

Enhancing Business Model Validation Using Artificial Intelligence: Insights from Student Business Model Canvas Analysis

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ABSTRACT

This study aims to identify common weaknesses in students' Business Model Canvas (BMC) and examine the role of Artificial Intelligence (AI) in improving early-stage business validation. A qualitative descriptive approach was employed using aggregated and anonymized data from 30 student business models. Data were analyzed using thematic coding to identify recurring patterns. The findings reveal that 70% of students struggle with unclear value propositions, 63% define overly broad customer segments, and 57% lack structured revenue models. AI-assisted analysis improves clarity, focus, and logical consistency of business models. This study proposes an AI-BMC conceptual framework as a decision-support approach for entrepreneurship learning. The findings contribute to bridging intuitive business ideation with AI-assisted validation.

INTRODUCTION

Technopreneur and entrepreneurship learning in college today focuses not only on theory, but also on the practice of developing applicable business ideas. Students are encouraged to engage in various activities such as project-based learning, business incubation, as well as entrepreneurial competitions such as funding programs and student business competitions. In this process, the Business Model Canvas (BMC) is the main tool used to help students compile and visualize their business models. BMC not only serves as a learning tool, but also becomes one of the important indicators in the business idea assessment process, both in the classroom and in entrepreneurial competitions.

However, in practice, various weaknesses are still found in the preparation of BMC by students. Many students fill in the elements of BMC in general without conducting an in-depth analysis of customer needs, problems faced, or the revenue model designed. The preparation process tends to be intuitive and assumptive, so the value proposition produced is less specific and the market segmentation is not clearly defined. This condition shows that although BMC has been widely used, its use has not been optimal as a business model validation tool.

On the other hand, the development of Artificial Intelligence (AI) provides new opportunities to support business analysis and decision-making processes. AI can act as a decision support system that helps users generate insights, evaluate business models, and provide alternative solutions quickly and systematically (Davenport et al., 2020). In the context of entrepreneurship, AI not only helps in the ideation stage, but it can also be used to improve the quality of business validation through data-driven analysis and more targeted recommendations.

Based on this, this study aims to identify patterns of weaknesses in the preparation of Business Model Canvas in student learning groups and explore the use of Artificial Intelligence in improving the early stage business validation process. This research is expected to contribute to the development of entrepreneurial learning that is more adaptive to technological developments, especially in integrating AI as a tool in the business decision-making process

LITERATURE REVIEW

(Fakieh et al., 2022) (Kupczyk et al., 2024) (Fakieh et al., 2022) (Xinli et al., 2018) (Ruiz-Ramírez et al., 2019) (Kupczyk et al., 2024) "Business Model Canvas Application in Start-Up Stage Business Developments: Constraints and Challenges" shows that BMC assists startups in simplifying business strategies and visualizing business ideas in the early stages. In addition, in the study (Xinli et al., 2018) "Developing Entrepreneurial Competencies for Successful Business Model Canvas" it was found that entrepreneurial competencies have a significant influence on the success of BMC preparation. The research titled "(Ruiz-Ramirez et al., 2019) Business Model Canvas as an Analytical Tool for the Evaluation of Companies" also shows that BMC is effectively used as a business model evaluation tool for companies.

(Wesley Friske, 2018) (Wesley Friske, 2018) (Berlin, 2015) (Sabri, 2022) (Berlin, 2015) (Nicolaj Hannesbo Petersen & Applied Business Research, 2024) (Garcia Altafin et al., 2025) (Sabri, 2022) "Adoption of Business Model Canvas in Exploring Digital Business Transformation" menunjukkan bahwa BMC mampu membantu organisasi memetakan perubahan bisnis digital. Namun demikian, dalam penelitian "(Nicolaj Hannesbo Petersen & Anvendt Erhvervsforskning, 2024) "Mindful Organizing Sensemaking of the Innovative Blank Canvas Business Modelling" mengkritisi framework BMC yang dianggap masih kurang fleksibel dalam menghadapi kondisi bisnis yang dinamis. Penelitian berjudul "(Garcia Altafin et al., 2025) "Business Model Revisited: A Novel Canvas for Digital Transformation" kemudian mengembangkan model canvas baru yang lebih sesuai dengan kebutuhan transformasi bisnis digital.

