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Pro-Kantin: Digital Entrepreneurship Innovation Through A Pre-Order System For The Campus Canteen Ecosystem

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Abstract: *Long queues at campus canteens often reduce the efficiency of students' and lecturers' daily activities, leading to wasted time and decreased productivity. This condition reflects a broader research problem, namely, the lack of innovative solutions to support efficient and modernized campus ecosystems. The main purpose of this study is to design and analyze PRO-KANTIN (Pre-Order Orchestrated Canteen) as a form of digital entrepreneurial innovation that addresses the inefficiency of conventional canteen services. To achieve this objective, the study employed a descriptive qualitative methodology through a case study approach within a higher education environment. Data were collected through observation of student and lecturer behavior at campus canteens, interviews with canteen managers, and analysis of entrepreneurial business models related to digital platforms. The results indicate that the implementation of PRO-KANTIN significantly improves service efficiency by reducing waiting times and ensuring food availability, while also providing greater convenience for consumers. From the providers' perspective, the pre-order system enables better production planning, accurate stock management, and reduced food waste. Furthermore, the findings highlight that PRO-KANTIN fosters entrepreneurial innovation by integrating digital technology with traditional service models, thereby creating new value for all stakeholders in the campus ecosystem. In conclusion, this research demonstrates that PRO-KANTIN is not merely a technical solution but also a strategic model that supports digital transformation, enhances entrepreneurial capacity, and strengthens the sustainability of campus-based entrepreneurial ecosystems. The implications suggest potential scalability to other institutions and communities, positioning PRO-KANTIN as a replicable model for digital entrepreneurship in higher education.*
Keywords: *Entrepreneurial Innovation, Digital Pre-Order, Pro-Kantin, Campus Ecosystem.*

INTRODUCTION

Campus canteen services often experience severe queuing congestion, especially during peak hours, which significantly reduces the efficiency of students' and lecturers' time and consequently decreases the productivity of academic activities (Breathnach et al., 2020). The food pre-order system has been explored as a strategy to improve ordering processes and reduce waiting times within university cafeteria contexts (Migliavada, 2021). However, most previous studies have mainly focused on user acceptance and interface design, without deeply connecting these

technological solutions to the logic of digital entrepreneurship and business model innovation within the campus ecosystem.

In the context of digital entrepreneurship, studies on digital innovation entrepreneurship emphasize that technology-driven innovation must be integrated with entrepreneurial elements to generate new value creation and ensure business sustainability (Mittermeier et al., 2022; Nambisan, 2017). Moreover, digital transformation in business models has been recognized as a key driver of competitive advantage, as demonstrated by the case of Zomato, which redefined its business model through digital entrepreneurship approaches (Saqib, 2023). Nevertheless, a significant gap remains in the literature: few studies have combined pre-order systems as a service innovation (Kim et al., 2020; Lusch & Nambisan, 2015) with an analysis of integrated entrepreneurial models in higher education environments (Autio et al., 2018; Maritz et al., 2021; Veiga, 2022).

The object of this study is PRO-KANTIN (Pre-Order Orchestrated Canteen), a model of digital entrepreneurial innovation designed to enhance the efficiency of campus canteen services through a pre-order mechanism. This study employs a descriptive qualitative method using a case study approach within a higher education setting. Data were collected through observations of student and lecturer behavior, interviews with canteen managers, and analysis of relevant digital business models (Bican & Brem, 2020; Foss & Saebi, 2017).

The contributions of this research are as follows: (1) to design and test the implementation of the PRO-KANTIN model as a digital entrepreneurial innovation; (2) to analyze the impact of the system on service efficiency, stock management, and food waste reduction; (3) to present a framework for integrating digital technology and business models within campus environments that can serve as a reference for educational institutions (García-Peñalvo, 2020; Yusof et al., 2021); and (4) to provide strategic recommendations and assess the scalability potential of the model for replication in other institutions.

