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Commercialization Study of Technological Product Innovation Using Business Model Canvas: Innovation Case of Mobile Laboratory

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ABSTRACTS

A premise states that the success of product technology innovation determines the economic growth of a country. On the other hand, the commercialization of technological product innovations has low success, and one of the reasons is the lack of careful planning. This study discusses the Business Model Canvas (BMC) concept for the commercialization of technological product innovation, using a mobile laboratory (Mobile Laboratory Bio-Safety Level 2/MBSL-2) as a sample product of innovation. MBSL-2 is one of the national technological product innovations initiated by the Agency for the Assessment and Application of Technology (BPPT) in early 2020 and developed as a solution to control the spread of COVID-19. The objective of this study is to evaluate the suitability of the BMC concept as an instrument policy for planning the commercialization of technological product innovation in government research institutions. Nine BMC elements are elaborated, namely customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure. The results of the discussion show how BMC works in a systematic, structured, and measurable way so that it can explain the arguments and objectives for each element of the business process, as well as the harmonization of business strategy with technology strategy. The BMC display is simple but contains important business aspects, making it easier for all parties to understand the business concept of technological product innovation. This study recommends that government research institutions promote the use of BMC as a supporting instrument for researchers in designing a proposal for technological product innovation.

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INTRODUCTION

In President Djoko Widodo's remarks at the 43rd BPPT anniversary in June 2021, he conveyed his vision to transform Indonesia's future value-added economic activities from being based on natural resources to being based on innovation, especially innovation-based on

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science and technology. The innovation referred to by the President can be interpreted as a mission to turn the inventions of the country's children into commercial products (product technology innovations) that can contribute to national economic growth. The President should indeed encourage to development of innovation in Indonesia, considering that Indonesia's innovation report card at the global level is still low. WIPO reports that Indonesia's global innovation index (GII) in 2021 is ranked 87th out of 132 countries [1], down 2 places compared to 2020 [2].

So far, the activities of technological innovation of national products are mostly carried out by government research institutions, but the results have not yet contributed to national economic impact. As a government agency that according to regulations may not play a direct role as a commercial institution, it must be acknowledged that the scope of its innovation program development is generally limited to prototypes or intellectual property rights, especially patents. On the other hand, the industry as a business entity (risk taker) is very selective in investing its capital in new products whose market acceptance has not been tested. Because they come from separate entities and work individually, the continuity of the innovation process is often a problem, so inventions (prototypes) cannot proceed to the stage of commercialization. Klitsie, Price, and Heleen De Lille (2019) [3] reported this failure phenomenon as an innovation journey that must end in the Death Valley of innovation, and this can occur due to technological, funding, or market failures. According to a literature review by Sandberg and Aarikka-Stenroos (2014) [4], a lack of commercialization competencies and an unsupportive organizational structure contribute to the valley of death's formation.

The failure rate of global business innovation is quite high. The results of a global survey by Professor Clayton Christensen from Harvard Business School presented by Carmen Nobel (2011) [5] reported that every year there are about 30 thousand new products launched but 95% of them fail. Furthermore, Jesse Nieminen (2019) [6] provided information from the start-up Genome Report about the high failure rate for global start-ups, which is around 92%. At the national level, Practitioner Yudi Candra (CEO of PT Duta Sukses Dunia) said that from around 1,500 to 1,700 start-up companies in Indonesia, only about one percent were successful [7]. Moreover, he explained that among the important causes of start-up business failure is the lack of focus/maturity in preparing business models, especially in capturing and integrating customer values into business processes.

Analysis to anticipate the failure of product technology innovation requires a better understanding of the concept of product technology innovation. Porumboiu (2021) [8] and Louis Lengrand & Associés (2006) [9] explain that product innovation can be in the form of new technology with a real beneficial effect (breakthrough/radical), or simply an improvement of existing technology, with unintended beneficial effects too large (incremental). Porumboiu (2021) [8] explains that the product technology innovation development process must at least include seven stages, namely: 1) idea generation, 2) idea screening, 3) concept development and testing, 4) market strategy/business analysis, 5) product development, 6) market testing, and 7) market entry/commercialization. Angelo Nicolaides (2014) [10], and EBRD (2014) [11] said that the drivers of product innovation at the company level are due to internal and/or external factors. The most important internal factor is the commitment to the role of R&D as an instrument of business competition, while the dominant external factors are government policies, dynamics of socio-economic-demographic life, and the environment. Besides R&D, the results of a McKinsey survey (2010) [12] reinforced by Henry Chesbrough [13] show the importance of partnerships, open innovation, and corporate commitment as effective internal factors for innovation.

