IDR Conference Proceedings - Vol. 02, November 2023
ISSN 3021-694X, eISSN 3021-6958
idresearch.uom.lk

Customised Packaging Solutions for Fragile Edible Cutlery: A Design and Development Study

DEWMINI M.G.C.N.[1]* **and SAMARAWICKRAMA S.**[2]

[1]*Department of Integrated Design, University of Moratuwa, Sri Lanka, chiraninilakna@gmail.com*
[2]*Department of Integrated Design, University of Moratuwa, Sri Lanka, sumanthri.s@gmail.com*

Abstract — *The research delves into the nuanced world of customised packaging design, specifically tailored for fragile edible cutlery, addressing the pressing need for safe and efficient transportation of these uniquely shaped products. Defined as a crucial aspect of ensuring food preservation during transit and storage, customised packaging design revolves around developing outer and inner packaging solutions to safeguard perishable, delicate food items. Highlighting two pivotal components, the study places emphasis on the outer packaging's requirement for pressure and puncture resistance, shielding products from damage during transportation and palletizing. Meanwhile, the inner packaging aims at securing and buffering fragile items against shocks and vibrations, thereby reducing damage rates. The research objective revolves around designing tailored packaging solutions for these delicate food items, considering their fragile nature and irregular shapes.The study employed a three-phase methodology, beginning with an analysis of existing packaging solutions and prototype development for selected edible cup and spoon shapes. This phase aimed to identify deficiencies and improve packaging considering factors impacting transportation. Innovative packaging design followed, focusing on addressing breakage and cushioning requirements while integrating sustainability features. The final phase involved prototype testing, gathering feedback from experts and exhibition visitors to refine prototypes iteratively, aligning with project goals and audience needs. Analysis of current packaging for edible cups highlighted limitations in attractiveness and user experience, emphasising the need for improved designs with enhanced cushioning and eco-friendly graphics. User feedback regarding the existing packaging by the sole Sri Lankan manufacturer revealed inadequacies, stressing the importance of enhancing product protection and user satisfaction. It suggests future research avenues to encompass diverse product shapes and sizes, focusing on continual improvement aligned with evolving consumer preferences.*

Keywords: *Customised packaging solutions, Fragile food protection, Edible cutlery packaging*

Introduction

**Contact: phone +94-771808280*
DOI: *https://doi.org/10.31705/IDR.2023.15*

Customised packaging design refers to the process of creating unique and personalised packaging for a product and customised packaging for fragile food is creating packaging that is specifically designed to protect and preserve fragile food items during transportation and storage. This type of packaging takes into consideration the unique characteristics of the food item, such as its fragility, shape, and perishability, and creates a customised solution that addresses these characteristics. The packaging of fragile products includes two parts: outer packaging and inner packaging. The outer packaging is usually required to have a certain degree of pressure resistance and puncture resistance to protect the fragile products from being intact during their transportation and storage and palletizing conditions. The main function of the inner packaging is to provide fixation and Buffer. Qualified inner packaging can protect fragile products from shock and vibration during transportation and reduce the damage rate of the items. (Gao, Z et al.,2021)

The customization may involve the use of specific materials and the integration of features such as custom moulds, inserts, and cushioning to create a protective barrier around the food item. The packaging may also include temperature control mechanisms to ensure that the food item remains fresh and of high-quality during transportation. Considering the specified above matter, the research objective of this study is to design and develop customised packaging solutions for fragile edible cutlery, taking into consideration its unique characteristics specially the fragility and irregular shapes.

The Relevance and The Need of the Study

In Sri Lanka there is only one edible cutlery manufacturer and there is no available research done regarding edible cutlery packaging. The relevance of studying customised packaging solutions for fragile edible cutlery lies in the need to ensure the safe transportation of these unique shaped products. The standard packaging is not suitable for these fragile and unusual shapes, which can result in breakage and waste. By developing customised packaging solutions, the manufacturers of edible cutlery in Sri Lanka can ensure the safe delivery of their products to customers both locally and in the global market. Furthermore, the demand for eco-friendly products is increasing worldwide, and edible cutlery is an innovative and sustainable alternative to plastic cutlery. By promoting and exporting this product, Sri Lanka can contribute to the global effort to reduce plastic waste and promote environmental sustainability. Effective packaging design research can ensure that the product reaches the customer in the best condition possible, thereby increasing customer satisfaction and promoting the brand.

In summary, the study of customised packaging solutions for fragile edible cutlery is important for the successful expansion of this product to the global market. It can help to ensure safe transportation, reduce waste, promote eco-friendliness and increase customer satisfaction.

Method and Material

The method of study consisted of three phases.

