercialization business model in universities emphasizes the role of the Technology Transfer Office (TTO) with its main activities in licensing and incubators with university spin-off incubation activities. Few studies have highlighted a business model in the form of a university profit-oriented company that focuses specifically on accommodating technology commercialization activities, especially in the Indonesian context. This study constructed technology commercialization business models from PT Rekacipta Inovasi, Institut Teknologi Bandung (PT RII). We conducted interviews with eight informants who are company's management and staff, university's management, and technology inventors. Using abductive approach, we found that business models for university technology commercialization are not only includes licensing practices and establishment of spin-off companies that focus on the Business to Business (B to B) market, but also joint venture and joint operation practices and direct selling with the Business to Costumer (B to C) market. Through this business model, universities can direct the commercialization practice of research results towards business practices that can generate revenue. This research provided a novel commercialization model for developing countries context which can be a reference for universities in carrying out their technology commercialization activities.

Keywords: *Business model; technology commercialization; university; company; PT Rekacipta Inovasi ITB*

INTRODUCTION

As a developing country, Indonesia faces significant challenges in commercializing technology from universities. Universities in Indonesia have limited funding, inadequate infrastructure, and a lack of skilled personnel. Furthermore, most Indonesian universities are struggling to find the best model to commercialize their research products (Lasambouw et al., 2020). On a broader scale, Indonesia faces challenges related to the weakness of its strong industry in research and development (R&D), few technopreneurs, and low government R&D spending (Dhewanto & Umam, 2009). In addition, Indonesia has a low innovation index (WIPO, 2022) and weak relations between universities and industry (Alibekova et al., 2019).

Meanwhile, universities are also urged to become entrepreneurial universities with commercialisation activities oriented toward revenue centres. However, adoption of this mission in universities in Indonesia is very low due to a lack of institutional support and a weak innovation ecosystem. A study by Maritz et al. (2022) stated that among 33 universities surveyed, only a few institutions give actual or substantive result of entrepreneurial initiative. In addition, universities are also faced with the challenge of financial sustainability (CNBC, 2021), so adopting alternative business models such as commercialization activities becomes a rational choice.

Technology commercialization activities in various universities in Indonesia are generally managed as cost centres and a few as revenue centres (Dzakiy et al., 2024; Asmoro, 2017). The

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revenue centre for this activity can provide additional income, especially for universities that adopt the entrepreneurial university mission. A university company that manages commercialization activities can run this revenue centre. Through the establishment of a company, commercialization activities are not just projects but sustainable business activities that can also create added value for universities (Andrianto, 2017).

The university's only revenue-generating activity is licensing from two commercialization channels: licensing and spin-off (Sengupta & Ray, 2017). Other channels for technology commercialization activities can be revenue generators in developing countries with less-than-ideal innovation ecosystems. Through a company, universities can trace activities that can generate revenue. In addition, commercialization activities at universities that were previously managed conventionally can be managed more professionally and business-oriented.

This study presents a case study of PT Rekacipta Inovasi case study (PT RII). This company was established in 2016 and was formed explicitly by Institut Teknologi Bandung (ITB) as a revenue generator for commercialization activities. PT RII is one of the special technology commercialization companies formed explicitly by a university in Indonesia and has a track record in implementing successful commercialization activities. Therefore, this study highlights the business model implemented by PT RII, which can ultimately provide theoretical contributions in the form of a model for the commercialization of university research results and practical contributions for universities in managing technology commercialization activities.

Previous research on the commercialization business model at universities has focused more on the Technology Transfer Office (TTO), which has its main activity in licensing and incubators with their spin-off company incubation activities (Holgersson & Aaboen, 2019). The previous study emphasized the management of commercialization activities that were more cost-centred than revenue-centred. Furthermore, no existing research has highlighted a business model in the form of a university profit-oriented company that focuses on accommodating technology commercialization activities, especially in the Indonesian context. This is particularly related to a business model based on technological characteristics and the readiness of the commercialization ecosystem. This study fills this gap by proposing a technology commercialization business model from a university in Indonesia, Institut Teknologi Bandung (ITB). Therefore, this study will answer the following question: How is the technology commercialization business model at universities achieved by forming a special company?

