IJEMS
International Journal of Economics and Management Sciences
E-ISSN: 3046-9279
P-ISSN: 3048-0965

(Research) Article

Validation of The Business Model of IOT Digital Industry-Class Services

Adelia Octaviana Mandasari [1], Astri Ghina [2]

[1] Master of Management Study Program, School of Economics and Business, Telkom University, Main Campus (Bandung Campus), West Java, Indonesia.; Jl. Telekomunikasi No. 1, Bandung 40257,
[2] Master of Management Study Program, School of Economics and Business, Telkom University, Main Campus (Bandung Campus), , West Java, Indonesia.; Jl. Telekomunikasi No. 1, Bandung 40257
* Author Corresponding: adeliaoctavian@student.telkomuniversity.ac.id

Abstract: This study investigates KIDI IoT, an educational service by PT Telkom Indonesia designed to bridge the skills gap between Vocational High School (SMK) graduates and the demands of the Industry 4.0 workforce. The primary objective was to assess the extent to which the KIDI IoT service fulfilled the requirements of educators and learners to substantiate its value proposition. A qualitative, exploratory methodology was employed utilizing in-depth interviews and the Value Proposition Canvas (VPC) framework for analysis. The outcomes demonstrate how effectively the program's project-based, experiential approach increases user motivation and offers a practical, industry-relevant learning environment. The service successfully generates the desired customer benefits. A major customer pain point that the current model ignores is that participants often expressed that the two-day offline training period was insufficient to help them master the material or build their confidence for working independently. This led to a significant misalignment. The KIDI IoT value proposition is fundamentally strong and well-regarded; however, the study concludes that its implementation necessitates improvement, particularly through the provision of more specialized teacher training and an extended training duration, to ensure sustained impact and skill acquisition.

Keywords: Internet of Things (IoT); Value Proposition Canvas; Product Validation; Educational Technology; Skills Gap;

1. Introduction

Businesses and educational institutions are just two of the many fields and industries that have undergone significant transformations as a direct result of the digital transformation that has occurred during the fourth industrial revolution. The rise of significant technologies such as automation, big data, and the Internet of Things (IoT) in recent years has resulted in significant changes to business models and the expectations of customers. Kevin Ashton was the first person to present the concept of the Internet of Things in 1999. Since then, it has become widely recognized as "The Next Big Thing" in the field of information technology.

This makes it possible for physical objects to share data and connect with each other, which leads to automated processes and many chances for growth in many fields. As a result of this technological change, there is a big and growing demand for data-driven automation solutions and a greater need for people who are skilled in IoT. It makes it easier for physical objects to share data and connect with each other, which leads to automated processes and many chances for growth in many fields. This change in technology has led to a big and growing market need for data-driven automation-based solutions and a rise in the need for workers with IoT skills. To meet this demand and prepare the next generation for the challenges of Industry 4.0, IoT must be integrated into the educational system, particularly at the vocational level. This research focuses on KIDI IoT (Kelas Industri Digital Internet of Things), a service created by PT Telkom Indonesia's Digital Business Division. KIDI IoT is

Received: July 08 2025
Revised: July 21 2025
Accepted: August 14, 2025
Published: August 23, 2025
Current Ver.: August 23, 2025

an educational solution designed to provide vocational high schools (SMKs) with comprehensive facilities and services for learning about IoT.

The Indonesian government has started implementing measures like creating IoT for Smart City concepts and modifying educational paradigms to the new industrial revolution in response to the challenges posed by Industry 4.0. Programs like the Merdeka Belajar (Freedom to Learn) initiative and the Revitalization of Vocational High Schools (Inpres Number 9 of 2016) are examples of these efforts, which seek to improve vocational education in order to satisfy labor demands. Curriculum development has long been a crucial strategy for raising the standard of education. The infrequent involvement of industry stakeholders in the curriculum design process, however, is a serious flaw in this strategy, especially in developing countries. The skills taught in schools and the real demands of the industry diverge significantly as a result of this exclusion. High-level government initiatives seek to address the mismatch caused by conventional educational models' inability to keep up with the rapid advancements in technology, but they are unable to resolve it on their own.

The primary research problem stems from the disparity between the competencies of SMK graduates and the requirements of the modern industrial landscape. Due to this misalignment, SMK graduates have low industry absorption rates and a high unemployment rate, which suggests that the industrial sector has little faith in the vocational education system. One major problem is that SMK curricula frequently do not match industry demands, resulting in a skills gap. Furthermore, SMKs frequently face significant challenges, including a lack of adequate learning tools, a shortage of competent instructors in emerging fields like IoT, and outdated curricula that do not reflect current technological trends. This research directly addresses this gap by seeking to answer the question: "How suitable is the KIDI IoT service product in fulfilling customer needs?".

In order to close the gap between industry demands and vocational education, this study suggests validating the KIDI IoT service's business model. Telkom, a state-owned telecom company, created KIDI IoT to bring digital innovation to the educational field. The program is designed to address the specific challenges faced by SMKs by offering a comprehensive solution that includes teacher training, student mentoring, online internships, certifications, and complete teaching modules with practical tools tailored to school needs. The curriculum is based on PT Telkom Indonesia's extensive experience as a key player in the IoT business, ensuring its alignment with both industry practices and government "link and match" programs. In order to fully comprehend the needs of the SMK and to examine how the KIDI IoT program is being implemented, the research uses a qualitative, problem-solving methodology. Data was gathered over a two-month period with a focus on grade XI students in the Computer and Network Engineering (TKJ) and Software Engineering (RPL) departments at various vocational schools in West Java. By confirming this model, Telkom hopes to guarantee that KIDI IoT is not just a cutting-edge technological solution but also a useful and long-lasting instrument for assisting SMKs with industry-based education.

