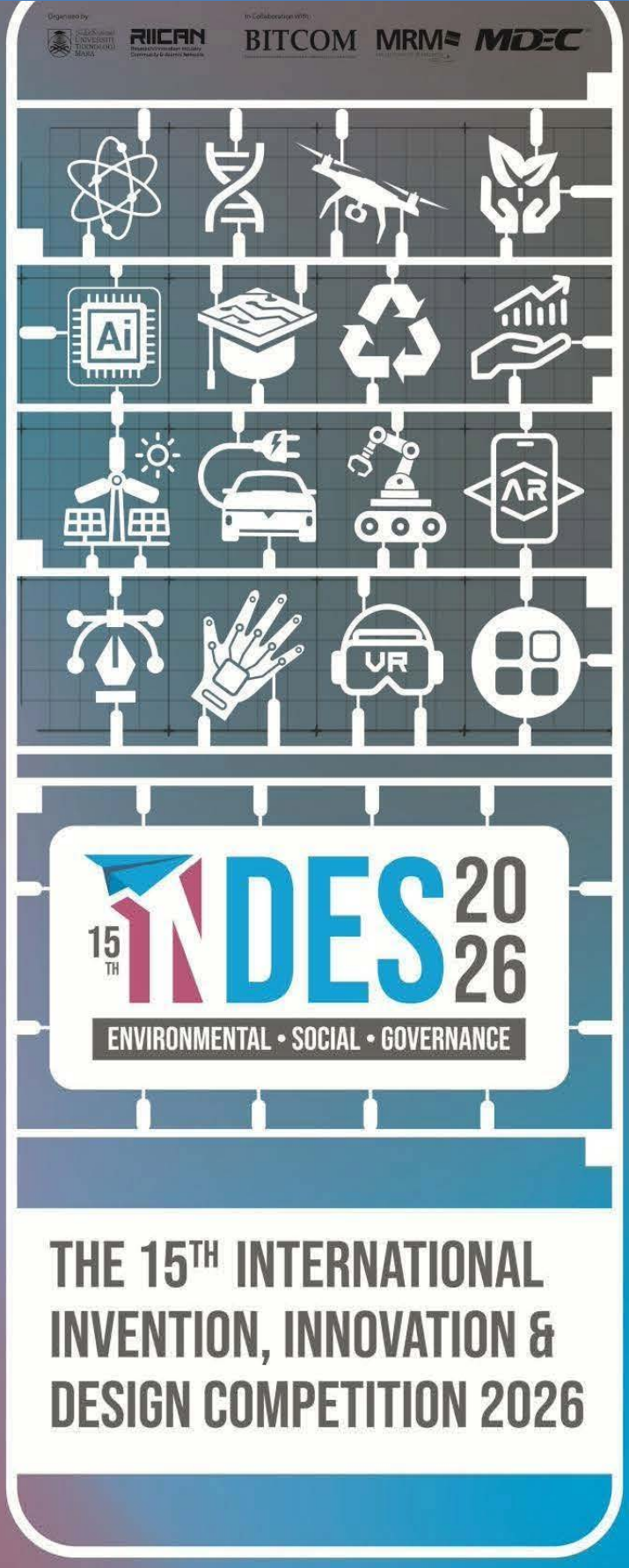


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EXTENDED ABSTRACT

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THE 15th INTERNATIONAL
INVENTION, INNOVATION &
DESIGN COMPETITION 2026

Organized by:
Office of Research, Industry,
Community & Alumni Network
UiTM Perak Branch

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Unit Penerbitan UiTM Perak,
Universiti Teknologi MARA,
Perak Branch, 32610
Seri Iskandar Perak, Malaysia.