In the context of measuring business performance and technology-based startups, (Montemari et al., 2019) through the research "Designing Performance Measurement Systems Using Business Models" explained that BMC can be used in the preparation of business performance indicators and Key Performance Indicators (KPIs). (Salim & Veri, 2025) in the study "Trends and Innovation of Technology-Based Startup Business Schemes" shows that the development of digital technology encourages startup business model innovation faster and more adaptively. The research (Zuqron & Veri, 2025) entitled "Systematic Review of Business Models and Technological Innovation in Start-ups" also confirms that the integration of digital technology and AI has a positive impact on startup business model innovation.

The development of Artificial Intelligence (AI) opens up new opportunities in business model development and decision-making. Jayanto and Suparwata (2025) through the research "The Role of Artificial Intelligence in Encouraging Product and Business Model Innovation in Technopreneurs in the Digital Economy Era" explained that AI is able to accelerate product innovation and support the development of data-based business models. (Adawiyah et al., 2025) in the study "Evaluation and Design of Business Model Proposal at Fibo School Using Business Model Canvas" shows that BMC assists the business evaluation process of AI-based products. (Tri Nanta Paramudya Putra et al., 2025) through the research "Business Model Analysis at PT TMDR with a Business Model Canvas Approach" also found that AI integration is an opportunity for service differentiation in technology companies.

In the context of entrepreneurship education, the use of AI is beginning to be applied in the learning and validation process of business. (Wayan et al., 2026) in the study "Mindset in Vocational Students Through AI-Assisted Business Model Canvas Workshop" showed that the integration of AI in the BMC workshop was able to increase students' understanding of technopreneurship and students' ability to develop business models. (Bouw et al., 2025) through the research "AIpreneurship: Building Artificial Intelligence-Based Entrepreneurship in the Digital Era for Students" explains that AI helps the process of business ideation, market analysis, and data-driven business model development. (Santosa, 2026) in the study "Artificial Intelligence, Product Innovation, and MSME Performance: A Strategic Perspective in the Digital

Economy Ecosystem" explained that AI is able to improve the quality of business decision-making and MSME product innovation. (Astawa & Dewi, 2025) through the research "Business Transformation in the Digital Era: The Strategic Role of Artificial Intelligence in Innovation and Competitive Advantage" also emphasized that AI supports business model innovation and digital business operational efficiency.

In addition, a study (Bih et al., 2025) entitled "Integration of Artificial Intelligence in Business Model Innovation in E-Commerce" shows that AI has a significant impact on the elements of value proposition, customer relationship, and digital business model innovation. Although various studies have addressed the use of BMC and the utilization of AI in business development, most studies still address the two concepts separately. Previous research has also focused more on the context of startups, companies, or digital transformation of organizations, while the integration of AI as a tool for validating Business Model Canvas in the context of student entrepreneurship learning has not been widely explored. Therefore, this study proposes the AI-BMC approach as an integration between Business Model Canvas and Artificial Intelligence to help the early-stage business validation process in a more systematic, adaptive, and technology-based manner.

METHODOLOGY

This study uses an exploratory qualitative descriptive approach to identify patterns of weakness in the preparation of students' Business Model Canvas (BMC). The research population is a business team of students who participate in entrepreneurship/technopreneur learning. The research sample is in the form of 30 student business models that were selected purposively based on their involvement in business development assignments or activities. All data is analyzed in aggregate and anonymous form to maintain research ethics.