The research's contributions can be separated into theoretical and practical advantages:

- Theoretical Contributions: It is anticipated that this study will add to the body of knowledge regarding the use of IoT in education, particularly in vocational high schools. Its conclusions will be a useful guide for scholars looking to improve the caliber of IoT education in SMKs and guarantee that students gain the skills that employers require;
- Practical Contributions: This research attempts to address the misalignment between SMK curricula and industry requirements, ultimately better preparing graduates for the contemporary workforce. It can also serve as a foundational reference for future researchers investigating the application of IoT-based learning in vocational settings. It

is also intended to provide concrete recommendations for enhancing the effectiveness of Telkom's business strategy in supporting IoT-based learning programs in SMKs.

This paper is structured as follows. Chapter II provides a review of the literature, discussing previous research to identify gaps and establish the study's position, and concludes with the research framework. The research methodology is described in Chapter III, along with the strategy, procedures, and methods employed for gathering and analyzing data. The research findings, including respondent characteristics, are presented in Chapter IV along with a thorough discussion and analysis of the data. Chapter V concludes with conclusions derived from the study's findings and offers recommendations for both scholarly and real-world uses.

2. Literature Review

The literature and underlying theories that support this research are reviewed in this chapter. The Internet of Things (IoT) and its use in education are covered first, and then the Value Proposition Design framework—which is used for product validation—is thoroughly examined. In order to determine the research gap that this paper attempts to fill, the chapter ends with a summary of the state-of-the-art from earlier studies.

2.1. The Internet of Things (IoT) in Education

Kevin Ashton first used the term "Internet of Things" (IoT) in 1999. It refers to a contemporary paradigm that makes it easier to connect the digital and physical worlds. In order to improve current applications and create new ones, it uses a network of physically connected objects that are outfitted with sensors and actuators. These objects can connect to the internet. The technology is extensively used in many different domains, such as industrial automation, informatics, and healthcare. IoT has a great deal of promise to improve education by enabling more dynamic, interactive, and effective learning environments that can be customized to meet the needs of each individual student. Future generation planning, professional development, and maintaining the safety of the learning environment are important applications in education.

Benefits and Challenges of IoT in Learning

There are many benefits to implementing IoT in education. In higher education, it can be used to manage administration, check health, and save energy. It is also essential for monitoring and controlling activities in educational organizations. A primary benefit is the ability to easily collect and share data with other devices, allowing students to access teaching materials from anywhere. By connecting previously unconnected objects, IoT opens new opportunities and can significantly enhance the student learning experience by linking them to their learning environment.

However, the adoption of new technology is not without its challenges. The acceptance of technology is a mindset influenced by numerous variables, and its adoption requires individuals and organizations to perceive the concept as innovative. There has been some opposition to technology in education, with claims that its application does not substantially change learning. The mere implementation of educational technology does not guarantee successful integration or an improvement in educational quality. Therefore, educational institutions must shift their focus from simply asking whether technology should be used to determining how to deploy it effectively to improve student capabilities.

IoT for Vocational High Schools (SMK)

In the current era, IT-based learning is essential for education to adapt to global changes. Preparing human resources for an IT-based world requires careful planning, including the provision of hardware and software infrastructure and skilled personnel. For

Vocational High Schools (SMKs), which aim to produce graduates who can meet the demands of the job market, integrating IoT is critical. Students must understand IoT to master its developments and use it wisely. This integration allows for a more interactive, personal, and adaptive learning environment. To address this need, the Kelas Industri Digital Internet of Things (KIDI IoT) was created as a service for the education sector, specifically targeting SMKs with relevant technical majors like Software Engineering (RPL) and Computer and Network Engineering (TKJT). KIDI IoT provides a complete package, including student learning assistance, teacher training, online internships, certifications, and teaching modules with equipment, all aligned with government "link and match" programs.

2.2. Value Proposition Design for Product Validation

A product or service's market acceptance, which shows that it successfully satisfies customer needs, is just as important to its success as its technical attributes. A vital tool for businesses looking to develop goods and services that consumers genuinely desire is Value Proposition Design (VPD). A value proposition is the main factor that influences a customer's decision to choose a business over another since it meets a need or resolves an issue, claim Osterwalder & Pigneur (2016). VPD is an ongoing process that motivates businesses to create products and services that are still relevant to their target market.

The VPD framework is an integral part of the Business Model Canvas (BMC), which consists of nine building blocks: Key Partnerships, Key Activities, Key Resources, Value Propositions, Customer Relationships, Channels, Customer Segments, Cost Structure, and Revenue Streams. This research utilizes the Value Proposition Canvas (VPC) as the central analytical tool to visually map the relationship between customer needs and the value offered by a product. The Value Map and the Customer Profile form the two essential elements of the VPC.