A). Use and analysis of packaging solutions for fragile perishable goods.

In the initial phase of the research, an assessment was conducted on the existing

packaging solution for selected edible cups and spoons shapes to identify any defects and determine necessary improvements. Various structures and forms were explored

*Contact: phone +94-771808280
DOI: https://doi.org/10.31705/IDR.2023.15

and prototypes were developed accordingly. Furthermore, measurements of the cups and spoons were taken, and an analysis of their stacking and packaging together was conducted. Prior to this, an analysis was performed on currently available fragile packaging solutions. This analysis was done with the help of the research conducted by Zhu Gao et al. (2021) titled "Research on the Reduction Design of Fragile Product Cushion Packaging under the Green Development Concept."

The design and development were carried out in two methods to cover the two important factors when developing packaging for fragile food. Method one is Measurement and analysis. For that the measurements were taken of the cups and spoons, including their dimensions, weight, and other relevant factors that can impact their packaging and transportation. Then analysing the data to identify any potential issues or challenges that may arise during packaging and transport, such as the need for cushioning, the risk of breakage, or the impact of temperature and humidity were identified. Method two is prototype development for selected edible cups and spoons shapes, using different materials and designs to test their durability and resilience to damage during transportation.

B). Development of an innovative packaging

In the second step, a packaging design was designed, to address the challenges such as breakage or the need for cushioning, and to incorporate the best features of the existing packaging solutions as identified in the previous phase. An innovative package that reduces waste and is environmentally friendly, provides maximum protection ensures that the contents remain fresh and safe for consumption and offers a competitive advantage to the producers and suppliers of the edible cutlery products factors were considered in the final prototype.

There were three factors to be considered,

a. Edible cutlery is marketed as an eco-friendly alternative to traditional plastic cutlery then packaging must align with the product's sustainability goals by being eco-friendly
b. Packaging should be visually appealing, showcasing the product's unique features and benefits
c. Packaging should be designed for convenience and ease-of-use to ensure customer satisfaction.

C). Prototype tests

Then as the next step, user testing was conducted to get feedback from people. The testing involved industry experts at different stages of development and visitors to two major exhibitions, the ProPack exhibition held at BMICH and the Design Code exhibition held at the University of Moratuwa. The feedback gathered from industry experts and consumers was analysed to identify any recurring issues or areas of improvement. Based on the feedback, the prototype was iterated and improved until a final design was created that met the goals of the project and satisfied the needs of the target audience.

*Contact: phone +94-771808280
DOI: https://doi.org/10.31705/IDR.2023.15

Results and Discussion

Due to the recent introduction of edible cutlery, the packaging options available for this product are still in the early stages of development. Current packaging for edible cups were analysed before going into developments.

Figure 1 – Current packaging for edible cups (Global Market)

The current packaging designs are not very attractive or provide a satisfactory experience for the target user as identified from the user testing. Therefore, there is an opportunity to further develop packaging designs that can enhance the user experience by incorporating cushioning for protection during transport and storage. Additionally, graphic designs needed to be utilised to communicate the eco-friendliness and sustainability of the product to potential customers. As the market for edible cutlery continues to expand, customised and innovative packaging options are needed to meet the needs of consumers.

Figure 2 – Current secondary and primary packaging for the selected cups and spoons

The solitary producer of edible cutlery in Sri Lanka functions as a small to medium-scale enterprise. For research purposes, the cups and spoons produced by this company were chosen for analysis. Nevertheless, according to user feedback, the existing packaging design fails to offer sufficient protection or a satisfactory user experience. This underscores the

*Contact: phone +94-771808280
DOI: https://doi.org/10.31705/IDR.2023.15

necessity of creating packaging solutions that efficiently shield the product and improve the overall user experience, ultimately bolstering the product's market success.

Figure 3 – Development of the shape of the packaging according to the stacking method of cups

Above packaging design is the innovative packaging solution (Figure 3) that addresses the multifarious challenges related to packaging fragile waffle cups. The core aim of this packaging is to ensure the safety of the product during transportation and storage while simultaneously preserving its taste and quality as identified in the previous analysis phase. This is achieved by shielding the product from exposure to air, moisture, and odours from the environment via an airtight seal that remains intact until the package is unsealed by the end-user by tearing a sticker. According to research and analysis, the target group of the client was in Gulf countries and their average family size (8) was used to determine the number of units included in one packaging. Functionality was a crucial consideration in the design of this packaging solution. To this end, the packaging is engineered to protect the waffle cups from damage during transport and storage, keep them uncontaminated, and facilitate ease of opening, closing, serving, and stacking for storage.