The data analysis technique in this study was carried out using *the thematic coding* approach, which is a qualitative analysis method used to systematically identify patterns of findings. The analysis process begins by identifying various forms of weakness that appear in each element of the student's Business Model Canvas (BMC). Furthermore, the findings are grouped into main categories based on common characteristics, such as weaknesses in value propositions, market segmentation, and revenue models. After the categorization process, a frequency analysis is carried out to find out how often each category of weaknesses appears in the data, so that the most dominant problems can be identified. The final stage is the interpretation of the results, in which the researcher analyzes the meaning of the patterns and relates them to the relevant entrepreneurial context and theory. Through this stage, a deeper understanding of the general weaknesses in the preparation of student business models is obtained.

It can be easily concluded that *the thematic coding* analysis technique is carried out in the following stages:

- a. Identify patterns of weakness in BMC.
- b. Grouping findings into key categories.
- c. Calculate the frequency of occurrence of each category.
- d. Interpret the results to understand the dominant problem.



Figure 1. Research Methodology Flowchart

The image above shows the flow of the research methodology starting from the collection of student business model data, followed by initial analysis to identify the components of the Business Model Canvas. Furthermore, analysis was carried out using thematic coding to find weakness patterns. The next stage is the exploration of using Artificial Intelligence to improve elements of the business model. The results before and after the use of AI are then compared to generate insights, which are then used in the preparation of research conclusions and recommendations.

RESEARCH RESULT

The results of the analysis show that there are three main weaknesses in the preparation of student BMC, namely an unclear value proposition, too broad market segmentation, and an unstructured revenue model. A summary of these findings is presented in Figure 2.

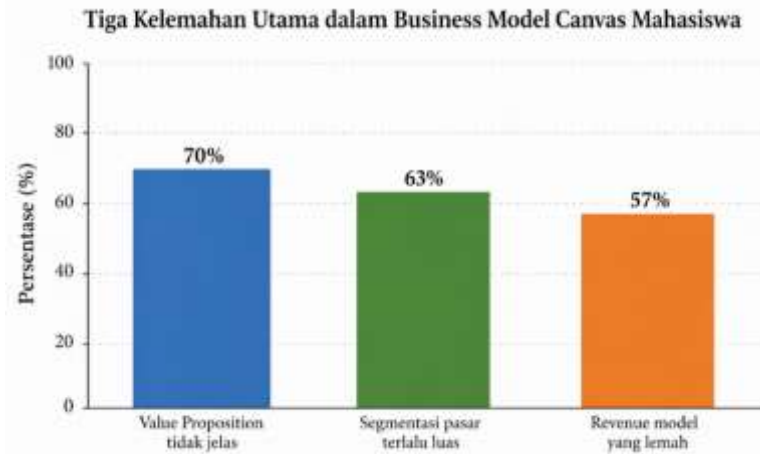


Figure 2. Results of the Processing of the Main Weaknesses of the BMC students (N=30)

From the image above, it is found that three main weaknesses are 70% have an unclear value proposition, 63% have too wide market segmentation, and 57% have a weak revenue model. Furthermore, an exploration of the use of Artificial Intelligence (AI) to improve these BMC elements is carried out. This process involves using AI as a tool to generate alternative value propositions, clarify market segmentation, and build a more logical and structured revenue model.

Furthermore, the results of the exploration of the use of Artificial Intelligence (AI) show that there is an improvement in the quality of each element of BMC after AI-based improvements are made. AI can help clarify business value, drive more specific market segmentation, and build more logical and structured revenue models. This indicates that AI can play a role as a tool in the business validation process, especially in the early stages of idea development.

Based on these findings, this study proposes a conceptual model called AI-BMC (*Artificial Intelligence Business Model Canvas*). This model was developed as an approach to integrate AI in the process of drafting and validating business models. AI-BMC not only functions as an analysis tool, but also as a *decision support system* that helps students identify weaknesses, evaluate business models, and produce more appropriate alternative solutions.



Figure 3. AI-BMC Framework

Figure 3 illustrates the AI-BMC Framework flow in a vertical form that shows the process of gradually refining the business model. The process starts from a *business idea* as the initial input that comes from the student's idea, then enters the AI processing stage where *Artificial Intelligence* is used to analyze problems, develop ideas, and evaluate business models. Furthermore, a validation stage is carried out to test the suitability of the business model to market needs and feasibility logically. The final stage produces a refined BMC, which is a *Business Model Canvas* that has been improved and more structured. This flow is iterative, allowing for continuous improvement in the business model development process

Here are the before and after results of using AI then compared to see differences in the quality of business models. The comparison is presented in Table 1, which shows an improvement in the clarity of business value, the accuracy of the target market, and the structure of the revenue model.