To answer this question, this article consists of a literature review of existing business models of technology commercialization at universities, followed by research methodology, results, discussion and conclusions.

LITERATURE REVIEW

Business Model Practice of Technology Commercialization at University

A business model is generally defined as how an organization creates, delivers, and captures value through exchanges with multiple stakeholders (Massa & Tucci, 2013). This concept is particularly relevant in university technology transfer, where institutions seek to maximize the value of their research outputs by engaging with industry and societal partners. A well-structured business model enables universities to manage their commercialization efforts strategically, ensuring that innovations reach their intended users while generating revenue and societal benefits.

The value creation process in university technology transfer involves active engagement with stakeholders, including researchers, industry partners, policymakers, and investors (McGrath & MacMillan, 2000). On the other hand, value capture focuses on how universities can monetize their research through licensing, spin-offs, joint ventures, or direct sales (Teece, 2010). According to

Baden-Fuller and Mangematin (2013), a comprehensive business model framework comprises four main elements: customer sensing, engagement, monetization, and value chain relationships. In the university context, these elements translate into prioritizing technology transfer activities, identifying and engaging key stakeholders and ensuring that the commercialization process delivers measurable benefits. Understanding and categorizing technology transfer business models is essential for universities to enhance their social impact and refine policies.

Baglieri et al. (2018) introduced the catalytic university model, which positions universities as key drivers of innovation ecosystems. Rather than focusing solely on patents or start-ups, this model encourages universities to act as global actors that foster collaborative partnerships between academia and industry. Under this approach, universities earn revenues primarily from exploiting research outputs through licensing agreements, which are often more effective in generating long-term economic impact than start-ups alone. However, this model tends to be most effective when universities generate disruptive technologies from cutting-edge research laboratories, highlighting the need for strong institutional support, funding and market-driven innovation strategies.

Commercialization Channel at the University

Commercialization of university research outputs has traditionally been achieved through technology licensing agreements and the formation of spin-offs (Sengupta & Ray, 2017; Holgersson & Aaboen, 2019). Technology licensing is a widely adopted mechanism that allows universities to transfer their research-based innovations to external organizations. Through licensing agreements, universities grant companies the right to use their patented technology in return for a fixed fee or ongoing royalty payments (Wood, 2011). These agreements are often part of strategic alliances, allowing businesses to leverage academic research while universities benefit from financial benefits (Trott, 2016). Licensing is most effective when patents protect the technology well and commercial uncertainty is relatively low (Pries & Guild, 2011). However, in cases where commercial uncertainty is high or specialized complementary assets are required for successful market entry, licensing may not be the most effective approach.

In such cases, spin-offs serve as an alternative commercialization strategy. Spin-offs refer to creating new business entities from university research, often founded by university professors, researchers, or students who develop the technology (O'Shea et al., 2008; Rasmussen et al., 2006). The structure of spin-offs can vary, with universities owning or establishing them through partnerships with external investors or industry players (Shane & Stuart, 2002). Lockett and Wright (2005) and Wright et al. (2006) identified three primary forms of academic spin-offs: licensing-based spin-offs, in which the university transfers intellectual property rights to a new entity; equity-based spin-offs, in which the university retains a stake in the company; and university-founded spin-offs, in which the institution takes an active role in establishing and managing the company.

Spin-off formation is often associated with university patenting activity (Rasmussen et al., 2006). Prestigious institutions such as the University of Oxford have developed structured processes for spin-off formation, allowing them to retain control of intellectual property while securing external investment and generating long-term financial returns (Lockett et al., 2003). Spin-offs are particularly well-suited for technologies that require significant investments and involve high commercial uncertainty (O'Shea et al., 2008). However, despite their potential, spin-offs face significant challenges, particularly in developing countries with limited access to venture capital and early-stage funding. The lack of financial support and an underdeveloped innovation ecosystem can hinder the growth and sustainability of university spin-offs in these regions.