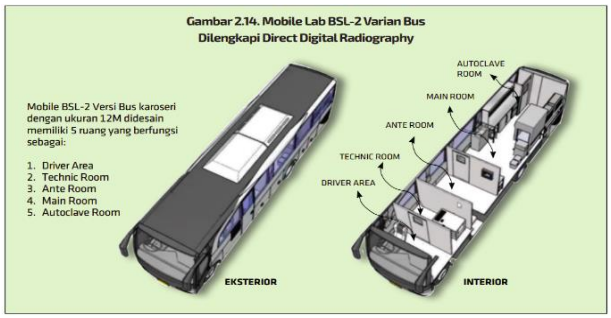
The commercialization of product technology innovations including MBSL-2 requires careful business planning. Various business models developed by academics and practitioners generally emphasize the importance of transferring or integrating market characteristics and customer experiences into the value creation process within the company (Bernd W. Wirtz and Peter Daiser, 2019) [14]. The importance of the customer's role in the content of the business model was also conveyed by Foss and Saebi (2016) [15], Wirtz et al. (2016) [16], and Rhoads (2015) [17], and Teece (2010) [18]. However, customer value is dynamic so the existing business model is ideally accommodating to the existing dynamics. This issue was raised by (Pynnönen et al., 2012) [19] who criticized the limited business model that can accommodate the dynamics of the development of customer values in business model construction.

In a more comprehensive concept, Neil Maclure (2014) [20] reports that there are 3 (three) key aspects of the commercialization of innovative products, namely 1) the ideation stage (maturation of the product concept for business continuity), 2) the business process stage (setting the goals of each product), business processes and milestones), and 3) engage stage (key stakeholder involvement from the start). The latest business model concept whose substance can accommodate the thoughts of academics and according to the needs of practitioners is the Business Model Canvas (BMC) developed by Osterwalder et al. (2010) [21]. Based on practice, BMC can be used for all business lines without being limited to the business sector, however, the benefits are seen as effective for start-up businesses, including for product technology innovation businesses.

This article intends to discuss the application of BMC for the commercialization of product technology innovations. The aim is to evaluate the feasibility of BMC to be developed and promoted as a policy instrument for product technology innovation planning,

especially in government research institutions. To provide a more concrete description of the discussion, the application of the BMC concept in this report will use the case of the commercialization of the technological innovation of the Mobile Laboratory Bio-Safety Level 2 (MBSL-2) product developed by BPPT (now merged into the BRIN institution) since early 2020. The MBSL-2 was chosen for object discussion for three reasons. Firstly, the BPPT as an inventor argued that the characteristics of MBSL-2, which is easy to move (mobile) following the epicenter, proposed to be a solution to the limited capacity of national permanent laboratories in handling the control of the spread of COVID-19 (Hammam Riza et al., 2020) [22]. As long as the threat of COVID-19 or other infectious diseases with similar characteristics persists, the existence of MBSL-2 is urgent. Secondly, the benefits of MBSL-2 have been recognized by the government, so it was determined by the Ministry of Health as an alternative laboratory through Kepmenkes no. HK.01.07/Menkes/ 4642/2021 concerning Control of Covid-19 Variant Omicron. Thirdly, only limited/registered laboratories are allowed to operate MBSL-2 and the quality of MBSL-2 has to comply with specifications adopted by government regulation. These conditions could be a reminder to the industry that commercialization needs to be carefully prepared so as not to fail.

At the early issue of the moving laboratory needs for controlling covid's spread, engineers from research institutions and industry have tried to develop various MBSL-2 designs, from the type and size of the minibus (modified Isuzu Elf/Giga and Toyota Hiace), various bus of micro-medium-big sized, as well as the modified trailer. Compilation of the public information explained that up to the end of the year 2021, the number of MBSL-2 developed consists of less than 30 modified busses of various sizes and less than 40 mini busses, as well as only several trailers. The off-taker is mostly from hospitals and laboratories under government ownership. The illustration of the product and interior layout of the MBSL-2 bus variant resulting from BPPT's innovation is shown in **Figure 1.**



Source: Hammam Riza dkk. (2020) [22]

Figure 1. Illustration of the MBSL-2 bus variant.

Along with the market response as well as quality and operator requirements of MBSL-2 stipulated by the government of Indonesia (Ministry of Health), it seems that only certain variants can meet. This study, therefore, will also discuss the estimated type of MBSL-2 product according to those market responses and the government's requirements.