Customer Profile

The customer profile's primary goal is to gain a thorough understanding of each customer segment. Its goal is to determine customers' needs, wants, and feelings so that a relevant value proposition can be developed. It is composed of three parts:

- Customer Jobs: These are the tasks that clients are attempting to complete. They may serve social purposes (such as enhancing one's image), emotional needs (such as providing a sense of safety), functional roles (such as enabling document printing), or support employment (such as facilitating purchases).
- Customer Pains: These represent the challenges, risks, or negative experiences faced by a customer. Pains encompass risks, such as functional or financial concerns, obstacles, including slow applications, and undesirable outcomes, also characterised by slow applications. Creating effective solutions necessitates a compassionate comprehension of these challenges.
- Customer Gains: These are the benefits or outcomes that clients desire or anticipate. Gains may be anticipated (standard benefits), essential (fundamental benefits), desired (benefits that customers desire but may not be able to obtain), or unexpected (surprise benefits that delight the customer).

Value Map

The Value Map provides an explanation of how the products and services offered by a company add value for the customer. It consists of three different components and reflects the Customer Profile in its entirety:

- Products and Services: This is the list of goods and services that make up the value proposition. These could be financial products, services, intangible digital goods, or tangible goods.
- Pain Relievers: This section describes how the goods and services particularly ease the suffering of the clients. Data automation, for instance, could be a pain reliever for a customer who is annoyed by lengthy forms.
- Gain Creators: This refers to how the goods and services generate the desired gains for the clients. Gain creators offer more than just problem-solving; for example, they provide premium loyalty programs for customers seeking exclusivity or a one-click checkout feature for customers seeking speed and convenience.

2.3. State-of-the-Art and Research Gap

Previous research has explored the development of IoT business models and the application of the Value Proposition Canvas for product validation across various sectors. Finding the fundamental components and categories for IoT business models was the main goal of studies by Almeida et al. (2020), Morris et al. (2015), and Ikävalko et al. (2018). These studies emphasized that value is derived from data and services as well as from products. Some studies have even suggested expanding the BMC to better address the particular difficulties of IoT platforms (Wecht et al., 2021).

A popular tool for product validation in various startup settings is the Value Proposition Canvas. VPC has been used, for instance, to guarantee product-market fit in startups in the fields of printing (Afifa, 2024), education technology (Fauzy & Ghina, 2021), legal technology (Taufiqurrohman & Hasbi, 2024), and agricultural technology (Wibowo & Prabowo, 2022). Some studies have concentrated on creating e-modules or project-based learning models to improve student skills in the particular context of IoT in vocational education. According to a 2023 study published in the Journal of Digital Learning and Education, PT. Telkom successfully developed an IoT e-module for SMK students, and both teachers and students gave it very positive reviews.

There is still a research gap in spite of these contributions. Research that explicitly validates the value proposition of a comprehensive, industry-led IoT educational service—like KIDI IoT—designed for the vocational school sector is lacking, despite the fact that prior studies have looked at IoT business models generally and applied VPC to a variety of startups. This study aims to fill that gap by using the Value Proposition Canvas framework to analyze the alignment between the KIDI IoT service and the actual needs (jobs, pains, and gains) of its target customers: vocational schools, including their students and teachers. It combines, in a unique way, the validation of an educational technology service with a thorough examination of the particular needs of the vocational education ecosystem, as determined by a number of stakeholders.

3. Proposed Method

The methodological framework utilized in this study to validate the business model for the KIDI IoT service is described in this section. It describes the research design, the phases of the study, the methods used to collect data, the validity and reliability checks, and the procedure for analyzing the data.

3.1. Research Design

This study uses a qualitative, exploratory research design. Since the problem of validating digital education products specifically for vocational high schools (SMKs) is a relatively new and under-researched area, an exploratory approach is appropriate. The qualitative approach was selected due to its capacity to offer profound, contextual understandings of social phenomena, enabling a thorough investigation of concepts and a thorough comprehension of the issue.

The study is carried out in an unmanipulated, natural environment to capture users' real experiences. In order to provide a snapshot of user attitudes and behaviors regarding technology adoption, the data collection is cross-sectional, meaning it was done all at once. In-depth interviews are the main method of gathering data, with document analysis and observation serving as supplementary techniques. To guarantee the accuracy and objectivity of the data collected, the researcher participates directly in the process.

3.2. Research Stages

From the first planning to the last conclusion, the research was carried out in a methodical sequence of steps, as shown in Figure 1. This methodical procedure guarantees that the research stays targeted and in line with its goals.