Table 1. Existing Business Models for University Technology Commercialization

Channel	Market	Business model
Spin-off	B to B	Share ownership
Licensing	B to B	Royalty from the licensing agreement

RESEARCH METHOD

This study uses abductive reasoning to answer the objective of this study, namely, to construct a developed business model of technology commercialization at the university. Abductive reasoning is an approach that continuously moves back and forth between empirical observation and theoretical development, allowing for a dynamic interaction between research activities and emerging insights (Dubois & Gadde, 2002). This approach aims to refine existing theories by integrating them with real-world observations. According to Spens and Kovács (2006), abductive reasoning begins with prior theoretical knowledge and then combines empirical observations to achieve theory matching, generate theory suggestions, and apply conclusions. Unlike purely inductive or deductive approaches, abductive reasoning offers flexibility in refining conceptual models based on empirical insights, making it particularly suitable for exploratory business and management research.

To explore this phenomenon, we adopted a case study strategy, which allows for an in-depth examination of the technology commercialization process in a real-life context. According to Robson (2002), a case study is a research strategy that involves an empirical investigation of a contemporary phenomenon in a real-world context, drawing on multiple sources of evidence. This methodology is beneficial for developing theory because it provides in-depth insights into an empirical phenomenon while maintaining contextual understanding (Dubois & Gadde, 2002). Case study research has been widely used in business and management studies to generate rich, context-dependent knowledge, making it an appropriate method for examining university technology commercialization practices.

This study selected PT Rekacipta Inovasi ITB (PT RII) as the case study because it is the only university-formed company in Indonesia focusing on revenue streams from technology commercialization. This company was established by the Institut Teknologi Bandung (ITB) in 2016 and is designed to bridge the gap between academic research and market applications. PT RII provides an appropriate context for investigating the university's commercialization model due to its structured commercialization mechanism and direct affiliation with a leading research institution.

Semi-structured interviews and Focus Group Discussions (FGDs) were conducted with key stakeholders to collect primary data. The interviews occurred between April 2022 and February 2023, with an average duration of 1 hour and 30 minutes, while the FGD was held on July 12, 2022. Semi-structured interviews were chosen because they allow flexibility in probing responses, allowing researchers to capture both expected and unexpected insights (Eisenhardt, 1989). The interviewees included company executives, university administrators, and key personnel involved in technology commercialization governance. These informants were selected based on their direct involvement in PT RII operations and their expertise in technology transfer and commercialization strategies. FGDs served as a complementary data collection method, allowing for interactive discussions among stakeholders and facilitated the identification of shared experiences, challenges, and perspectives, thus enriching the depth of qualitative insights (Krueger & Casey, 2014). Combining individual interviews with group discussions ensured a more comprehensive understanding of PT RII's commercialization practices.

For data analysis, we employed content analysis, a method that is particularly effective for examining both explicit (manifest content) and implicit assumptions (latent content) in texts (Spens & Kovács, 2006). Content analysis allows for a systematic, objective, and reliable interpretation of textual data, facilitating the identification of key themes, underlying meanings, and patterns in the collected material (Krippendorff, 2018). This approach was chosen because it facilitates qualitative and quantitative examination of universities' commercialization strategies.

To structure the analysis, we followed Strauss and Corbin's (1990) coding framework, which consists of three main stages: Open Coding, which involves identifying concepts, categories, and patterns in the data; Axial Coding, which involves establishing relationships between categories and integrating them into broader themes; and Selective Coding, which involves refining and consolidating categories to develop a coherent theoretical framework. We systematically identify commercialization mechanisms, strategic challenges, and best practices for university-driven technology transfer initiatives using this coding process. This structured approach ensures that the data is analyzed transparently and rigorously. Furthermore, we conducted content analysis by coding manually without using specific tools. This manual coding allows researchers to engage with the data deeply to produce a more profound understanding (Braun & Clarke, 2006).

To enhance the validity and reliability of this study, we carefully documented each step of the study, including defining the research question, i.e. clearly outlining the scope and objectives of the study; data collection procedures, i.e. ensuring systematic interview and FGD protocols; data analysis framework, i.e. using structured coding methods for thematic analysis; and formulation of conclusions, i.e. gaining insights based on empirical evidence while maintaining alignment with theoretical perspectives. By detailing each stage of the research process, we ensure methodological rigour and reproducibility, thereby increasing the credibility of our findings. Additionally, triangulation—using multiple data sources (interviews, FGDs, and documentation)—helps reduce bias and increase the robustness of our conclusions (Yin, 2018).

