

Sustainability Innovation

Solve The Problem Of Delivery Food(Waimai)'s Over-packaging With New Package Design

Houxin Liang, Shenzhen Senior High School (Group)

Kaiyuan Chen, Shenzhen Senior High School (Group)

Zhijie Duan, Shenzhen Senior High School (Group)

Huilin Gao, Shenzhen Senior High School (Group)

Yilin Mo, Shenzhen Senior High School (Group)

Junfei Huang, Shenzhen Senior High School (Group)

Xinyan Li, Shenzhen Senior High School (Group)

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Summary

With the rise of take-out (or 'Waimai') food industry in China, some over-packaging phenomenon (such as using large plastic lunchbox for small amount of food caused by the problem of face, sanitation, etc) lead to dramatic increase in pollution.

According to the criteria of environmental-protective efficiency and users' acceptability, this design of environmental-friendly lunchbox will be a precise solution to the problem of over-packing. The change of lunchbox' s structure and materials minimized the material usage and increase the recyclability of lunchbox respectively, which can make take-out industry part of people' s green lives.

Besides, it doesn' t change people' s dining habits since the motivation of packaging—including the worry of sanitation, enjoyment of good-looking, and unwillingness of paying over-priced—is in consideration of this design. This can be proven from the results of research. As for the problem indicated by the research, we come up with solutions respectively.

Furthermore, in the promotion plan, we utilize many different ways to different stakeholders.

In conclusion, this design of lunchbox is reasonable because its high-probability of popularization and efficiency in pollution reduction.

Identify the Challenges

1.Environmental Awareness

Commonly, consumers are lack of the consciousness of the environmental protection. They superficially notice the problem of pollution because they think they have already paid the money, so they don't need to care about the consequences, like the recycling and disposal. The waste which is caused by the over packaging may destroy the environment eternally. For example, the time of degrading a plastic bag can be up to a hundred year, which is extremely harmful to the ecosystem by contaminating the soil. Therefore, the neglection of environmental awareness has become a serious problem.

2.Competition

In the perspective of merchants, they would like to put efforts on the design the packaging to attract consumers and compete with other producers. According to the Dupont Principle (which is given by a famous American company), 63%of the consumers choose the products based on the packages. In addition, from the report of The UK Market Survey Institution, the goods female consumers lastly buy usually excess their planned amount at over 45%. Sometimes the design will waste materials like metal, paper, and glass, which are not necessary actually and even increase the burden on the process of transportation. Additionally, excessive packaging increases the cost of packaging. Packaging cost of some commodities has reached 70% of the total price of the whole commodity, which gains more profit from selling at a higher price of products. In the perspective of merchants, they would like to put efforts on the design the packaging to attract consumers and compete with other producers. According to the Dupont Principle (which is given by a famous American company), 63%of the consumers choose the products based on the packages. In addition, from the report of The UK Market Survey Institution, the goods female consumers lastly buy usually excess their planned amount at over 45%. Sometimes the design will waste materials like metal, paper, and glass, which are not necessary actually and even increase the burden on the process of transportation. Additionally, excessive packaging increases the cost of packaging. Packaging cost of some commodities has reached 70% of the total price of the whole commodity, which gains more profit from selling at a higher price of products.

3. Hygienic Condition

One problem is the consumers' concerns about the hygiene of the goods. Therefore, most of the sellers provide products with high quality with a high hygienic condition to satisfy the consumers. For instance, the WAIMAI (Online

Food Order in China), utilizes double plastic bags to separate the food from disseminating the odors and keep the original flavor. A seller who cannot ensure the safety of the consumers will lose the reputation, so it is necessary for the sellers to keep the products with a clean, neat and safe condition.

4.0 Cultural Tradition

Another challenge is about cultural tradition. In most of the Asian countries, a decent and exquisite package represents the face of the giver. Some of the packages may be overuse and the consumers only use it for one time. Despite this, consumers are still willing to pay a high price on good packaging on the gifts although the packaging doesn't have existential purposes. On account of the "face", sellers adopt different kinds of decorations on the products to satisfy the appetite of the consumers. Another challenge is about cultural tradition. In most of the Asian countries, a decent and exquisite package represents the face of the giver. Some of the packages may be overuse and the consumers only use it for one time. Despite this, consumers are still willing to pay a high price on good packaging on the gifts although the packaging doesn't have existential purposes. On account of the "face", sellers adopt different kinds of decorations on the products to satisfy the appetite of the consumers.

5. Convenience

When consumers are shopping, they prefer to choose the products with convenience. The products which are can be easily taken away by the consumers. For example, single-use plastic bags which are portable are widely used in the supermarkets. Consumers can get them after finishing shopping without taking the bags that need to be washed by themselves. They consider that it is convenient to use the plastic bags that provided by the markets freely, so it will aggregate the overuse of packaging.

