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CONSUMER-ORIENTED PRODUCT ASSORTMENT AND VENDING MACHINE BUSINESS DESIGN: A LEARNING FACTORY PROJECT

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Abstract

This article presents a Learning Factory project that designed a vending machine business around consumer needs, product assortment, customer experience, and marketing communication. The project used a questionnaire to identify daily product needs, preferred package sizes, and purchase tendencies among internship participants, followed by spreadsheet-based data processing and product selection. The selected categories covered personal care, household cleaning, oral care, minor health products, vitamins, beverages, snacks, and seasonings. The project then translated the estimated demand into inventory quantities, vending-machine slot allocation, pricing assumptions, cash-flow projections, promotional mechanisms, and customer-feedback procedures. Two intended vending machine locations were treated as Site A and Site B to avoid disclosing organizational identities. The project illustrates how consumer information can be connected with assortment and operational decisions in an automated retail setting. The approach is consistent with recent vending-machine research showing that product assortment and portfolio decisions can be analyzed using transaction and demand information (Kumoro et al., 2026). However, the present project is a feasibility and learning design rather than an evaluation of realized transaction outcomes.

Keywords:
Vending Machine; Consumer Behavior; Product Assortment; Customer Experience; Marketing Communication; Learning Factory

1. INTRODUCTION

Automated retail requires careful product selection because the physical capacity of a vending machine is limited and each slot must be allocated to products that are relevant to the target market. In the project documented in the source report, the business idea emerged from concerns about the availability, quality, hygiene, and accessibility of daily necessities for internship participants. The proposed vending machine was therefore positioned not only as a distribution channel but also as a consumer-oriented business solution. The initial design relied on questionnaire data to identify product needs and purchasing tendencies.

The project connected consumer behavior with operational decisions. Respondents were asked about product types, package sizes, and purchasing frequency. The responses were then filtered and ranked, with products receiving at least ten responses retained for further analysis. Estimated demand was subsequently used to determine stock quantities and the allocation of vending-machine slots. This approach reflects the practical logic of assortment optimization: limited physical capacity should be allocated toward products with stronger demand potential.

Recent research provides a useful reference for this type of decision. Kumoro et al. (2026) demonstrated that a Modified BCG Matrix can be adapted to vending-machine portfolio decisions by using internal sales indicators rather than conventional market-share measures. Their study also showed that product portfolio optimization can be linked to changes in consumer purchase behavior and sales performance. The present Learning Factory project does not reproduce that empirical transaction study; instead, it applies a simpler demand-oriented selection process at the business-design stage.

The objective of this article is therefore to describe how consumer information was translated into vending machine product assortment, slot allocation, financial planning, marketing communication, and customer experience design. The article emphasizes the learning process and feasibility logic documented in the project.

2. RESEARCH METHOD

The project used a descriptive, project-based approach within a Learning Factory setting. The unit of analysis was the vending-machine business design developed during April–June 2025. Data were collected through a questionnaire distributed to internship participants and were processed using Microsoft Excel. The project stages consisted of (1) identifying consumer needs, (2) collecting and filtering questionnaire responses, (3) estimating product quantities, (4) designing product categories and machine allocation, (5) calculating pricing and financial projections, and (6) designing promotional and customer-experience mechanisms.

Products receiving ten or more questionnaire responses were retained for the selection stage. Package size preferences were used to guide the choice of product size. Where the questionnaire did not distinguish product variants, the report used an assumption based on purchase frequency and market availability. The estimated quantity was then converted into a proportional allocation of vending-machine slots. The machine specification used in the project had 48 horizontal slots with a nominal capacity of five units per slot, or 240 units in total.

The financial component included revenue estimation, fixed and variable costs, investment costs, selling-price assumptions, cash-flow projections, and payback-period calculations. Marketing communication was designed through a low-cost promotional mechanism using QR-code information and transaction proof, while customer experience was addressed through observation of preferred product variants and the provision of QR-based feedback. Because the project did not use realized transaction records, the financial figures and payback periods are treated as project projections rather than observed business performance.