METHODS

The hypothesis used in this study follows the conclusion of Neil Maclure (2014) [20] that the key to the commercialization of innovative products must include 3 (three) aspects, namely the maturation of the product concept, the clarity and measurability of the objectives of each business process, and the involvement of key stakeholders. In addition, the alignment between business elements which is a demand in business management is also a concern in the discussion. This alignment includes the relationship between operational and strategic aspects, as well as between business strategy and technology strategy (Jann Hidajat, 2015) [23]. These parameters are positioned as a reference of key indicators of an ideal business model, such that the elaboration of the BMC to the MBSL-2 product technology innovation in this study should reach the proven key indicators fulfilment to the such referenced business model.

The data and information for this study were obtained through document reviews and in-depth interviews with actors (resource persons) involved in the process of technological innovation of MBSL-2 products. The resource persons for the engineering design activity are engineers (Head of Program and Chief Engineer) from BPPT and Pajajaran University-Bandung, while for manufacturing activities is the commissioner of PT SDA (Sumber Daya Agung) - Jakarta. Meanwhile, for marketing activities, the resource persons are the marketing in charge of BPPT and PT SDA, while the resource person for users of MBSL-2 products is a medical doctor who is in charge of operating MBSL-2 at Moh Ridwan Meuraksa Hospital - Jakarta. Considering that the distribution of medical device products for health services in Indonesia is bound by distribution permits and other regulations, the elaboration of the BMC in this study also considers related regulations, as well as interviews with officials from the Research Institution of the Ministry of Health.

In the BMC concept, there are 9 (nine) boxes figured out each as a canvas (see Figure 2), representing business process elements, namely customer segments, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure. All of these elements will be elaborated on their substance content measurably, through a sequence of activity steps (business processes) as shown in **Figure 2.**

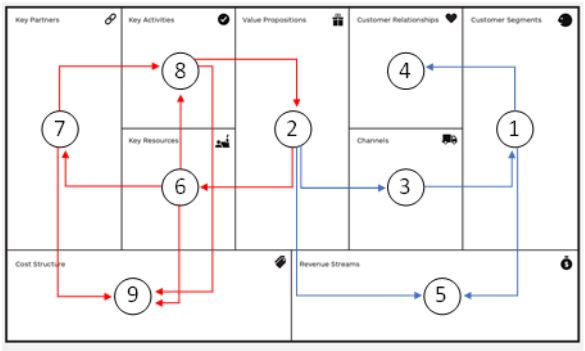


Figure 2. Business Model Canvas Work Chart.

The numbers in the circles in **Figure 2** indicate the order of elaboration that must be done, while the arrow directions indicate the process or workflow of the business activity. The red and blue line represents the technology strategy and operational, and business strategy consecutively. The elaboration results obtained later must be able to provide a business shape that can meet the completeness of the indicators as stated in the study hypothesis.

RESULTS AND DISCUSSION

Business Element Elaboration

(1) Customer Segments

According to the Decree of the Minister of Health number HK.01.07/Menkes/4642/2021 concerning the Control of the Covid-19 Variant Omicron, the laboratories authorized to carry out tests/examinations to ensure the presence of the SARS-CoV-2 virus in specimens are a) Laboratories in Health Facilities), b) Regional Health Laboratories, and c) Clinical Laboratories, both with the status of a government or private institution. If the laboratory uses MBSL, its facilities and operations cannot stand alone and must be part and responsibility of the permanent COVID-19 testing laboratory or the responsibility of the district/city government health office. However, ownership of MBSL can be carried out by the Central/Provincial/ District/City Government and the private sector.

This provision explains that the Customer (user/operator) of the MBSL-2 innovation product is the three types of laboratories above (a, b, c), but the Client (the owner/buyer of the MBSL-2 product) is the Government (Central/Provincial/District/ Municipal) and Private which have a structural relationship with the three types of laboratories. The client, in deciding to procure the MBSL-2 product, considers the service characteristics of the laboratory where the MBSL-2 product will be placed. According to the Ministry of Health (1919) [24], the Central Government which operates hospitals and/or other health service facilities is primarily the Ministry of Health, the Indonesian National Army (TNI)/, the Indonesian Republic Police (POLRI), and a few state-owned enterprises. Of the 2,269 hospital units in Indonesia in 2018, the Central Government managed around 10%, the Provincial Government 4%, the Regency + City Government 27%, and the private sector 59%. According to article 4 of Law number 6 of 2018 concerning Health Quarantine, the task of protecting public health (pandemic control) is the government's mandatory (mandatory). On the other hand, not many Regency/City Governments have the financial capacity to purchase MBSL-2 products, moreover, the usefulness of the goods is only for certain conditions (read pandemic/endemic). Thus, the Central Government and Provincial Governments seem to be the most appropriate to be main clients for marketing MBSL-2 products.