Table 2. List of the Interviewees

No.	Occupation	Position	Topic of interview	Duration of interview
1	University's company	Director of PT Rekacipta Inovasi (PT RII)	Role of the RII in commercializing university research	55 minutes
2	University's company	Staff of Business Development, PT RII	Role of the RII in commercializing university research	2 hours 4 minutes
3	University's company	Staff of Business Development, PT RII	Role of the RII in commercializing university research	1 hour 9 minutes
4	University's company	Director of Operations, PT RII	Role of the RII in commercializing university research	1 hour 22 minutes
5	University Management	Director of BPUDL (university-	Role of university shareholders in company shares	1 hour 35 minutes

No.	Occupation	Position	Topic of interview	Duration of interview
		owned company management)		
6	University management	Vice-Rector, Research and Innovation	Role of university management in supporting technology commercialization	1 hour 37 minutes
7	Industry	Public relations, Ventilator, Indonesia	Joint operation process	1 hour 22 minutes
8	Industry	Principal Researcher: Katalis Sinergi Indonesia	Spin-off process from research to business	2 hours 2 minutes

FINDINGS AND DISCUSSION

Overview of the PT Rekacipta Inovasi ITB

PT. Rekacipta Inovasi ITB (PT RII) is important in commercializing research and innovation products developed within the Bandung Institute of Technology (ITB). As a company owned by ITB, PT RII bridges academic research and market application, ensuring valuable technological advances can reach a broader industry and society. With 97% of its shares owned by ITB through the Sustainable Fund and Business Management Agency (BPUDL ITB) and the remaining 3% owned by another ITB company, PT LAPI ITB, PT RII operates as a strategic subsidiary dedicated to the commercialization of research. Since its establishment in February 2016, the company has focused on patent support, fostering technological innovation, and accelerating the growth of start-up companies emerging from the ITB research ecosystem (Inovasi ITB, 2024).

A key aspect of PT RII's operations is its close collaboration with ITB's Technology Transfer Office (TTO), LPIK-ITB. This partnership is critical in enhancing the commercial value of intellectual property rights (IPR) by facilitating the licensing process. In addition, PT RII collaborates with ITB's Science and Technopark (STP) to accelerate the development of spin-off companies by providing access to manufacturing facilities for mass production and facilitating market entry. Through this strategic collaboration, PT RII helps transform academic research into commercially viable products and businesses. The company's impact is evident in its revenue generation, which has earned IDR11.4 billion from technology commercialization activities between 2021 and 2023.

Joint Operation

This joint operation strategy is appropriate for technologies that have reached the industrial prototype stage. The case study discussed here is a portable ventilator called Vent-I. The COVID-19 pandemic that began in early 2020 caused a huge increase in the need for ventilators to treat the rapidly growing number of patients. To respond to this need, a group of ITB inventors and external parties, namely doctors from Universitas Padjajaran (Unpad) and a social foundation based in Bandung, Indonesia (Rumah Amal Salman), joined the Vent-I team. They developed Vent-I (Ventilator Portable Indonesia) technology, a Continuous Positive Airway Pressure (CPAP) model ventilator that continuously injects air into the lungs to maintain cavity opening and minimize the potential for respiratory failure in patients who can still breathe independently. Before production, the product meets all standard test criteria with general requirements for basic safety and critical

performance. The product has also been completed in clinical trials at 11 government-designated COVID-19 referral hospitals.

After the prototype was created and patented at ITB, the development team asked ITB company, PT RII, to find a production partner. PT RII obtained a manufacturer partner who would produce the prototype that had been developed. After the partner was found, the production process was then carried out. Parallel testing of the device was carried out at the Ministry of Health, while PT RII and the development team assisted with distribution testing as part of this process. The Government relaxed several provisions in the ventilator distribution licensing process due to the pandemic emergency. If the first stage of production was carried out by a local manufacturer, then the second stage was carried out by a large manufacturer, PT PHCI as part of Panasonic Gobel Indonesia. The distribution of royalties from the sale of this device follows standard provisions at ITB, while royalties from the inventor were handed over entirely to a social foundation, Rumah Salman.