Perpustakaan Negara Malaysia Cataloguing in Publication Data

No e- ISBN 978-967-2776-67-3

Cover Design: Asrul Nizuan Ariffin

Typesetting : Georgia

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DESIGN OF AN ECO-FRIENDLY MULTIFUNCTIONAL BICYCLE BASKET TO SUPPORT URBAN MOBILITY

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ABSTRACT

Global energy challenges and rising fuel prices are driving a fundamental shift toward more efficient, health-conscious, and sustainable modes of mobility, with cycling emerging as a prominent alternative. Observations conducted in Trangsan Village, Sukoharjo Regency, Central Java, confirm that cycling culture remains highly active. However, its broader adoption is frequently hindered by a lack of practical and modern supporting accessories, particularly bicycle baskets that lack the flexibility and functionality required to meet contemporary daily needs. To address this gap, this project employs a Design Thinking approach to develop an adaptive bicycle basket while simultaneously empowering local artisans. The product integrates rattan weaving and leather detailing with a flexible hook attachment system, ensuring compatibility across various bicycle types. Beyond its primary capacity to carry daily essentials, its defining innovation lies in its transformative functionality: the basket can be seamlessly detached and converted into a tote bag, effectively bridging cycling utility with the demands of modern urban lifestyles.

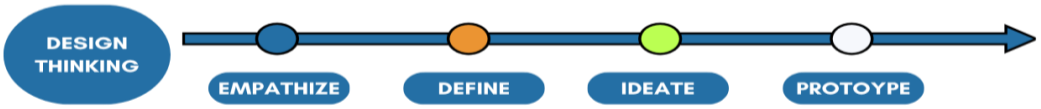
Keywords: Natural, Practical, Lightweight, Multifunctional, Convenient

1. INTRODUCTION

Global energy instability has become a primary concern as energy demands climb and resources remain increasingly constrained. Analysis by the International Energy Agency reveals a 2.2% surge in demand above the annual average in 2024, precipitating sharp fuel price increases that have consequently eroded household purchasing power worldwide. This economic pressure has catalyzed a fundamental paradigm shift in mobility, steering populations away from motor vehicles toward more sustainable and cost-efficient transportation alternatives (Yuliani et al., 2023). Bicycles have emerged as a compelling solution within this transition, offering a convergence of energy efficiency, physical health benefits, and significant carbon emission reduction. This remains particularly evident in Trangsan Village, Sukoharjo Regency, Central Java, where cycling persists as a vital and deeply embedded component of daily life. However, this transition is significantly hindered by a lack of adequate supporting products capable of meeting modern lifestyle demands. A persistent obstacle lies in the limited design of existing bicycle baskets, which critically lack the flexibility and usability required for practical everyday use, while their aesthetics fail to align with contemporary sensibilities. Consequently, there is an urgent need for a novel design approach that seamlessly integrates functional versatility with modern aesthetics. The development of an adaptive bicycle basket is proposed as a more practical and contemporary product solution, anticipated to streamline daily user activities and more effectively support the demands of modern life.

2. METHODOLOGY

This project uses a design thinking approach to develop a user-centered product by understanding user needs and perspectives through direct engagement with the community of Trangsan Village, particularly teenagers, adults, and the elderly.



a. Empathize

User understanding was conducted through interviews to explore needs, experiences, and behaviors. The data were analyzed using empathy mapping to identify key insights from each user group (adults, elderly, and teenagers).