In the case of the hexagonal-shaped packaging, this design allows the packages to be tightly fitted together, reducing the amount of unused space between them. The hexagonal shape also provides a more secure fit for round-shaped waffle cups with cushioning, ensuring that the contents remain safe and undamaged during transportation.

The packaging's overall design and shape fulfil the key factor of providing a secure and tight fit for the contents, improving the safety and quality of the packaged products. By using this type

*Contact: phone +94-771808280
DOI: https://doi.org/10.31705/IDR.2023.15

of packaging, businesses can achieve better storage and transportation efficiency, which can lead to cost savings and improved overall productivity.

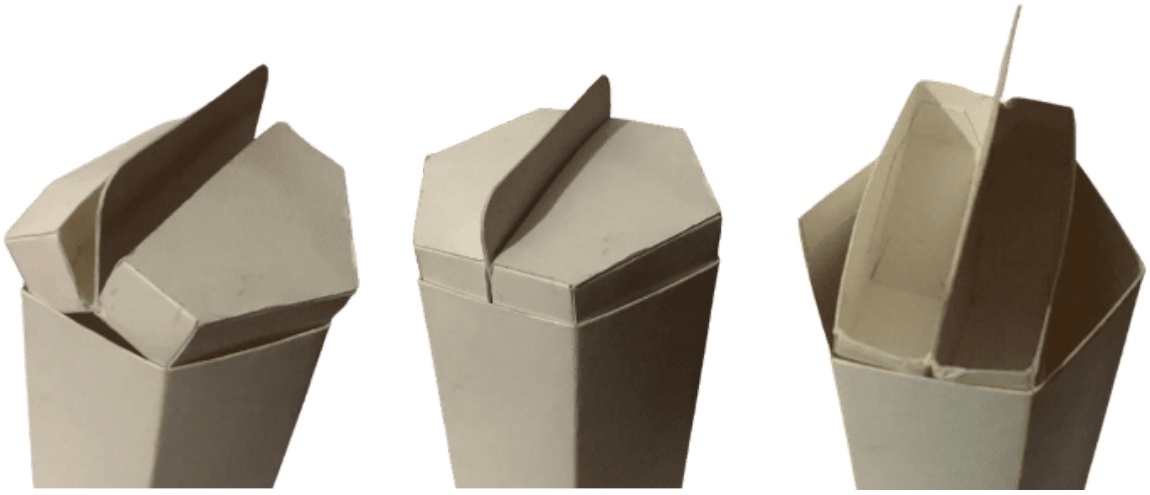

Figure 4 –Opening experience of the packaging

The opening experience, which is illustrated in Figure 4, is an innovative feature that sets this packaging apart from conventional packaging techniques. It is designed to make the process of serving and handling the product more convenient and effortless. In user testing, individuals have expressed high levels of satisfaction with this innovative feature. The bag-like shape of the opening allows for easy grabbing of the contents, while the shape of the opening ensures that it can be conveniently placed on a flat surface for serving. All the materials used in the packaging are made of cardboard, a material that can be recycled. This eco-friendly design not only demonstrates a commitment to sustainability but also aligns with the growing trend towards environmental conservation in the packaging industry.

Conclusion

From the study, it can be concluded that, studying customised packaging solutions for fragile edible cutlery lies in the need to ensure the safe transportation of these unique-shaped products. Effective packaging design research can ensure that the product reaches the customer in the best condition possible, thereby increasing customer satisfaction and promoting the brand. Also is important for the successful expansion of this product to the global market.

The current research undertaken by an enterprise solely concentrates on one specific product size within its range of products. However, there exists a possibility to extend the scope of the study to encompass other shapes and sizes of the products offered. Furthermore, the incorporation of packaging design research would enable the improvement of the product's quality. For instance, the addition of a window to enable consumers to view the product's contents necessitates the use of premium packaging, ultimately providing a value addition that is worthwhile to the consumer.

*Contact: phone +94-771808280
DOI: https://doi.org/10.31705/IDR.2023.15

References

Gao, Z., Dong, W., & Xiaomin, J. (2021). Research on the Reduction Design of Fragile Product Cushion Packaging under the Green Development Concept. *IOP Conference Series: Earth and Environmental Science*, *657*(1), 012057

Gilaninia, S., Monsef, S. M. S., & Soleymani, F. (2013). Quality Packaging and Saffron Export. *Singaporean Journal of Business , Economics and Management Studies*, *1*(10), 1–5

Mohammadi, M., Tabatabai Hnzayy, S., & Azad, N. (2014). A study on packaging factors influencing export development. *Management Science Letters*, 2213–2220

**Contact: phone +94-771808280*
DOI: *https://doi.org/10.31705/IDR.2023.15*