> *"PT RII has several products for which we have joint operations. PT RII's joint operations do not lead to the production line but to partners for production. For example, joint operations in pharmaceutical products with mallon (contract manufacturing) are performed because they do not have a factory. In the manufacturing process alone, RII requires a large HR system and resources."* - Operation Manager, PT RII

Joint Venture

Joint ventures are business models where a university partners with an external company to develop and market a technology. In this model, the university and the external company share the risks and rewards of the commercialization process. Joint ventures are particularly suitable for technologies that require significant investments and have high commercial uncertainty (Rasmussen et al., 2006). However, joint ventures also face significant challenges, especially in developing countries with weak partnership legal frameworks. This is reflected in the fact that

The technology development adopted through the joint venture strategy has reached the industrial prototype stage until then a company was founded called Katalis Sinergi Indonesia (KSI). The story started when the Chemical Engineering and Catalysis Laboratory (TRKK) of ITB collaborates with PT. PERTAMINA to develop catalysts to convert palm oil into various fuel products. These products include biofuel (BBN), biodiesel, biooil, and biogasoline. The collaboration began with the manufacture of catalysts on a laboratory scale, followed by production scale to supply the needs of PT. PERTAMINA as the largest oil and gas company in Indonesia. The development of catalysts is driven by the use of solid catalysts in industry, which reaches about 80%, with metal catalysts being the most widely used type. More than 70% of catalyzed reactions involve metal catalysts.

ITB through PT RII uses three patents as capital to become part of a joint venture company, PT KSI, namely catalysts for biodiesel and hydrotreating catalysts. These patents are in the name of researchers at TRKK ITB. The formation of PT KSI involves PT RII, PT PERTAMINA, and Pupuk Kujang. Ownership of PT KSI is divided between ITB (25 percent), Pupuk Kujang (a state-owned company, 40 percent), and PERTAMINA (a state-owned company, 35 percent).

KSI began producing catalysts in 2023, with production prioritized to meet the internal needs of Pupuk Kujang and PT. Both state-owned companies are offtakes of PT. KSI's catalyst products. Further development was carried out from 2016 to 2019 with funding support from various stakeholders, including the Ministry of Research and Technology through the innovation acceleration program, the National Research and Innovation Agency (BRIN), and the Palm Oil Plantation Fund Management Agency (BPDKS).

"After the MoU between ITB and Pupuk Kujang (a state-owned company), a technical team was formed. At that time, the RII was invited and began its joint venture. In the middle of the journey, Pertamina (another state-owned company) was involved in the collaboration. They finally agreed to form a joint venture agreement. A joint agreement is the basis for establishing a joint company".–Director of PT RII

Licensing

Licensing is one of the universities' most common business models for commercializing research output. In this model, universities license external parties to use patented technology in exchange for fees or royalties. Licensing is best suited for technologies that are well-protected by patents and have low commercial uncertainty (Pries & Guild, 2011). However, licensing also has limitations, especially in developing countries where the legal framework for intellectual property (IP) protection is weak.

Licensed technologies remain protected or patented. Licensing as part of commercialization channel requires lower investment compared to the formation of high-risk spin-off companies. Commercialization projects involving the licensing process at ITB include a portable ventilator licensed to an ITB company, PT RII, which then entered a joint venture with the established companies. NIVA technology was also licensed to a manufacturer, PT Selaras, before a joint operation was created. Masaro technology was also licensed to a start-up company, PT Masaro Jabar Lestari, and, finally, lightning protection technology licensed by PT RII was then sublicensed to an SME called Tesla Daya Elektrika (TDE). ITB licenses the patented technology through the Technology Transfer Office (TTO), LPIK-ITB, to the university company, PT RII, before being produced by a manufacturer. Royalties from the sale of these products are subject to ITB's standard regulations.