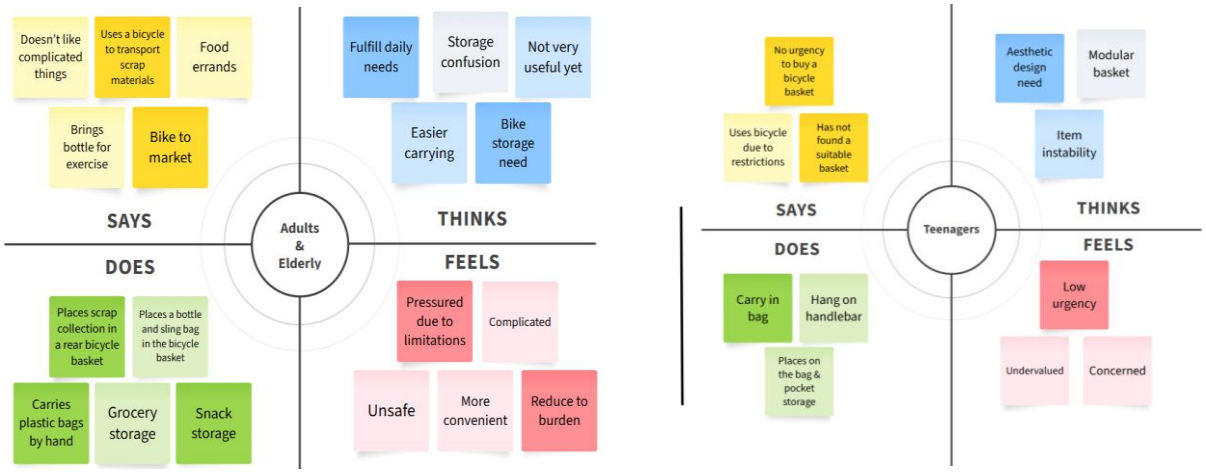


Figure 1 Empathy Mapping

b. Define

Findings were synthesized into problem statements using the Point of View (POV) method (user,need,insight).

1. Adults and elderly need a safe and practical bicycle basket to carry goods, with a cover to protect belongings.
2. Meanwhile, teenagers show lower usage; however, they prefer attractive, durable, and detachable designs, indicating strong potential for influence.

c. Ideate

Solutions were generated through brainstorming and sketch exploration.

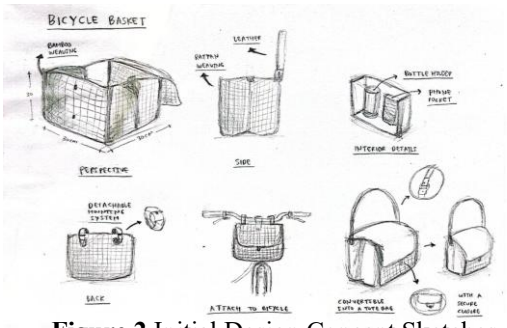


Figure 2 Initial Design Concept Sketches

d. Prototype

Design concepts were visualized through simple physical models and 3D modeling to evaluate form and usability.

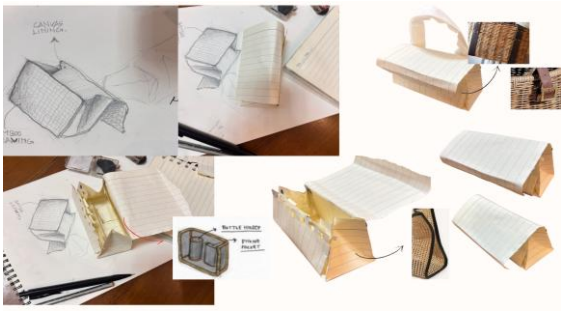


Figure 3 Design Concept Prototype

3. FINDINGS

The design process resulted in a multifunctional bicycle basket inspired by synthetic woven bags, re-engineered for modern urban mobility by utilizing rattan weaving for its superior strength-to-weight ratio and natural flexibility.

Table 1 Bicycle Basket Description

Parameter	Specification
Materials	Rattan and bamboo weaving with leather
Dimensions (*H* x *W* x *D*)	30 x 30 x 30 cm
Mounting System	Quick-release detachable mounting system
Storage Features	Internal tumbler holder and phone pocket

The core innovation is a pulley-driven flap system that allows the structure to transform from a rigid bicycle basket into a flexible tote bag. When the pulley is engaged, the internal lining folds the rattan frame into a handheld form. This multifunctional capability is supported by a buckle-based detachable mounting system, ensuring a secure fit that accommodates standard handlebars while maintaining shape under heavy load.



Figure 4 Final Design Concept

4. CONCLUSION

This project demonstrates that a user-centered design approach can produce practical and adaptable solutions for urban mobility. The product directly addresses users' need for convenience, security, and aesthetic relevance in a contemporary setting. Its transformative two-in-one functionality broadens accessibility for a wider demographic of urban cyclists. Furthermore, the use of locally sourced natural materials offers a sustainable alternative to synthetic mass-produced woven bags, reinforcing the principles of green consumption while simultaneously empowering local artisan and preserving traditional rattan craftsmanship. The design stands as evidence that locally rooted creativity and cultural heritage hold genuine potential to contribute to global sustainability efforts.

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eISBN 978-967-2776-67-3

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Date of Publication: 13 July 2026

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(online)