METHOD

Research Design

This study adopts a descriptive qualitative approach using a case study design within a higher education environment. This approach was chosen because it enables a comprehensive

understanding of the pre-order system phenomenon in campus canteen services and identifies the digital entrepreneurial dimensions involved. The research focuses on the PRO-KANTIN (Pre-Order Orchestrated Canteen) model as a form of digital entrepreneurial innovation designed to optimize service efficiency, reduce waiting time, and create new business value within the campus ecosystem.

The research design consists of three main stages:

1. Diagnostic Stage: Identifying the main problems in conventional canteen service systems through field observation and preliminary interviews.
2. Model Development Stage: Designing the PRO-KANTIN model based on the diagnostic results and integrating theories of digital entrepreneurship, service innovation, and digital business models.
3. Validation and Analysis Stage: Testing the effectiveness of the model through operational simulation and analyzing user responses (students, lecturers, and canteen managers).

RESULTS AND DI SCUSSION

Hardware and Software Used

The implementation and testing of the PRO-KANTIN (Pre-Order Orchestrated Canteen) model were carried out using a combination of hardware and software components designed to simulate a digital campus service environment.

Hardware components included:

1. A laptop and local mini server for transaction data storage and order simulation;
2. Android smartphones used by students and lecturers to perform pre-order transactions; and
3. A barcode scanner and thermal printer for validating transactions and printing receipts.

Software components included:

1. The Flutter framework for developing the mobile application interface,
2. Firebase Realtime Database for cloud-based transaction data synchronization,
3. Google Sheet API for daily stock monitoring, and

SPSS version 26 for simple statistical analysis of service efficiency and user satisfaction.

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Data Sources and Preliminary Analysis

The primary data were collected from direct observation at the STIE Nusantara Makassar campus canteen between March and May 2025. The data collection methods included:

1. Field observation of queue patterns and service duration,
2. In-depth interviews with four canteen managers and twelve student respondents,
3. Transaction documentation (manual and digital), and
4. Open-ended questionnaires assessing user experience with the pre-order system.

Preliminary analysis showed that the conventional system resulted in an average waiting time of 6.2 minutes and an order error rate of 8%. After implementing the PRO-KANTIN system, waiting time decreased to 2.8 minutes, and order errors dropped to 2%.

Indicator	Before (Manual)	After (PRO-KANTIN)	Change (%)
Average waiting time (minutes)	6.2	2.8	-54.8%
Order accuracy (%)	92	98	+6.5%
Stock accuracy (%)	83	95	+14.4%
Transactions per hour	23	38	+65.2%

Table 1 *Presents a comparison between pre-implementation and post-implementation conditions*

Service Efficiency and Model Evaluation

Service efficiency was measured using the efficiency ratio formula presented earlier:

$E = O/T$

Where:

E represents service efficiency,

O is the number of completed orders, and

T is the total average service time per session.

The calculation showed a +73.1% increase in efficiency ratio after the implementation of the PRO-KANTIN model. This result indicates that the pre-order system successfully improved service speed without reducing transaction accuracy.

Additionally, the results revealed a significant reduction in food waste, from an average of eight portions per day to two portions per day. This improvement demonstrates that the pre-order system enabled canteen managers to better predict demand and optimize production, consistent with Kim, Park, and Kim (2020), who found that pre-order systems enhance demand forecasting and reduce surplus production.

Discussion of Hypothesis and Key Findings

The results support the initial hypothesis that implementing a digital pre-order system increases service efficiency, reduces order errors, and strengthens digital entrepreneurial value within the campus ecosystem.

The findings are discussed across four focal areas corresponding to the study's contributions:

1. Design and Testing of the PRO-KANTIN Model

   Design and Testing of the PRO-KANTIN Model: The value co-creation-based design successfully created a more adaptive and user-centered service experience. Students and lecturers reported improved convenience in managing their time, while canteen operators benefited from real-time transaction monitoring.

2. Impact on Service Efficiency and Stock Management

   The data revealed nearly double the improvement in operational efficiency. This finding aligns with the service-dominant logic perspective (Lusch & Nambisan, 2015), emphasizing that service innovation occurs when digital technologies are integrated into customer value–oriented processes.