3. RESULTS AND DISCUSSION

3.1 Consumer Need Identification and Product Assortment

The project identified 13 broad product categories: soap, shampoo, facial cleanser, body lotion, deodorant, detergent and fragrance products, toothpaste, toothbrushes, minor health products, vitamins, beverages, snacks, and seasonings. The assortment was developed for two intended customer environments, referred to here as Site A and Site B. The source report allocated three machines to one site and two machines to the other, based on the estimated needs of the respective consumer groups.

Table 1. Product categories identified for the vending machine business design

Category	Consumer-oriented rationale	Use in assortment design
Personal care	Frequent daily-use needs	Core assortment
Household cleaning	Routine household/living needs	Core assortment
Oral care	Daily hygiene requirements	Core assortment
Minor health products	Basic first-aid and relief needs	Selective assortment
Vitamins	Supplement-related demand identified in survey	Selective assortment
Beverages	High-frequency convenience purchases	High-priority assortment
Snacks	Convenience and impulse-oriented purchases	High-priority assortment
Seasonings	Specific household/food preparation needs	Selective assortment

The product-selection procedure shows a direct link between consumer information and physical assortment. Rather than filling the machine with an undifferentiated set of products, the project first filtered the questionnaire responses and then estimated the quantity required for each selected product. This is important in vending-machine operations because assortment decisions are constrained by slot capacity and the physical characteristics of products.

3.2 Demand Estimation and Slot Allocation

The project converted estimated demand into a slot-allocation rule. The proportional share of a product was calculated as its estimated quantity divided by the total estimated quantity for the machine, multiplied by 100. The resulting proportion was then multiplied by 48, the total number of available slots. The allocation was subsequently adjusted by considering product weight, packaging, product type, and expected operational risk.

The report also recognized an important managerial trade-off. Some products showed relatively high estimated interest but low selling prices, which could result in a large slot allocation without generating an equivalent profit contribution. Consequently, some slots were considered for reassignment toward products expected to rotate more quickly. This decision logic is consistent with the broader principle that product portfolios should be managed not only by demand but also by contribution and operational constraints (García-Vidal et al., 2023).

Table 2. Demand-to-slot allocation procedure

Stage	Decision rule	Output
1. Survey screening	Retain products with ≥10 responses	Eligible products
2. Demand estimation	Combine respondent frequency and occurrence	Estimated quantity
3. Proportion calculation	Estimated quantity / total quantity × 100%	Product share
4. Slot conversion	Product share × 48 slots	Initial slot allocation
5. Operational adjustment	Consider weight, packaging, and product type	Final slot allocation

3.3 Financial Feasibility and Investment Planning

The financial analysis was prepared separately for Site A and Site B. The report estimated monthly revenue of Rp78,505,581 for Site A and Rp130,451,294 for Site B. After variable costs, fixed costs, and a 12% tax assumption, the projected monthly net income was Rp9,451,945 for Site A and Rp15,919,383 for Site B. These figures represent the project's business projections and should not be interpreted as realized sales.

Table 3. Projected financial performance by vending-machine site

Indicator	Site A (Rp)	Site B (Rp)
Projected monthly revenue	78,505,581	130,451,294
Variable cost	66,729,744	110,883,600
Fixed cost	1,034,991	1,477,486
Total cost	67,764,735	112,361,086
Profit before tax	10,740,846	18,090,208
Tax assumption (12%)	1,288,902	2,170,825
Projected monthly net income	9,451,945	15,919,383

The source report estimated the vending-machine investment at approximately Rp35,000,000 per unit, in addition to the initial product inventory. It also projected a two-year payback period for Site A and a one-year payback period for Site B. The project interpreted positive NPV and an IRR above WACC as indicators of feasibility. Because these are simulation outputs, their validity depends on the assumptions concerning selling volume, cost, and the percentage of projected sales achieved.