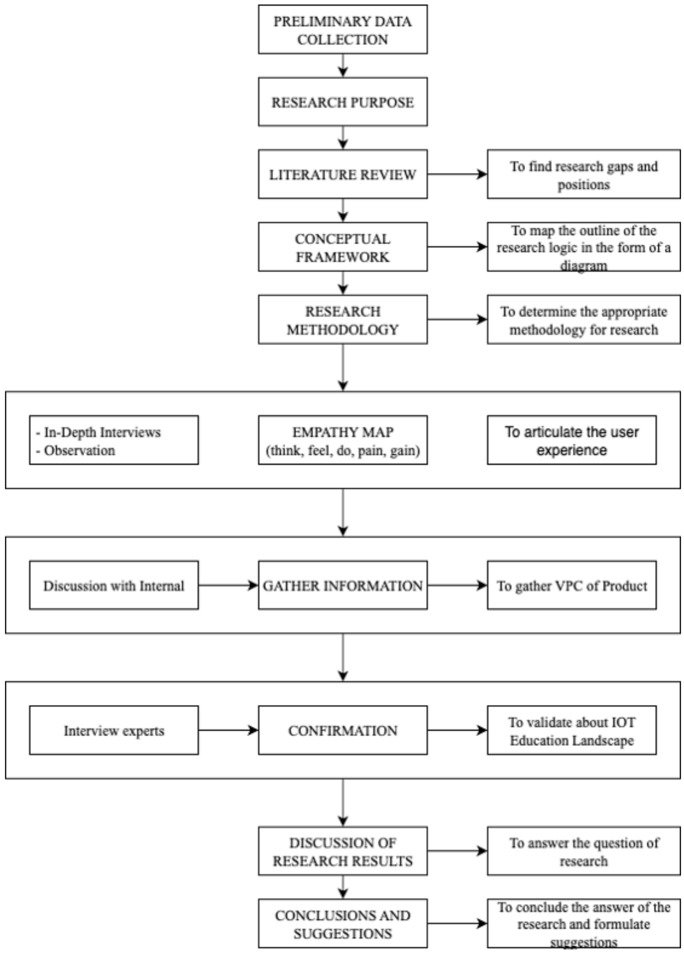

Figure 1. Research Stages

The following stages make up the research process:

1. **Preliminary Phase:** To identify the research phenomenon and establish the goals, the study started with the collection of preliminary data. To determine the research gap and place this study within the larger scientific field, a thorough literature review of related theories and earlier studies was then carried out. A conceptual framework was created to map the research's logical flow based on this review. The choice of the suitable research methodology marked the end of this phase.
2. **Data Collection Phase:** Three different sources of data were gathered during this phase:

- User Experience (Empathy Map): Direct observations and in-depth interviews were carried out to comprehend the user experience with the KIDI IoT service. Users' experiences were thoroughly described using the Empathy Map technique, which focuses on what they think, feel, do, as well as their pains and gains.
- Internal Product Information (Gather Information): To learn more about the planned Value Proposition Canvas (VPC) for the product, talks were conducted with the internal KIDI IoT team.
- Expert Validation (Confirmation): Industry experts were interviewed in order to support the findings. The purpose of this step was to validate the data gathered from other sources and to obtain a more comprehensive understanding of the IoT educational landscape.

3. **Analysis and Conclusion Phase:** In order to address the main research question, the research findings were discussed in this last phase. A summary of the findings and pertinent suggestions for further research and real-world application are included in the study's conclusion.

3.3. Data Collection

3.3.1. Participants and Sampling

The study was carried out at SMK Informatika Sumedang in the academic year 2024–2025. The school uses the "Kurikulum Merdeka" (Merdeka Curriculum) and is planning to implement the KIDI IoT program, which is why this location was chosen.

Purposive sampling, a popular method in qualitative research, was used to choose informants. The researcher can choose participants using this method who are most representative of the phenomenon under study. Three groups of informants were formed: industry experts, the internal KIDI IoT team, and KIDI IoT service users (teachers and students). As explained below, particular standards were set for choosing each informant in order to guarantee the accuracy and applicability of the data.

- **Students:** Must have finished the 30-day online internship and taken part in the 2-day offline KIDI IoT workshop.
- **Teachers:** Must have attended the 2-day offline KIDI IoT training of trainers.
- **Internal Team:** Must be directly involved in the development of the KIDI IoT product and hold a strategic role concerning its concept and value proposition.
- **Experts:** Must have a minimum of two years of practical work experience in a relevant industry and have experience interacting with the vocational education sector.

A total of 12 individuals participated in the study; three were chosen from each of the four groups (students, instructors, internal team, and industry experts), and they all took part in in-depth interviews.

3.3.2. Data Collection Techniques

Three main methods were used to gather data for this study:

- **In-Depth Interviews:** Semi-structured in-depth interviews were the primary technique used to collect data. While staying true to the main research questions, this format gives the interviewer the freedom to delve into subjects as they come up. The objective was to collect open, unrestricted, and detailed information about the research topic.
- **Observation:** To methodically document phenomena associated with the research object, non-participant, structured observation was carried out. In order to record activities and interactions in their natural environment, the researcher watched teacher-student training sessions.

- **Documentation:** This method entailed gathering corroborating information, including photographs, audio recordings from interviews, and other pertinent reports. A crucial part of data triangulation to improve validity is documentation, which acts as secondary data.

3.4. Data Validity and Reliability

Construct validity was a major priority in order to guarantee the caliber and rigor of this qualitative investigation. By providing exact operational definitions for the concepts under study and accounting for potential bias, this method seeks to preserve objectivity. Triangulation, which uses several techniques and sources to confirm results and create a more thorough understanding of a phenomenon, was the main tactic used to increase validity. Two particular methods of triangulation were used:

- **Method Triangulation:** To get more precise and comprehensive results, this technique combined information from several data collection techniques, particularly in-depth interviews, observation, and document analysis.
- **Source Triangulation:** This method entailed contrasting and comparing information obtained from various sources, including users (teachers and students), industry experts, and the KIDI IoT management team. This approach helps guarantee the validity and alignment of the results by contrasting the internal company viewpoint with expert insights and customer needs.

3.5. Data Analysis Technique

Sugiyono (2014) described a three-step procedure for analysing data collected from semi-structured interviews.