"Researchers carry out the patent process of their inventions with ITB ownership. ITB has regulations for this, including benefits received in the form of shares of a certain percentage to researchers and a certain percentage to several other parties".– Director of PT RII

Direct Selling

Direct selling is a business model in which universities sell their products directly to consumers. This model is best suited to products with apparent market demand that do not require significant investments in marketing and distribution. However, direct selling also presents significant challenges, especially in developing countries where the market for university-developed products is often limited. In this context, the lack of an established consumer base and the need for a strong marketing and branding strategy can make it difficult for universities to achieve sustainable revenue through direct selling alone.

In the case of PT Rekacipta Inovasi ITB (PT RII), direct sales are conducted after production cooperation with the manufacturers. After the product is produced, PT RII takes responsibility for its marketing and sales to its customers. Vent-I, a ventilator developed through ITB research, is a prime example. After production, large stocks are stored in warehouses and are awaiting distribution through PT RII's direct sales efforts. Another example is Ganeshafit, a health supplement developed by the ITB School of Pharmacy in collaboration with manufacturers. This product is marketed and sold directly by PT RII's sales team, with a portion of the revenue being donated to the company's financial sustainability.

Despite its potential benefits, the Business-to-Customer (B2C) approach poses several challenges for PT RII. One significant obstacle is that revenues generated from direct sales are

typically lower than those from business-to-business (B2B) transactions, such as licensing and joint ventures. Additionally, PT RII's team has limited experience in consumer sales, which makes it challenging to scale direct sales operations effectively. Expanding sales, digital marketing, and customer engagement expertise is critical for strengthening PT RII's direct sales strategy.

> *"PT RII has never had a product like this before. Because the brand rights belong to PT RII, this company must first become a distributor of this herbal product".* - Business Development Staff, PT RII

Proposed Business Model for University Technology Commercialization

Business models in technology commercialization encompass the strategies and processes used by universities to create, deliver and capture value from their research outputs. Massa and Tucci (2013) define a business model as consisting of several key components, including a value proposition, target market, revenue streams, and the resources and activities required to deliver value. The most common business models in university technology commercialisation involve licensing, spin-offs, joint ventures, and outright sales. These models enable universities to translate their research into tangible economic and social benefits, thus bridging the gap between academic innovation and market application.

To optimize commercialization efforts, universities often establish a dedicated entity to manage commercialization activities and generate revenue. However, due to the patchy nature of the innovation ecosystem and the fact that many of the technologies developed by universities are not necessarily cutting-edge, these commercialization companies must adopt a pragmatic approach. Although the revenues generated are relatively small, these companies play a critical role in ensuring that university innovations reach the market. Unlike conventional commercialization models targeting the industry sector through business-to-business (B2B) strategies such as licensing and spin-offs, university commercialization companies also explore business-to-consumer (B2C) models through direct sales. These diverse commercialization pathways reflect the challenges universities face, including the limited experience of commercialization teams and their reluctance to make significant investments in high-risk technology commercialization ventures (Kirchberger & Pohl, 2016).

Table 3. Proposed Business Models for University Technology Commercialization

Channel	Market	Business Model
Spin-off	B to B	Profit from company's share (dividends & capital gain)
Licensing	B to B	Royalty from the licensing agreement
Joint venture	B to B	Investment, Management, profit from share (dividends & capital gain)
Joint operation	B to B	Joint profit from production
Direct selling	B–C	Profit from sales (Buy-sell profit)

Given these challenges, universities should not limit themselves to traditional commercialization mechanisms. Although licensing and spin-offs remain important components of technology transfer, alternative models offer additional opportunities, such as joint operations, joint ventures, and outright sales. These strategies allow universities to overcome the limitations of their technology-push approaches, which often lack market-driven insights (Ameka, 2013). By engaging in collaborative commercialization efforts and leveraging industry partnerships, universities can enhance their market knowledge and increase the likelihood of successful

technology transfer.

RII's technology commercialization model provides an alternative to the technology commercialization model in universities that is more about licensing and spin-off creation (Sengupta & Ray, 2017) and cost-centred. RII's model is more about revenue streams with the principle of a company's professionalism and is in the context of Indonesia, which is weak in the technology-based industrial ecosystem (Dhewanto & Umam, 2009) and innovation ecosystem (Nesta, 2019). From the RII's model, other universities can make joint ventures, joint operations, and direct selling as alternative business models for commercialization that are oriented toward revenue streams. The key to the successful implementation of this alternative business model is the establishment of special companies that are oriented toward commercializing technology.