The “Customer Segments” element in BMC is intended to identify the specific needs of the market (clients and customers), which will later be translated into the design of MBSL-2 innovation products. Osterwalder et al. (2010) [21] explained that in the BMC concept, customer needs are generally grouped into 3 categories, namely customer jobs, customer gain, and customer pain. In the context of MBSL-2 for additional capacity to control the spread of COVID-19, customer jobs can be translated into completeness and independence of laboratory equipment capable of thoroughly checking the presence of the COVID-19 virus in specimens. Meanwhile, customer gain can be translated into MBSL-2 mobility capabilities and access to existing infrastructure limitations in the area (easy to move following the development of the epicentre of the spread of the virus), capacity and speed of inspection, the accuracy of examination results, and completeness of information system equipment for data storage and results reporting. Moreover, customer pain can be translated into an MBSL-2 design that can guarantee bio-security and bio-safety, flexibility in the use of reagents (easiness in procuring reagents), ease of operation (automation of how the tool works), the layout of lab equipment, price product, as well as its independence in providing electricity for operation.

The criteria for customer jobs are the demands of all customers. Therefore, all MBSL-2 specifications related to customer jobs criteria and part of customer gain and customer pain, have been packaged by the government as a distribution requirement for MBSL-2 products and promulgated as Kepmenkes number HK.01.07/Menkes/ 4642/2021. For Central and Provincial Government Clients, the main criteria for customer gain may be mobility, considering that this unit will be placed in an area with intensive distribution (epicenter) whose locus may move around. If the reach of the target market is national, it is necessary to consider regional characteristics, especially between Java and outside Java. For areas in Java, the population is dense with relatively good infrastructure conditions, especially roads. Meanwhile outside Java, the population is sparse, the area is large, and the infrastructure is relatively poor. Therefore, the relevant customer gain criteria for the Java region are the capacity and speed of inspection, while for regions outside Java the emphasis is more on

mobility and MBSL access to reach areas (smaller MBSL vehicle size) and MBSL independence in providing electrical energy.

Meanwhile, private clinics that charge fees from suspects/applicants (business motives) and operate in urban areas, of course, want to provide excellent service and the image of sophisticated equipment to prospective customers. Therefore, the demand for customer gain criteria is important, especially related to equipment automation systems, vehicle comfort, information system facilities, as well as accuracy and speed of inspection.

(2) Value Propositions

Value Proposition elements provide space to elaborate on the strengths and advantages or uniqueness of products and/or services that can provide superior attractiveness to potential customers. According to Domingo, R.T [25], the effectiveness of the operation management of a business entity that is oriented to the attractiveness of potential customers (customer's value) is generally determined by the QCD (quality, cost, delivery order) parameters. Slack and Lewis [26] added a parameter other than QCD, namely the product's flexibility (F). Regarding MBSL-2 products, quality can mean the completeness of the specifications according to customer needs, cost means the selling price of MBSL-2 products, and delivery order means the duration of time for the delivery of the ordered goods. Based on the results of the elaboration of the requirements/standard specifications for the MBSL-2 product according to government regulations and the specific needs of the Client/Customer as discussed in the Customer Segments sub-chapter, the flexibility parameter (F) can be interpreted as a variant of the MBSL-2 product that can be selected by the client/customer. The variants in question include (1) large buses and (2) microbuses, each with (a) standard specifications (around Government requirements) and (b) premium (standard specs plus other advantages). Types of vehicles with dimensions smaller than microbuses, it seems difficult to able to meet the requirements of the Ministry of Health number HK.01.07/Menkes/4642/2021, especially regarding the provision of having to provide a separate room for the driver, anteroom, main room (lab equipment), as well as technical requirements. autoclave tool placement.

MBSL-2 is of course not mass-produced but made to order. However, the innovation business entity, which is driven by engineering institutions, especially BRIN, which requires research facilities and competent engineering human resources, must of course be prepared to be able to produce variants with premium specs and make them product advantages. If the variant and spec options are opened to the customer's choice (flexible product), business entities need to conduct detailed assessments and calculations so that delivery times remain measurable.

For MBSL-2 with a standard qualification type, the business competition strategy can emphasize the cost parameters (C=minimum price) and delivery order speed (D). This strategy is expected to be effective for Government Clients, especially in the regions. Meanwhile, a strategy that emphasizes quality (Q) or premium performance is commonly required by business entities that are oriented to excellent service, especially private companies or laboratories in urban areas. Because MBSL-2 is a new technology-based product, while the main potential users are health service entities in areas with limited technical human resource competence, the business entity (producer) of MBSL-2 product innovation should also provide product maintenance services, including providing fast-damaging spare parts, as well as laboratory operation training.