3.4 Marketing Communication and Customer Experience

Marketing communication was designed as a practical mechanism to stimulate purchases and manage slow-moving inventory. The project proposed a low-cost promotion in which customers purchasing at least two products in one transaction could scan a QR code, submit transaction evidence, and claim a gift. The mechanism was designed to use products remaining in stock or approaching their planned promotional window as incentives. This connects promotional communication with inventory management rather than treating promotion as a separate activity.

Customer experience was addressed through direct observation and feedback collection. The project proposed monitoring which product variants were preferred, adjusting the assortment based on observations, and placing a QR-code questionnaire on the vending machine. These mechanisms allow the business to collect customer feedback without adding a staffed service counter.

The approach is also relevant to contemporary vending-machine portfolio management. Kumoro et al. (2026) show that systematic product portfolio decisions can influence consumer purchase behavior when assortment and replenishment decisions are connected to transaction evidence. In the present project, the same managerial logic is visible at the planning stage: consumer information is used first to select products, then to allocate scarce machine capacity, and finally to design mechanisms for future feedback and adjustment.

3.5 Learning Implications and Project Limitations

The project demonstrates the integration of consumer behavior, customer experience, marketing communication, and operational planning within a single business-design exercise. The main learning

outcome is the ability to translate questionnaire information into operational decisions such as product selection, inventory quantity, slot allocation, pricing assumptions, and customer-feedback mechanisms.

Several limitations should be considered. First, the questionnaire did not always contain sufficiently detailed product-variant information, so some variants were inferred using assumptions based on purchase frequency and market availability. Second, the financial analysis was based on projected sales rather than actual transaction records. Third, the project did not empirically test whether the proposed assortment changed purchasing behavior. These limitations are explicitly important when comparing the project with empirical vending-machine research such as Kumoro et al. (2026), which used longitudinal transaction data.

4. CONCLUSION

The Learning Factory project developed a consumer-oriented vending-machine business concept by linking questionnaire evidence with product assortment, stock estimation, slot allocation, financial planning, marketing communication, and customer-experience design. The selection process covered 13 product categories and translated estimated consumer demand into a structured allocation of limited vending-machine capacity. Financial projections suggested positive business feasibility under the assumptions used in the report, while the promotional and feedback designs provided mechanisms for future customer engagement and assortment adjustment.

The project should nevertheless be understood as a feasibility and learning design rather than evidence of actual consumer behavior change. Future implementation should use transaction-level data to evaluate product rotation, stock-outs, purchase concentration, revenue, and customer responses. Such data would allow the project to progress from questionnaire-based assortment planning toward evidence-based portfolio optimization, consistent with the direction of vending-machine research reported by Kumoro et al. (2026).

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REFERENCES

García-Vidal, G., Sánchez-Rodríguez, A., Pérez-Campdesuñer, R., & Martínez-Vivar, R. (2023). Contribution margin and quantity matrix to analyze the product portfolio in the context of SMEs: Criticism of the BCG matrix and its alternatives. Cogent Business & Management, 10(3), 2233272. https://doi.org/10.1080/23311975.2023.2233272

Kumoro, C. J., Sulaeman, L. R., Malsad, G. S., & Maulana, M. A. (2026). How Modified BCG Matrix-Based Product Portfolio Optimization Changes Consumer Purchase Behavior: Evidence from Vending Machine Transactions. International Journal of Management Science and Information Technology, 6(2), 1914–1927. https://doi.org/10.35870/ijmsit.v6i2.8278

Marinelli, L., Fiano, F., Gregori, G. L., & Daniele, L. M. (2021). Food purchasing behaviour at automatic vending machines: The role of planograms and shopping time. British Food Journal, 123(5), 1821–1836. https://doi.org/10.1108/BFJ-05-2020-0418

Nemoto, G., & Hiraishi, K. (2024). A POMDP-based approach to assortment optimization problem for vending machine. IEICE Transactions on Fundamentals of Electronics, Communications and Computer Sciences, E107-A(6), 909–918. https://doi.org/10.1587/transfun.2023EAP1036

Power, D. J., & Heavin, C. (2017). Decision support, analytics, and business intelligence (2nd ed.). Business Expert Press.