6. Privacy

Privacy is the primary concern of consumers. Sellers wrap the goods intensely in order to keep the privacy from spreading. For example, some buyers of adult products don't want others to know their demand in this aspect. Therefore, the sellers wrap the products by using pieces of paper, plastic bags and foam to protect consumers' privacy. However, although it keeps the privacy of consumers, it results in over-packaging. Privacy is the primary concern of consumers. Sellers wrap the goods intensely in order to keep the privacy from spreading. For example, some buyers of adult products don't want others to know their demand in this aspect. Therefore, the sellers wrap the products by using pieces of paper, plastic bags and foam to protect consumers' privacy. However, although it keeps the privacy of consumers, it results in over-packaging.

7. Transportation

One of the most important uses of the package is to facilitate transportation and storage. Merchants adopted a system of using lots of foams and corrugated paper into the box for the sake of preventing the package from breaking and damaging. In this way, consumers will likely to believe that the more materials the sellers used, the higher the quality and credits the sellers have. Most packaging that originally do not need the use of some layers of packaging use more foams or vacuum bags to fill the blank in boxes. Items that could have been packed in smaller packages were packed in larger, heavier packages, which increased in volume and weight, thus greatly reducing the effective quantity of goods transported per unit number of times by the same means of transport. Thus, the process leads to the rise of logistics costs and brings the waste of logistics resources, which will eventually be reflected in commodity prices, increasing the burden on consumers, and at the same time aggravating environmental pollution.

Identify a Root Cause

1. Because of the rapid increment of consumption due to enhancement of living standard that leads to higher demand for products quality without corresponding realization about environmental importance during the development process, over packaging problem rises. This lack of environmental awareness makes over packaging a tool to gain stronger market competitiveness for sellers and a resort to flaunt their wealth for consumers.
2. The emphasis on convenience in modern city contributes to the over packaging, such as the overuse of plastic bags in shopping.
3. Lack of juristical restriction that limit over packaging.

Generate Solutions

1. Use edible materials to produce table wares

The design companies can launch edible table wares to save resource and avoid environmental pollution. Since most table wares are made by plastic which is degradation-resistant, the environment has been harmed severely. In order to prevent this, we can design a type of table wares made by edible materials. Customers can choose to eat the spoons and chopsticks after finishing the meal or they can choose to throw them away without harming the environment because the spoons and chopsticks can degrade easily with other food residues and become nutrition for plants. As a result, extra packaging can be avoided since no more plastics are needed to produce table wares.

2. Design the product containers into a compressible form

The design companies can design compressible product containers to reduce the cost and increase the efficiency for recycling. This is because the usual containers always occupy a large number of space during the transportation, which is expensive. But when the containers can be compressed, a large area can be emptied for more containers to be recycled. So the efficiency of recycling can be enhanced. Also, normal containers have larger volumes, which also requires larger areas of outer packages. However, compressed containers require less outer package so the extra packaging can be reduced.

3. Include alerting slogans

The express companies can include alerting slogans such as "plastic has already been found even in the world's deepest trenches" on the coverage of express boxes to alert customers to protect the environment. As a result, they will be more likely to reutilize the packages and produce less waste. At last, the resource spent on packaging will be lessen and the problem of over packaging can be eased. Plastics have already cause severe damage to the environment and wild lives but many people still do not have the awareness to protect the environment. If we include alerting slogans on the express boxes to warn people, they will pay more attention to protecting the environment rather than "face". Even if packaged produce truly can give consumers the perception that the product has higher quality, customers will realize that the products do not lack high quality, but instead protects the environment.

4. Produce product containers with layers

The producers can produce containers with layers instead of multiple small containers. Sometimes when we order take-outs, we may notice that the dishes

are placed in different containers to avoid the mixture of taste. If we design a container with layers, the materials required to make the containers can be reduced while the mixture of taste can also be avoided.

5. Propagandize the importance of protecting the environment

Customers may tend to choose environmental friendly products if we give out pamphlet and propagate the importance of minimizing the package of express in order to protect the environment. Some people do not know the seriousness of using excess packaging so if we inform the public of the harm human beings did to the environment, they will be willing to contribute their effort into protecting the environment.

6. Establish the official certification environmental friendly companies

The government can issue an official certification to prove that the company's packaging is under a certain amount to show the customers that they do not have to pay extra money for the over packaging. In this way, customers will buy more products with this official certification since all the money they spent are on the product instead of the packaging. When people have the conscious that fancy packaging does not mean high quality but means extra money to pay, less people will pay for the excess packaging.

7. Establish a recycle bin for express boxes

The express companies can place some recycle bins for express boxes. Since most express boxes are recyclable, people should not just throw them away like rubbish. Instead, reutilizing them is a perfect method to protect the environment and save resources. Individuals can throw the express boxes into the boxes and the express company will come and collect them. Then, the company can reuse the boxes in the recycle bins and do not have to produce new boxes, which reduces the materials used for packaging.