(3) Channels

The Channels element shows how the business entity provides information regarding the value or benefits of the product to consumers. The goal is to provide information and convince potential customers that the products offered have advantages or uniqueness compared to other products, as well as flexible options for specific specifications according to the needs of potential customers. Based on the conventional theory of Marketing Channels (Stanton, 1994) [27], especially for mass products, there are three marketing channels so that products can reach consumers, namely: 1) producers directly to consumers, 2) producers - retailers - consumers, and 3) producers - wholesalers - retailers - consumers. However, the MBSL-2 product that will be marketed here is not a mass product because it has the characteristics of large size, high price, and variants according to customer-specific needs. Because of that, the nature of production and sales uses a make-to-order system, so the most appropriate marketing channel is number 1), namely from producers directly to consumers. Since the main target client/customer is the Government, this can be done through 1) Government Goods/Services Procurement Policy Institute *("LKPP")* e-catalogue, and 2) opening an online communication space through the website and/or brochures. (2) workshops/exhibitions, and (3) advocacy to relevant central/regional government offices. For the LKPP e-catalogue nominal price of the standard variant, the product can be stated, while for the premium variant the nominal range can also be stated. To support the function of the channel's element, there needs to be a special marketing team, either formed internally or in collaboration with external marketing agents.

(4) Customer Relationships

The essence of the Customer Relationship element is Customer Relations Management (CRM). According to Kotler and Keller [28], CRM or customer relationship management is the process of managing detailed information about each customer, to maintain customer loyalty. The success or failure of a company to create customer loyalty is highly dependent on the company's ability to create customer value, and continuously strive to improve it. For this reason, CRM manages all

customer touchpoints, i.e., all events where customers come into contact with the company's products or services, from personal experiences, and mass communications to casual observations. He further explained that the factors that affect customer loyalty include at least 4 (four) aspects, namely: 1) caring, 2) trust, 3) protection (length of patronage), and 4) accumulative satisfaction (overall satisfaction).

In the caring aspect, the company must be able to understand and overcome all the needs, expectations, and problems faced by customers, with the hope that customers are satisfied and make transactions again, or at least provide positive testimonials. For this reason, MBSL-2 product companies must have an after-sales team tasked with serving customers proactively (requested or unsolicited) and equipped with the provision of an easily accessible hotline, for example by reminding the time of maintenance, or providing an engineer contact number if it is related to a problem. operation technical. To gain the trust of customers, the important thing that companies need to do is to provide quality products and services as promised so that customers do not feel cheated. This includes the completeness of tested product operating and maintaining SOPs. Meanwhile, to protect customers from the use of products and services related to MBSL-2 products, the company can provide product guarantees and minimum service level agreements, and apply them fairly and responsibly. In the end, the company must be able to provide cumulative satisfaction to customers through various types of services provided and the way they are served so that it can lead to a positive company image.

(5) Revenue Streams

The revenue stream explains the flow of business income obtained from the results of customer appreciation for the use of the value offered by the company. As explained in the Value Proposition discussion, customer values related to the implementation of the covid-19 virus inspection function will be implemented by-product technology innovation business entities in 3 forms, namely: 1) sales of MBSL-2 bus variants: a) standard big buses, b) standard microbuses, c) premium big buses, and d) premium microbuses, 2) MBSL-2 bus maintenance services purchased by customers/clients, and 3) MBSL-2 bus operation training services for customers. These three types of services will become a source of income for technology innovation business entities.

Sales of MBSL-2 buses should contribute as the main source of income for business entities because their commercial value is much higher than maintenance and training services. Maintenance and training services also only serve as a complement to the sales of MBSL-2 bus products. The results of a survey of MBSL-2 products that have been sold in 2020-2021, the price of MBSL-2 buses per unit is between 4-6 billion rupiah (depending on the variant). Hidayah (2021) [29] reports that what needs to be specified in the Revenue Stream element includes the method of payment/transaction according to the client's condition. This is to provide convenience for clients so that payments are not delayed, thereby securing cash inflow for business entities.

(6) Key Resources

Osterwalder et al. (2010) [20] describe Key Resources elements as the main resources in the form of technology, skilled human resources, facilities, funding needed to realize the value proposition, distribution channels, customer relations and revenue streams from MBSL-2 products. This report limits the discussion examples to the technological resources and expert human resources required for the MBSL-2 vehicle (Bus) design activity.