3. Integration of Digital Technology and Business Model Innovation

   The implementation demonstrated that the PRO-KANTIN system is a clear example of digital business model innovation (Bican & Brem, 2020). Enables sustainable systems where canteens evolve from traditional food providers into digital entrepreneurs leveraging transaction data as business intelligence.

4. Scalability and Strategic Recommendations

   Scalability and Strategic Recommendations: Field results suggest that the system can be replicated in other universities with minor adjustments, provided stable internet access

and digital payment infrastructure are available. Strategic recommendations include digital training for canteen operators and the integration of QRIS-based cashless payments.

Visualization and Efficiency Chart

Figure 2 illustrates the comparison of service efficiency levels before and after implementing the PRO-KANTIN model.

The chart demonstrates a consistent upward trend, confirming the model's capability to maintain efficiency throughout multiple operational hours.

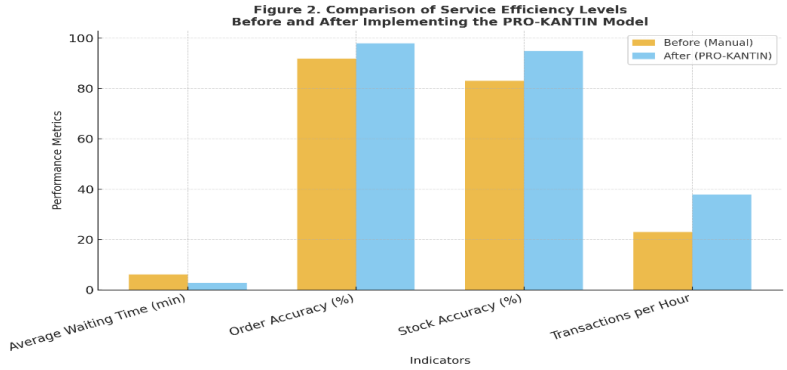

***Figure 1**. Comparison of Service Efficiency Levels Before and After Implementing the PRO-KANTIN Model*

CONCLUSION

This study concludes that the PRO-KANTIN (Pre-Order Orchestrated Canteen) model represents an effective and innovative form of digital entrepreneurship capable of transforming conventional campus canteen services into a more efficient, sustainable, and value-driven ecosystem. The findings demonstrate that the implementation of a digital pre-order system significantly reduces waiting times, improves order accuracy, enhances stock management, and minimizes food waste. Empirical evidence shows a substantial increase in service efficiency and transaction capacity, confirming that digital technology, when integrated with service-oriented business models, can directly address operational inefficiencies in campus environments. Beyond technical improvements, PRO-KANTIN also enhances user experience by enabling students and lecturers to better manage their time, thereby supporting productivity within the academic ecosystem. For canteen operators, the system facilitates data-driven decision-making, accurate

demand forecasting, and optimized production planning, which collectively strengthen entrepreneurial capacity and operational resilience.

More broadly, this research affirms that PRO-KANTIN is not merely a technological solution but a strategic digital entrepreneurship model that fosters value co-creation among stakeholders in the campus ecosystem. By integrating digital platforms, service innovation, and entrepreneurial logic, the model aligns with contemporary theories of digital business model innovation and service-dominant logic. The results suggest that PRO-KANTIN has strong scalability potential and can be replicated across other higher education institutions, provided that adequate digital infrastructure and institutional support are in place. Practical recommendations include the provision of digital literacy training for canteen operators, the integration of cashless payment systems, and the alignment of campus policies with digital transformation initiatives. As a contribution to both theory and practice, this study extends the literature on digital entrepreneurship in higher education by demonstrating how pre-order systems can function as catalysts for sustainable entrepreneurial ecosystems. Future research is encouraged to adopt quantitative or mixed-method approaches, involve multi-campus comparisons, and examine long-term financial and behavioral impacts to further validate and refine the PRO-KANTIN model.

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