

Case Study: Prototype Development of Coffee Cube – A Product Innovation in the Coffee Segment

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Introduction

Coffee is deeply embedded in global culture, serving as a daily essential for millions. In India, particularly in Karnataka, coffee holds immense economic and cultural importance, with the state contributing nearly 70% of India's coffee production (Chakravarty, 2020). Coorg and Chikmagalur remain the primary coffee-growing regions, renowned for their high-quality beans. While traditional filter coffee remains a staple, changing consumer lifestyles have led to a surge in demand for instant and portable coffee solutions, particularly among urban youth and working professionals who seek convenience without compromising on taste.

To address this evolving demand, Coffee Cube was developed as an innovative ready-to-use coffee solution. The cube format integrates instant coffee, milk powder, and sugar, allowing consumers to prepare a well-balanced cup of coffee in seconds by simply adding hot water. This concept emerged from a Project-Centric Learning (PCL) initiative, aiming to bridge the gap between traditional coffee preparation and modern convenience. This case study explores the development process, challenges faced, consumer insights, and future prospects of the Coffee Cube.

Market Context: Coffee Consumption Trends in Karnataka

As India's leading coffee-producing state, Karnataka has a significant impact on the coffee industry, both in terms of production and consumption. Studies indicate a shift towards instant coffee and specialty coffee formats, particularly in urban areas. According to Deshpande et al. (2021), the Indian instant coffee market was valued at USD 1.8 billion in 2020, with continued growth expected due to rising demand for convenient, high-quality coffee products.

Key factors driving this shift include:

- ✓ Rapid urbanization – Increased demand for quick and easy coffee preparation.
- ✓ Changing consumer preferences – Preference for on-the-go, single-serve coffee options.
- ✓ Busy lifestyles – Need for a fast, hassle-free alternative to traditional brewing.
- ✓ Expansion of café culture – Exposure to premium and flavored coffee options.

The Coffee Cube concept taps into these evolving trends by offering a portable, no-brew coffee experience, making it an attractive solution for students, professionals, travelers, and businesses looking for an efficient caffeine fix.

Product Concept and Initial Challenges

The Coffee Cube was designed to simplify coffee consumption by eliminating the need for separate coffee powder, milk, and sugar measurements. By compressing all essential ingredients into a dissolvable cube, the product ensures consistent flavor and convenience with every cup.

However, moving from concept to functional prototype involved several challenges:

- ◆ Compression Issues – Achieving the right balance of density and solubility without affecting taste.
- ◆ Ingredient Proportions – Finding the optimal ratio of coffee, milk, and sugar to create a well-rounded flavor.
- ◆ Structural Integrity – Ensuring cubes held their shape while dissolving quickly and evenly in hot water.
- ◆ Manual Compression Limitations – The use of a manual compressor led to inconsistencies in cube size and texture, requiring further refinements.

The team conducted multiple trial batches to perfect the composition and improve production techniques. Feedback from initial testers revealed that early prototypes lacked consistency, prompting adjustments in ingredient ratios and compression methods to enhance flavor and texture.

Development Process and Consumer Testing



Creation – A manual compressor was used to create a small batch of coffee cubes, with an initial focus on structural stability and solubility.

The Coffee Cube prototype underwent over 100 hours of testing to refine its formulation and structure. The development process consisted of several key stages:



- Prototype create a small achieving

- **Ingredient Testing** – Multiple variations in coffee-to-milk-to-sugar ratios were tested to enhance taste and texture.
- **Consumer Feedback Loop** – A batch of prototypes was distributed to a test group, including students, professionals, and coffee enthusiasts, who provided insights on flavor balance, convenience, and overall satisfaction.
- **Iteration & Refinement** – Based on consumer responses, modifications were made to improve solubility, taste, and consistency.

The testing phase revealed valuable insights—early testers preferred a stronger coffee taste, leading to adjustments in the coffee content, while others suggested variations like sugar-free or flavored options to cater to diverse preferences.

Time, Struggles, and Overcoming Challenges

The transition from idea to prototype was met with several hurdles, particularly in manufacturing consistency. Achieving uniform compression manually was a complex process, as cubes often crumbled or dissolved unevenly. The team had to experiment with different compression pressures and binding agents to achieve optimal cube stability without compromising taste.

Additionally, ensuring flavor consistency across multiple batches proved to be challenging. The early iterations were either too sweet or too mild, requiring continuous refinements before arriving at the ideal balance. Consumer acceptance also played a crucial role—while the convenience of instant coffee cubes was well received, the taste had to meet high expectations for widespread adoption.

Despite these struggles, persistence led to a well-optimized formula that delivered a rich and satisfying coffee experience, proving that innovation and adaptability are key to product development success.

Future Prospects

The Coffee Cube holds significant potential for future development. Planned advancements include:

- **Expanding Flavor Range** – Introducing decaf, strong coffee, and flavored options like vanilla, caramel, and hazelnut to cater to diverse consumer preferences.
- **Scaling Up Production** – Transitioning from manual compression to automated manufacturing for higher efficiency and consistency.

- Retail & B2B Expansion – Positioning Coffee Cubes for corporate offices, co-working spaces, hotels, and travel retail.
- Sustainable Packaging – Developing eco-friendly, single-serve packaging to enhance convenience while minimizing environmental impact.

With India's fast-growing coffee market, the Coffee Cube has the potential to disrupt the instant coffee segment by offering a more premium, convenient, and portable alternative.

Conclusion

The development of the Coffee Cube showcases innovation in the Indian coffee industry, addressing the increasing demand for quick, high-quality, and convenient coffee solutions. By compressing traditional coffee ingredients into a single dissolvable cube, the product appeals to younger, urban consumers seeking both efficiency and great taste.

The journey from conceptualization to prototype development highlights the importance of persistent testing, consumer feedback, and iterative improvements in product innovation. Despite initial manufacturing challenges, the Coffee Cube evolved into a functional and market-ready product with strong potential for commercial success.

References

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