The minimum specifications for MBSL-2 products have been regulated in Kepmenkes Number HK.01.07/MENKES/4642/2021, namely that MBSL must meet general and design requirements, engineering requirements, special requirements, as well as safety and supporting equipment requirements. An example of a design requirement is the need for separate spaces for drivers, anterooms, and laboratories. In this report, these minimum requirements are further defined as standard variants that must be designed, built and manufactured. Meanwhile, additional specifications that can add value to the product are categorized as premium variants. Premium specifications can include accuracy, capacity, and speed of test results, open system reagents, test automation, World Bio HazTech certificates, sensors and safety devices, IT systems and clouds, or environmentally friendly energy sources such as solar cells attached to vehicles.

To realize these specifications, MBSL-2 design engineering activities are required which are equipped with testing facilities for design validation, as well as science and technology human resources who master the fields of automotive vehicle design, machinery, electronics, biomolecular, pharmaceutical, testing technology, information technology, and instrument physics. Ali Nandar et al. (2020) [30] reported that the MBSL-2 BPPT design process was carried out through division according to technical fields namely Process Design, Architectural Design, Mechanical Design, HVAC Design, Plumbing Design, Electrical Design and Control System Design. It was further reported that the MBSL-2 BPPT design has also been equipped with a Building Automation System (BAS) and can be further developed by being integrated into an artificial intelligent (AI) based system, thus facilitating monitoring in the national reporting system.

Ali Nandar et al. (2020) [30] explained that in the design process, the testing stages were carried out starting from the component acceptance, configuration testing, functional testing, and overall performance testing. To test conformity with customer demand specifications, the BSL-2 Mobile Lab facility must be tested for performance or Performance Qualification, by operating the system by applicable SOPs, and using

measuring tools to determine system performance. In addition to SOPs and measuring instruments, several types of tests must be carried out in certain laboratories, such as the bio smart-safe system verification test on the MBSL-2 BPPT design carried out at LAPTIAB. Testing of vehicle-type prototypes can be carried out at the Roadworthiness Testing and Vehicle Certification Center (BPLJSKB), while for the finished product the manufacturer must be in the laboratory of the Directorate General of Land Transportation of the Ministry of Transportation by the provisions of PP Number 33 of 2018 concerning Vehicle Type Tests. Similar facilities also need to be prepared for the manufacture of MBSL-2 products and to support the implementation of activities on the elements of channels, customer relationships, and revenue streams.

(7) Key Partners

Elements of Partners or business partners in BMC explain the parties that have/need to be legally and formally bound to be jointly involved and responsible for carrying out business processes to fulfil the established value proposition. In the context of the MBSL-2 product as a business object, partnerships can occur in financing activities or technical activities such as product design, material supply, production/ manufacturing, and marketing. Partnerships can also occur because of the drive for economies of scale, reduction of risk and uncertainty, or the acquisition of resources. According to the Business Competition Supervision Commission (KPPU), partnerships must be based on the principles of mutual trust, mutual need, mutual strengthening, and mutual benefit for the parties.

According to Jean Murray [31] from The Balance Small Business, partnerships can be divided into 3 (three) types, namely: 1) General Partnership (GP), 2) Limited Partnership (LP), and 3) Limited Liability Partnership (LLP). A general partnership is a collaboration in which the business processes are carried out equally by the parties, while in a limited partnership, some of the parties are not involved in running the business or are not active (silent partners). Meanwhile, LLP explained the legal protection for the partners, if one of the partners due to his fault was involved in a legal case. An example of a general partnership is the relationship between a company and a material supplier, while a limited partnership is for example between a company and a creditor bank, investor, or insurance company. Since MBSL-2 products are manufactured with variants according to customer requirements, the relationship between the manufacturer and product designers and marketing agents will be more secure if done through a general partnership. If the product designer is an independent entity, while carrying out various design testing requires laboratory facilities belonging to a third party, then there should be a binding collaboration between the designing entity and the laboratory manager. With a clear bond of cooperation, business processes can be carried out smoothly so that product delivery orders can be fulfilled according to the agreement.

Training services related to the operation of MBSL-2 lab equipment need to be carried out by specific expert human resources, especially in the field of molecular biology or pharmacy. Therefore, it is also necessary to establish partnerships with competent entities that can provide these expert human resources. As for product maintenance services, it can be carried out by the manufacturer's human resources supported by product design human resources.