- **Data Reduction:** This preliminary phase entails the selection, simplification, and filtration of the extensive raw data gathered from field interviews. Irrelevant information was eliminated, while relevant data was preserved for subsequent analysis.This process includes developing codes, grouping them into themes, and organizing these themes into broader abstractions to derive meaning from the data. The research objectives serve as a guide for the reduction process, which entails producing thorough verbatim transcripts and then compiling the information into coding tables.
- **Data Display:** Following reduction, the data was arranged in a structured manner using visual documentation and descriptive narratives. This stage facilitates comprehension of the data and provides a clear picture of both the general research findings and individual components.
- **Conclusion Drawing:** Classifying the findings from the in-depth interviews is the last step in developing the research's main conclusions. By addressing the predetermined research questions derived from the data analysis, the conclusion seeks to present a concise and illustrative image of the research object.

4. Results and Discussion

The results of the qualitative data collection are presented in this chapter along with a thorough analysis and discussion of the results. In-depth interviews with the internal KIDI IoT team and students and teachers from SMK Informatika Sumedang were used to collect the primary data. The Value Proposition Canvas (VPC) serves as the framework for the analysis, which verifies that the KIDI IoT service satisfies customer needs.

4.1. Participant Characteristics

The study involved participants from two key user groups: students and teachers of SMK Informatika Sumedang from the Software Engineering (RPL) and Computer and Network Engineering (TKJ) departments. Three students and three teachers were interviewed. The students were all 16 years old and had participated in the KIDI IoT workshop and online internship. All the teachers, who ranged in age from 38 to 45, had finished the KIDI IoT Training of Trainers (ToT). A rich and pertinent dataset for analysis is provided by this selection, which guarantees that the data originates from people who have firsthand, direct experience with the KIDI IoT service.

4.2. Initial Data Analysis: User Experiences and the Empathy Map

The interviews were first transcribed, and the data was then condensed to find important user experience-related themes. In order to create a comprehensive Customer Profile, these themes were arranged into an Empathy Map that captured users' thoughts, feelings, behaviors, and main problems and benefits.

4.2.1. Student Interview Findings

The interviews with students revealed that the KIDI Internet of Things program was met with a very positive reception. The main conclusions from the student interviews are compiled in Table 1.

Table 1. Summary of Student Interview Results.

Aspect	Key Findings & Interpretation
General Experience	Students learned to assemble hardware and develop software for a complete smarthome project. The experience was described as comprehensive and highly practical for the SMK level.
Initial Feelings vs. Outcome	Initially, students felt some apprehension or "laziness," expecting a typical theory-heavy training. However, this quickly turned into enthusiasm and excitement once the hands-on, project-based learning began. The practical nature of the workshop was a significant motivator.
Pains (Challenges)	The primary challenges were technical, such as assembling hardware components for the first time or accidentally swapping parts. These issues were minor and quickly resolved with the provided guidebooks and trainer assistance, highlighting the effectiveness of the hands-on support model.
Gains (Benefits)	Students gained new skills in both hardware and software, with some finding the hardware more challenging and thus more engaging. They felt they had a "head start" compared to their peers, boosting their confidence and understanding of advanced programming languages and IoT concepts like RFID. The workshop successfully sparked a strong interest in pursuing a career or entrepreneurial venture in the IoT field.
Feedback	The most consistent piece of feedback was that the two-day workshop was too short. Students felt there was much more to explore and wished for more time to deepen their understanding and practice their skills.

The student feedback strongly supports the effectiveness of the *project-based learning* approach. As noted by Zaini (2024), IoT in education can create a more personal and adaptive learning experience. The initial hesitation followed by strong engagement demonstrates that the KIDI IoT program successfully overcame the typical disinterest associated with traditional classroom learning. The challenges encountered were productive, serving as learning opportunities rather than insurmountable obstacles. A crucial takeaway is that the program not only imparts technical skills but also significantly boosts student motivation and career aspirations in the tech industry.

4.2.2. Teacher Interview Findings

The teachers also provided positive feedback, particularly regarding the program's practicality and relevance to industry needs. Table 2 summarizes their responses.

Table 2. Summary of Teacher Interview Results.

Aspect	Key Findings & Interpretation
Program Practicality	Teachers praised the KIDI IoT program for being highly practical and well-suited for the SMK level. It provided a bundled, all-in-one solution that was easier to implement than teaching individual IoT components separately.
Cross-Disciplinary Learning	The program introduced new learning opportunities. RPL (software) teachers gained valuable hardware experience, while TKJ (hardware/network) teachers were introduced to software development, bridging a critical knowledge gap.
Pains (Challenges)	The main challenge stemmed from the teachers' specialized backgrounds. RPL teachers struggled with hardware assembly, while TKJ teachers found the coding aspects difficult. This indicates that while the program is comprehensive, teachers require more targeted support to master concepts outside their core expertise.
Facilities & Resources	The hardware kits, Antares platform, and learning modules provided by Telkom were deemed complete and highly supportive of a project-based learning environment. The resources helped the school understand what the industry requires.
Feedback & Suggestions	Similar to the students, teachers felt the two-day training duration was insufficient. They also expressed a need for more hardware units to allow for greater experimentation without the fear of damaging costly equipment. Suggestions included adding more training days and providing regular online webinars for continuous knowledge updates.

The teachers' feedback highlights the program's success in providing an industry-aligned, turnkey solution for teaching IoT. However, it also uncovers a critical challenge in vocational education: the siloed nature of technical disciplines. The difficulty teachers faced with non-core subjects underscores the need for more robust and sustained professional development to equip them with the interdisciplinary skills required to teach IoT effectively.