Table 1. BMC Quality Comparison Before and After AI

BMC Aspects	Before AI	After AI	Impact
Value Proposition	General	Specific	More clearly
Customer Segment	Area	Targeted	More relevant
Customer Problem	Unclear	Defined	More precise
Solution	Assumptions	More logical	Stronger
Revenue Stream	Weak	Structured	More realistic
Channels	Unclear	Specific	More effective
Differentiation	Weak	Clearly	More competitive

DISCUSSION

The results of the study show that the main weakness in the preparation of the student's Business Model Canvas (BMC) lies in the clarity of the value proposition, the accuracy of market segmentation, and the design of the revenue model. This condition shows that students are still in the early stages of understanding the relationship between customer needs and the solutions offered. In the context of entrepreneurship, this is related to the concept of problem-solution fit, where businesses must be able to answer the specific needs of market segments in order to develop sustainably.

The weakness of the value proposition shows that students are not able to identify the main advantages of their products, while market segmentation that is too general causes business strategies to be less directed. In addition, the unstructured revenue model shows that students still lack understanding of how businesses generate economic value in a sustainable manner. These findings are in line with theories that value clarity, proper market segmentation, and a strong revenue model are key elements in the success of business models (Osterwalder & Pigneur, 2010; Kotler et al., 2021).

The use of Artificial Intelligence (AI) in this study shows the potential as an effective tool in improving the quality of business model preparation. AI is able to provide more systematic recommendations in clarifying business value, determining target markets, and compiling revenue models. The proposed AI-BMC model strengthens the role of AI as a decision support system in early-stage business validation, as well as encourages students to think more structured and analytical. Thus, the integration of AI in entrepreneurial learning can improve the quality of decision-making and business readiness of students.

CONCLUSIONS AND RECOMMENDATIONS

This study shows that the main weakness in the preparation of students' Business Model Canvas (BMC) lies in the aspects of value proposition, market segmentation, and revenue model. This indicates that students are still not able to connect customer needs with the solutions offered in an appropriate and systematic manner. In addition, the process of preparing a business model still tends to be conceptual and has not been supported by in-depth analysis. The use of Artificial Intelligence (AI) in this study has been proven to make a positive contribution to improving the quality of business models. AI can help clarify business values, direct more specific market segments, and build more logical revenue models. The proposed AI-BMC model can be an alternative approach in supporting the early-stage business validation process, especially in the context of entrepreneurial learning.

Based on these results, it is suggested that the use of AI can be integrated more systematically in entrepreneurial learning to assist students in analyzing and validating business models. In addition, there is a need to strengthen understanding of the concept of Business Model Canvas, especially in key elements such as value proposition, market segmentation, and revenue model. The AI-BMC model developed in this study also has the potential to be further developed into a more comprehensive AI-based system or platform. Further research is recommended to use quantitative approaches or experimental methods to test the effectiveness of the use of AI in improving the quality of business models in more depth.

ADVANCED RESEARCH

This research has several limitations, including the use of a qualitative descriptive approach that has not been able to test causal relationships quantitatively, the number of samples is limited in the student learning context so that it cannot be generalized widely, and the use of Artificial Intelligence (AI) which is still exploratory and has not been integrated in the form of a comprehensive system. Therefore, further research is recommended to use a quantitative approach or mixed methods to test the effectiveness of AI in improving the quality of the Business Model Canvas in a more measurable manner. In addition, the object of research can be extended to MSME actors or startups in order to obtain more general and applicable results. Advanced development can also be directed at the creation of AI-based systems or platforms that are able to help the business model validation process automatically, thereby making a more practical contribution to the development of technology-based entrepreneurship.

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