(8) Key Activities

The Key Activities element describes all activities related to the company's business processes. Osterwalder et al. (2010) [20] explained the four factors that merit consideration when deciding on Key Activities are: 1) requirements to fulfil Value Propositions, 2) activities required for Distribution Channels, 3) activities to build positive Customer Relationships, and 4) required activities of Revenue Streams. Moreover, it is explained that Key Activities are usually grouped into three categories, namely: 1) production, 2) problem solving, and 3) platform/network. The production category refers to the design (R&D), manufacture and delivery of MBSL-2 products according to customer values, while the problem-solving category relates to activities to find new solutions to each customer's problems. Included in this category are after-sales services and the activities of providing operation and maintenance training for MBSL-2 products related to the specific needs of customers. The platform/network category relates to software that functions as a platform, so it must be constantly updated. In this digital era, software applications to support business processes are a necessity for business entities that are oriented towards efficiency, precision, accuracy and competition. Applications are also needed for product branding, so that information and product advantages of MBSL-2 innovation are effective in reaching customers.

As an innovative product, mastery of technology is often done in stages, and therefore R&D could be a very important activity. This is relevant, for example for premium variants of MBSL-2 whose specifications and uniqueness must always be developed to keep the product superior to competing products. An example is how to equip buses with solar panels that can provide independent and environmentally friendly energy sources for MBSL-2. Therefore, the product development roadmap along with the required resources is also relevant to be elaborated on the Key Activities elements. On the other side, managing production MBSL-2 requires several key activities, some of which are: product selection and design, production process selection, production planning, production control, quality and cost control, inventory control, and equipment and machinery maintenance.

(9) Cost Structure

Osterwalder et al. (2010) [21] explained that the Cost Structure element is the financial implication of the business concept described/defined in the BMC element, particularly the Key Activities, Key Resources, and Key Partners elements, to generate business value propositions. This element defines and displays a cost map/structure that also explains the contribution of the cost components that require management attention, eg the most expensive, the most important, and/or the most sensitive. The structure needs to follow the rules of financial statements (fixed/variable cost, HPP, etc.) but also with certain format considerations so that it can be used as an analytical tool for strategic management decision-making. Managing costs efficiently will make the business you run more efficient and can minimize the risk of loss.

Advantages of Business Model Canvas (BMC)

The results of the elaboration of the nine business elements carried out following the sequence as shown in Figure 2 shows an indication that the Business Model Canvas or BMC is a management strategy in the form of a visual chart framework consisting of 9 interrelated business elements based on customer needs and values, especially the Central Government and the Provincial Government. The relationship between business elements and their measurability can be explained, for example in the elaboration of the Value Proposition element in box number 2, where the substance is elaborated and determined to answer customer's specific needs (customer's values). After the products and services that contain customer values are determined, then the Channels element (number 3) elaborates on alternative channels to deliver these products and services to customers. Then based on the customer's appreciation for the products and services they receive, the Revenue Streams element (number 5) can calculate how much income the business entity will earn. In strategic management, this elaboration is an important part of business strategy, namely establishing customer-oriented business processes. This elaboration also answers the study hypothesis that a good business model must pay attention to aspects of product concept maturation as well as the clarity and measurability of the objectives of each step of the business process.

In the process of product technology innovation, what has been determined in the business strategy must be a reference in designing and producing products and services that will be offered to customers. Therefore, the business elements in numbers 6-8, are measurable activities to realize the value proposition in number 2. In number 6, the requirements for technology resources (hard & soft), human resources, and funds needed for design/design and production are determined. number 7 is an operational activity for the manufacture of products and services. For business efficiency, resource constraints in element number 6 that cannot be provided by the company can be overcome through business partnerships. Therefore, element number 8 describes important business partners who need to be involved in the business process. The clarity of the content of elements number 6, 7, and 8 are then translated by element number 9 in the form of expenses and cost structures to run business processes. The elaboration of business elements number 6-9 shows the steps of the company's technology and operational strategy in aligning with the business strategy. In addition, this way of working shows consistency in maintaining the maturation of the product concept, measurability of the objectives of each step of the business process from beginning to end, as well as clarity of key stakeholders that can strengthen the business position as stated in the study hypothesis.

The comparison of the cost structure in element number 9 with the income structure in element number 5, turns out that it can function as a measuring instrument for the indication of the feasibility of the company's product innovation business. Of course, if the ratio of number 6 to number 9 is more than one, it can be interpreted that the business is feasible to run. This format certainly makes it easier for management to carry out analysis and simulations, to lead to an effective and efficient business, as well as accommodate the dynamics of the development of customer values. A complete summary of the results of the elaboration of business elements according to the BMC concept is presented in **Figure 3.**