4.3. Validating the Value Proposition: The Fitting Process

The core of the analysis involved "fitting" the Customer Profile (derived from user interviews) with the Value Map (derived from interviews with the internal KIDI IoT team). This process validates whether the product's intended value proposition truly aligns with customer needs.

4.3.1. Fitting Pains with Pain Relievers

Table 3 shows the alignment between the identified customer pains and the solutions (Pain Relievers) offered by KIDI IoT.

Table 3. Fitting Analysis: Customer Pains vs. Pain Relievers

Customer Pain	Pain Reliever Offered	Fit?
Assembly errors and technical difficulties during workshops.	- 4 days of offline training (for students & teachers combined). - 30 days of online learning support. - Grouping students from different majors (TKJ & RPL). - Providing detailed practical and user guide modules.	Yes

Customer Pain	Pain Reliever Offered	Fit?
The short duration of the workshop (2 days) prevents users from developing the skills needed for independent project creation.	- The offline training is limited to 4 days total. - 30 days of online training is provided as a follow-up.	No
Difficulty for students and teachers in mastering subjects outside their core specialization (e.g., RPL with hardware, TKJ with software).	- Collaborative grouping between TKJ and RPL students. - Comprehensive modules designed to help TKJ learn software and vice versa.	Yes

The fitting process reveals both strengths and weaknesses. The program successfully addresses immediate technical difficulties through guided modules and collaborative learning. However, there is a clear mismatch (No fit) regarding the training duration. While the KIDI IoT team offers a 30-day online follow-up, the feedback from both students and teachers indicates that the intensive, hands-on offline session is too short to build the confidence required for independent work. This is a critical area for improvement.

4.3.2. Fitting Gains with Gain Creators

Table 4 assesses whether the product's features (Gain Creators) successfully deliver the benefits (Gains) desired by the customers.

Table 4. Fitting Analysis: Customer Gains vs. Gain Creators

Customer Gains Desired	Gain Creator Offered	Fit?
A new and engaging learning experience, especially in IoT.	Project-based learning delivered through both offline and online sessions.	Yes
Easy-to-understand and applicable learning materials.	- Modules specifically designed for the SMK level. - Trainers who are certified industry experts.	Yes
High-quality and supportive training services.	After-sales support and ongoing guidance provided through a dedicated WhatsApp group (WAG).	Yes

The analysis shows a **perfect fit** between the desired gains and the gain creators. The project-based learning model, expert trainers, and dedicated support channels are highly effective in delivering a valuable and satisfying experience. This confirms that the core pedagogical approach of KIDI IoT is well-aligned with customer expectations.

4.4. Discussion

This section provides a detailed analysis of the research findings, structured around the Value Proposition Canvas framework. It examines the Customer Profile to understand user needs, the Value Map to outline the KIDI IoT offering, and finally, analyzes the fit between them to determine the overall suitability of the service, contextualizing the findings within existing academic literature.

4.4.1. Customer Profile: Understanding User Pains and Gains

The research identified a clear and consistent profile for the target customers—vocational high school (SMK) students and teachers. Their needs and challenges revolve around the desire for practical, industry-relevant education.

The primary **gains** sought by users are centered on tangible skill development and experiential learning. Students expressed a strong desire for a learning experience that was engaging, practical, and different from traditional, theory-heavy classroom instruction. Students were highly motivated by the opportunity to engage in hands-on activities, which they perceived as a significant advantage for their future careers. This aligns with the principles of constructivist learning theory, where learners build knowledge through active experience. The effectiveness of this approach in vocational settings is well-documented; studies on Project-Based Learning (PBL) consistently show that it enhances student engagement, problem-solving skills, and intrinsic motivation, particularly in STEM fields (Holubova, 2008; Al-Balushi & Al-Aamri, 2014).

They valued the opportunity to work with real hardware and software, seeing it as a way to get a "head start" on their peers and gain confidence. The desire for a "head start" reflects an understanding among students of the competitive job market and the value of industry-specific skills, a key driver in vocational education choices. For teachers, the desired gains included access to a structured, all-in-one curriculum that was easy to implement and directly relevant to industry needs. They also sought to upgrade their own cross-disciplinary skills, with software (RPL) teachers wanting to learn hardware and hardware (TKJ) teachers wanting to learn software.

Conversely, the users' **pains** highlight the significant hurdles in adopting complex new technologies within an educational context. The most critical pain point identified was the **insufficient time** allocated for the offline workshop. This reflects a common challenge in professional development and training, where short-term, intensive "bootcamp" models often fail to provide the necessary time for deep learning and skill consolidation (Zeichner, 2010). The two-day format, while effective for generating initial excitement, creates a "knowing-doing gap" where participants understand concepts but lack the confidence and practice to apply them independently. Furthermore, the pain related to the **cross-disciplinary skill gap**—where software-focused users struggled with hardware and vice versa—is a well-known issue in integrated fields like IoT. This challenge is particularly acute for teachers, who are expected to become subject matter experts in areas outside their formal training, a significant barrier to the effective implementation of new technology curricula (Ertmer & Ottenbreit-Leftwich, 2010).

4.4.2. Value Map: Deconstructing the KIDI IoT Service

The KIDI IoT service is designed as a comprehensive educational package that aims to address the needs of the vocational education market.

The **products and services** offered are extensive, bundling hardware (IoT practice kits), software (the Antares IoT platform), and a suite of services including workshops for students, Training of Trainers (ToT) for teachers, detailed learning modules, a 30-day online training program, and after-sales support through a dedicated communication channel. It's a turnkey solution aimed at lowering the barriers to entry for schools wanting to teach IoT. This bundled approach is a strategic response to the resource constraints often faced by educational institutions.