While various commercialization strategies are available, universities need to assess the effectiveness of each model. The goal of technology commercialization is not only to generate revenue but also to maximize the impact of university research on industry and society. Therefore, future studies should evaluate the long-term sustainability of various business models and their alignment with the university's core education, research, and innovation missions. Universities can develop more effective and sustainable business models that balance financial viability with broader academic and societal goals by continually refining and adapting commercialization strategies.

CONCLUSIONS

Universities are critical in driving innovation and economic growth by commercializing research output. To effectively bridge the gap between academia and industry, universities can establish dedicated companies focused on commercialization activities. These entities can act as intermediaries, ensuring that research outputs are transformed into viable products, services, or technologies that benefit society. However, given the challenges an imperfect innovation ecosystem poses, universities must adopt a pragmatic approach to commercialization. They should implement proven revenue-generating strategies rather than relying solely on conventional models. This research constructed proposed business models for university technology commercialization by establishing a company in the Indonesian context.

A multifaceted commercialization approach can enhance the impact and sustainability of university-driven innovation. In addition to traditional licensing agreements and the formation of university-affiliated start-ups serving the business-to-business (B2B) sector, universities can explore alternative models, such as joint operations and joint ventures. These collaborative efforts with industry partners can maximize the potential of research-based innovation by leveraging external expertise, funding, and market access. Furthermore, universities can engage directly with consumers through business-to-consumer (B2C) strategies, including direct sales, which enable research-based products to reach end users more effectively. By diversifying their commercialization models, universities can ensure that their research activities are not limited to academic publications but translate into real-world applications that generate economic and societal value.

This research theoretically fills the gap in the existing business model of technology commercialization in universities, which is more toward licensing and spin-off. In practical terms, this alternative university commercialization business model guides university management to mainstream commercialization activities as revenue centre activities by optimizing the role of companies specifically designed to carry out technology commercialization activities. In addition, this alternative technology commercialization business model is expected to contribute to financial sustainability. However, the effectiveness of these models requires further empirical investigation.

Future studies should evaluate the impact of different commercialization strategies to

determine the most sustainable and efficient approaches. A well-structured commercialization model should generate revenue and align with the university's core mission of education and research. Universities can develop a long-term commercialization framework that balances financial viability with academic excellence and innovation-driven growth by continually refining these models through data-driven assessments.

LIMITATION & FURTHER RESEARCH

This study is limited to a single case study, focusing on PT Rekacipta Inovasi ITB (PT RII) as a model of university-based technology commercialization in Indonesia. While this case provides valuable insights into the commercialization strategies used by Institut Teknologi Bandung (ITB), its findings may not be fully generalizable to other universities with different institutional structures, funding mechanisms, or industry relationships. The generalization process of this study is potentially biased due to the single case study. This study may not fully capture the diverse commercialization landscape across Indonesian higher education institutions. Future research should conduct other case studies at universities in Indonesia to obtain more contextual result for the Indonesian context.

Another limitation of this study is the specific context in which PT RII operates. As a leading technology-focused university in Indonesia, ITB has established strong research capabilities and commercialization support mechanisms, which may not be available at smaller or less research-intensive universities. As a result, the challenges and best practices identified in this study may not be directly applicable to universities that do not have a dedicated technology transfer office, commercialization funding, or strong industry links.

Future research should incorporate multiple case studies from across Indonesian universities to enhance the applicability and generalizability of the university commercialization model. By analyzing multiple commercialization approaches, including licensing, spin-offs, joint ventures, and direct sales, researchers can develop a more comprehensive framework that accommodates the unique characteristics of different institutions. In addition, future research should examine the role of government policies, industry collaborations, and international benchmarking in shaping the success of university commercialization. By broadening the scope of research, academics and policymakers can identify best practices and scalable models that support sustainable and adaptive commercialization strategies across university environments. This will ensure that technology commercialization efforts generate revenue and contribute to national innovation and economic growth.

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