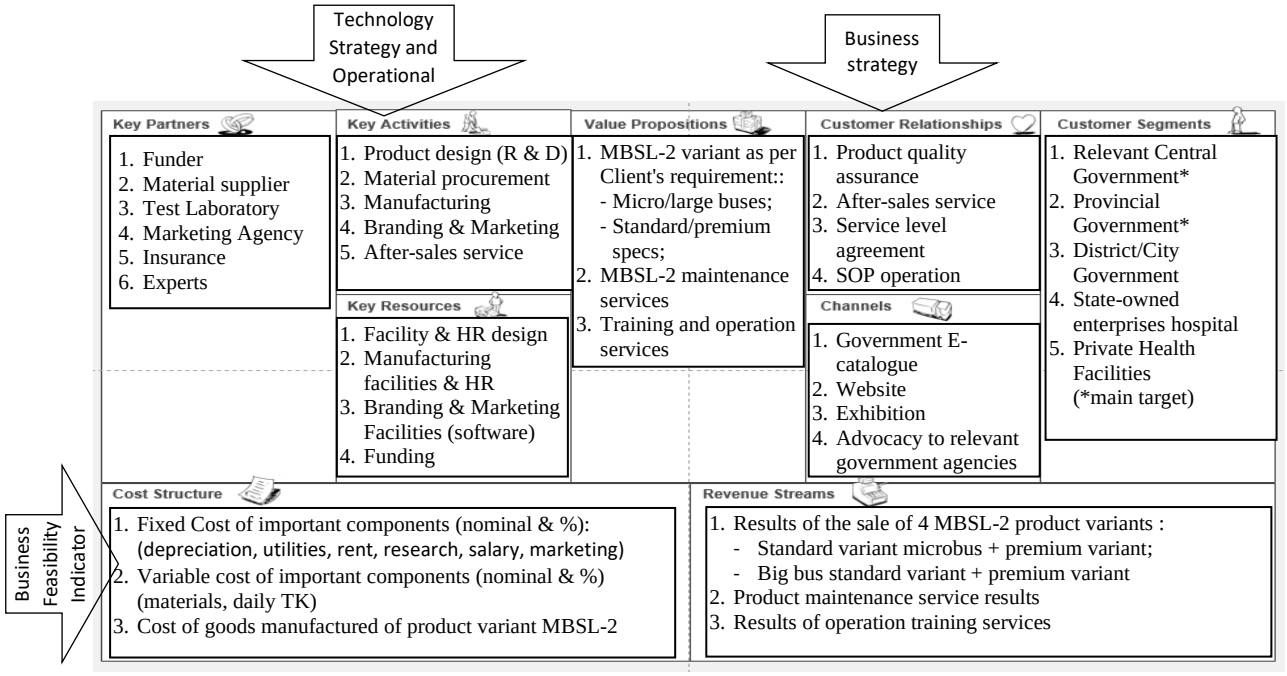


Figure 3. MBSL-2 product BMC.

If figure 3 is examined further, the comparison of the cost structure in element number 9 with the income structure in element number 5, it turns out that it can function as a measure of the feasibility of the company's product innovation business. Of course, if the ratio of number 6 to number 9 is more than one, it can be interpreted that the business is feasible to run. This format certainly makes it easier for management to carry out analysis and simulations, to lead to an effective and efficient business, as well as accommodate the dynamics of developing customer values.

Another advantage of BMC's way of working is that it can convey important business aspects, business rationale, and a structured and systematic description of a business plan. The content of BMC substance that reflects the business foundation provides an easy-to-see strategic reference so that it can act as a guide in the process of making product roadmaps. Its appearance, which describes the company's mission statement and is presented in a simple, systematic, and easy-to-understand format allows BMC to guide business independence, especially for start-up businesses. This concept will of course also make it easier for companies to convince potential partners to be prospected to collaborate.

CONCLUSION

The role of product technology innovation as a driver of economic growth is undeniable, but its success requires careful business planning. The results of the discussion show the effectiveness of using the Business Model Canvas (BMC) as an instrument to oversee the commercialization process of product technology innovation. Its effectiveness is shown by its ability to convey important business aspects, especially in finalizing the product concept, explaining the objectives of each business element, strategic partners that need to be involved, as well as the systematic preparation that can produce business buildings with a simple format but able to align business strategy with technology strategies and operations.

The suitability of BMC to act as a guiding instrument for the commercialization of product technology innovation, especially for start-ups, needs to be considered and promoted. For this reason, the government research institute needs to consider policies to make BMC a supporting instrument for researchers in designing a proposal for technological product innovation. If this proposed procedure is accepted, then the related unit in charge of the government research institutions needs to develop guidelines referring to the BMC concept in a suitable form–that is easy for researchers to implement.

Author Contributions

The first Author is the main contributor while the others contribute equally to this work.

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