The service's **gain creators** are strategically designed to deliver a high-value experience. The core of this is the project-based learning model, which provides the hands-on experience users desire. This is supported by the use of certified industry experts as trainers and learning modules specifically tailored to the SMK level, ensuring the content is both relevant and accessible. The after-sales support further aims to create value by offering continued guidance.

The **pain relievers** are intended to mitigate the challenges of learning IoT. To address technical difficulties, the service provides detailed user guides, groups students from different majors to encourage peer-to-peer learning, and offers a hardware warranty. To address the short offline training duration, the program offers a 30-day online follow-up to allow for continued learning. The inclusion of a 30-day online support period is a nod to blended learning models, which aim to provide flexible, extended support beyond the physical classroom (Garrison & Kanuka, 2004).

However, the design of the pain relievers reveals a potential misunderstanding of the core problem. While the online support is a valuable supplement, it is positioned as the primary solution to the time-constraint issue, a problem that users feel is rooted in the offline, hands-on experience itself.

4.4.3. Analysis of the Customer Profile-Value Map Fit

When analyzing the fit between the Customer Profile and the Value Map, it becomes clear that the KIDI IoT service is successful in some areas but falls short in a critical one.

The program demonstrates a **strong fit** in creating desired gains. The project-based learning model, expert trainers, and comprehensive package directly align with the users' desire for an engaging, practical, and supportive educational experience. This alignment is the primary reason for the overwhelmingly positive initial feedback and high levels of motivation observed among both students and teachers. It confirms that the core pedagogical approach of KIDI IoT is fundamentally correct and highly valued.

However, the analysis reveals a **critical misfit** in alleviating a core customer pain. The pain of insufficient time is not adequately resolved by the offered pain reliever. Literature on blended learning suggests that for such models to be effective, the online and offline components must be seamlessly integrated and mutually reinforcing, not positioned as substitutes for one another (Graham, 2006). While the KIDI IoT team provides a 30-day online support program, user feedback clearly indicates that this is not a substitute for the intensive, hands-on offline training they feel is necessary to build confidence and mastery. The two-day workshop, while effective as an introduction, does not provide the depth required for independent skill application. This disconnect between the perceived problem (the need for more hands-on time) and the offered solution (supplemental online support) represents the most significant weakness in the current value proposition.

Finally, there is a **partial fit** in addressing the cross-disciplinary skill gap. The strategy of grouping students from different majors works well as a pain reliever in the student workshops, fostering collaboration. However, this approach is less effective for the Training of Trainers. The "one-size-fits-all" Training of Trainers is insufficient for teachers, who require more specialized and sustained professional development to truly master subjects outside their core expertise (Ertmer & Ottenbreit-Leftwich, 2010). Teachers require more structured, individualized support to overcome deep-seated skill gaps outside their area of expertise. Therefore, while the service addresses this pain, the solution could be significantly improved, particularly for teacher professional development.

In summary, the KIDI IoT service has successfully created a product that users want, but its operational delivery model prevents it from fully solving a crucial problem they face. The program excels at generating excitement and engagement but must refine its approach to facilitate deep learning and skill mastery to deliver on its full potential.

5. Conclusions

This study investigated the suitability of the KIDI IoT service, an educational program designed by PT Telkom Indonesia, in meeting the needs of vocational high school (SMK) students and teachers. By applying the Value Proposition Canvas framework, the research found that while the program's core offering—a project-based, hands-on learning experience—is highly effective at boosting user motivation and is well-aligned with customer-desired gains, its overall suitability is significantly compromised by an operational flaw. The primary conclusion is that the two-day offline training duration is insufficient to address a key customer pain point: the need for adequate time to achieve mastery and confidence for independent project creation. This misalignment between the service's strong pedagogical potential and its current delivery model demonstrates that while the value proposition is fundamentally sound, its practical implementation requires significant refinement to be truly effective.

Theoretical Implications

This research contributes to the academic literature in several ways. First, it provides a practical and reproducible application of the Value Proposition Canvas for post-launch validation of an educational technology (EdTech) service, extending its use beyond the typical startup context to industry-led programs within formal education systems. Second, the study enriches the literature on industry-academia partnerships by providing empirical evidence of the specific challenges—such as cross-disciplinary teacher skill gaps and logistical time constraints—that can hinder the success of such collaborations. Finally, it contributes to the field of vocational education by demonstrating that while project-based learning is highly effective for engagement, its long-term impact is contingent on sustained, in-depth implementation rather than short-term, one-off interventions.

Practical Implications

The findings of this study offer clear, actionable implications for both the KIDI IoT service provider and vocational school administrators. For KIDI IoT's management, the results strongly suggest a need to redesign the service delivery model. This includes extending the duration of the offline training workshops or restructuring the program into multiple, progressive stages to allow for deeper learning. Furthermore, the study highlights the necessity of developing differentiated professional development programs for teachers to address the distinct skill gaps between software-focused (RPL) and hardware-focused (TKJ) instructors. For school administrators, this research underscores the importance of advocating for industry partnerships that prioritize deep learning over superficial exposure and highlights the need to invest in continuous teacher training to maximize the value of such programs.

Limitations and Future Research

This study is limited by its qualitative nature and its focus on a single case study at one vocational high school, which restricts the generalizability of the findings. The sample size, while appropriate for a qualitative inquiry, is small. To build upon this research, future studies should employ a quantitative approach across multiple schools to measure the impact of the program on student competency and employability at scale. A longitudinal study would also be valuable to track the long-term career trajectories of program participants. Further research is necessary to explore the optimal duration and structure for industry-led training programs and to develop a standardized framework for effectively integrating such initiatives into the national vocational curriculum.

References

Afifa, A. N. (2024). Analisis validasi produk menggunakan value proposition canvas (Studi Kasus: Startup D'cetak). *Skripsi*, S1 Administrasi Bisnis, Universitas Telkom, Bandung, Indonesia. https://repository.telkomuniversity.ac.id/home/catalog/id/209172/

Al-Balushi, S. M., & Al-Aamri, S. S. (2014). The effect of environmental science projects on students' environmental knowledge and science attitudes. *International Research in Geographical and Environmental Education*, 23(3), 213–227. https://doi.org/10.1080/10382046.2014.927167

Almeida, M., Abreu, A., & Dias, J. (2020). Building blocks for the development of an IoT business model. *International Journal of Online Biomedical Engineering*, 16(12), 4–17. https://doi.org/10.3991/ijoe.v16i12.16480

Ashton, K. (2009, June 22). That 'Internet of Things' thing. *RFID Journal*. http://www.rfidjournal.com/articles/view?4986

Creswell, J. W., & Creswell, J. D. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA, USA: SAGE Publications.

Ertmer, P. A., & Ottenbreit-Leftwich, A. (2010). Teacher technology change: How knowledge, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255–284. https://doi.org/10.1080/15391523.2010.10782551

Fauzy, R., & Ghina, A. (2021). Desain proposisi nilai pada startup bidang pendidikan (Studi pada startup Tutuo). *Tugas Akhir*, S1 Teknik Industri, Universitas Telkom, Bandung, Indonesia. https://repository.telkomuniversity.ac.id/pustaka/175507/desain-proposisi-nilai-pada-startup-bidang-pendidikan-studi-pada-startup-tutuo-.html

Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), 95–105. https://doi.org/10.1016/j.iheduc.2004.02.001

Graham, C. R. (2006). Blended learning systems: Definition, current trends, and future directions. In C. J. Bonk & C. R. Graham (Eds.), *The Handbook of Blended Learning: Global Perspectives, Local Designs* (pp. 3–21). San Francisco, CA, USA: Pfeiffer.

Holubova, R. (2008). Effective teaching methods—Project-based learning in physics. *US-China Education Review*, 5(12), 1548–6613. https://files.eric.ed.gov/fulltext/ED504949.pdf

Ikävalko, H., Pihkala, T., & Turkama, P. (2018). Value creation in the Internet of Things: Mapping business models and ecosystem roles. In *Proceedings of the XXIX ISPIM Innovation Conference* (pp. 1–13). Stockholm, Sweden. https://www.researchgate.net/publication/323923388_Value_Creation_in_the_Internet_of_Things_Mapping_Business_Models_and_Ecosystem_Roles

Morris, R., De Bruin, A., & Heller, B. (2015). Business models for the Internet of Things. In *2015 International Conference on Engineering, Technology and Innovation (ICE/ITMC)* (pp. 1–8). Belfast, UK. https://doi.org/10.1109/ICE.2015.7438686

Pemerintah Republik Indonesia. (2016). Instruksi Presiden Republik Indonesia Nomor 9 Tahun 2016 tentang revitalisasi sekolah menengah kejuruan dalam rangka peningkatan kualitas dan daya saing sumber daya manusia Indonesia. Jakarta, Indonesia. https://jdih.setkab.go.id/PUUdoc/174987/Inpres_Nomor_9_Tahun_2016.pdf

Sugiyono. (2014). *Metode penelitian pendidikan pendekatan kuantitatif, kualitatif, dan R&D*. Bandung: Alfabeta.

Taufiqurrohman, M. R., & Hasbi, I. (2024). Product validation analysis using value proposition canvas at Nominus startup. *Skripsi*, S1 Administrasi Bisnis, Universitas Telkom, Bandung, Indonesia. https://openlibrarypublications.telkomuniversity.ac.id/index.php/management/article/view/23717

Wecht, C., Rüping, S., & Böhm, K. (2021). Design method using extended business model canvas for IoT platforms. In *2021 IEEE 25th International Enterprise Distributed Object Computing Conference (EDOC)* (pp. 1–10). Gold Coast, Australia. https://doi.org/10.1109/EDOC52215.2021.00010

Wibowo, M. D. A., & Prabowo, F. S. A. (2022). Validasi value proposition pada startup A-Tani. *Tugas Akhir*, S1 Teknik Industri, Universitas Telkom, Bandung, Indonesia. https://repositori.telkomuniversity.ac.id/home/catalog/id/198777/slug/validasi-value-proposition-pada-startup-a-tani.html

Zaini, N. (2024). Implementasi Internet of Things (IoT) pada teknologi pendidikan 5.0: Menghubungkan peserta didik dan lingkungan pembelajaran. In *Prosiding KONAMI (Konferensi Nasional Mitra FISIP)*. https://doi.org/10.19184/konami.v1i1.928

Zeichner, K. M. (2010). Rethinking the connections between campus courses and field experiences in college- and university-based teacher education. *Journal of Teacher Education*, 61(1–2), 89–99. https://doi.org/10.1177/0022487109347671