8. Set up a reward system to encourage customers recycle the boxes

The express company can have a cooperation with the producers and set up an implementation system to encourage customers to recycle the express boxes by releasing some discount coupons. By reutilizing the old boxes, the producers can also attract more customers and the express company can reduce the materials required for producing new boxes and save money by reutilizing the old boxes.

9. Use degradable materials to produce express boxes

The design company can select a kind of degradable material to produce the express boxes so that the discarded boxes won't produce harmful chemicals to the soil. In this way the excess packaging will not harm the environment.

Identify the Criteria

1. Is it convenient for the public to accept the plan?
2. Can we keep the economic cost reasonable?
3. Can the plan be popularized to a wide range?
4. How effectively can the plan reduce overpacking?
5. Can the plan reduce its impact on the environment?

Evaluate the Solutions

Solutions

No. Solution 1. 2. 3. 4. 5. Total

1 Produce food containers with layers 4 7 6 6 6 29

2 Design the food containers into a compressible form 3 6 6 7 6 28

3 A reward system(encourage the seller to recycle the package box) 5 6 5 6 6 28

4 Establish a recycle bin for express boxes 5 5 6 5 7 28

5 Edible tableware 3 4 5 5 7 24

6 Establish the official certification environmental friendly companies 4 5 6 6 7 28

7 Print environmental slogan(it is about the phenomenon of the current environment; it includes some amazing and not well-known data which illustrates the severity of the environment) 4 7 7 5 4 27

8 Use degradable materials to produce express boxes 5 4 5 6 8 28

 [Evaluation](#)

Make an Action Plan

1. Results of advance users' survey

The motivation (sanitation & good-looking) and acceptable premium (2-3yuan) of packaging are the keys to our environmental-friendly lunchbox' s design.

2. Design concepts

2.1 Use collapsible clapboards to prevent excess packaging

We designed boxes with two foldable clapboards to separate different dishes. The producers can also choose to divide the box into the quantity they desire according to the demand. For example, when both of the clapboards are folded in the middle of the box, which separates the box into two parts. But if they need more space, they can unfold the clapboards to form three or four parts.

The total volume of the box is 1180 ml and the normal size of the rice or each dish in the set meal is 250 ml. For the original box that only contains one layer to separate only one dishes from the rice, one box can only hold one dishes and rice. The volume utilized in each box is only 500 ml out of 1180 ml and it will require two boxes the hold the meal. But if the producers choose to use our boxes, it only requires one box and the volume utilized in the box is 1000 ml out of 1180 ml.

2.2 Buckle design

We design two buckles on two opposite sides of boxes and use a rope to pass through all the buckles on every layer of the box. Tie a knot on the top of the boxes so that the users can directly pick up that knot. The height of our container is 6cm, the length of the side is 13cm, the lateral sides is 78cm², and bottom sides is 169cm². Our design can reduce at least 481cm² plastic for one layer of one box, and 312cm² for every added layer, which largely reduces the pollution of plastic.

2.3 Upper and Lower Nested Structure

Our product can significantly reduce the surface area needed. The bottom of the upper box can also serve as the cover of the underlying box.

The dimension of our box is height 6cm, length13cm, width13cm. By composing two small boxes, we can also get a volume of 1014 square cm², which is close to that of the common lunchbox. The total surface area of our product is 650 square

cm². The average surface area of the traditional lunchbox is 790 square cm². Thus, we can save 18 percent of the total surface area, reducing the package needed.

2.4 Biologically degradable material

Our lunchbox is made of kraft paper produced from chemical pulp, plant fiber, wheat straw, and rice hull. Kraft paper is non-toxic, tasteless, can be biologically degraded in soil. Also, replacing plastic box with kraft paper, the production cost and the production period of the package can be reduced by 24.5 percent, according to the economist.

2.5 Design interesting patterns outside or inside boxes and noticeable slogans.

2.5.1

We design cute patterns or paintings on the surface of one side of the boxes, and each box has a different but essential pattern. When consumers stack up to three or two boxes together, they can see the whole pattern like a tree or other intriguing patterns.

Rationalization of packaging design patterns can give consumers in the use of the process of bringing a happy mood, conducive to the occurrence of the second purchase behavior.

2.5.2

We design attractive patterns on the inside bottom of boxes. When consumers eat up all the food inside the boxes, they can see interesting patterns. In this way, the design can promote consumers to eat up all food. Also, Companies can set a reward mechanism that consumers can take a picture of the bottom of the box and when they collect a certain number of pictures, companies can give a preferential price for their next consumption.

2.5.2

Put well-marked slogans on the surface of the box. The slogans on the boxes can encourage consumers to be aware of the environmental issue on the Earth and protect the environment by reducing their use of plastic and so on. For example, we can print slogans like, "Well, now we can find micro-plastics in our bodies" , "More than 5 trillion pieces of plastic are floating in the world's oceans, weighing 269, 000 tons" .

3. Promotion plan from different stakeholders

3.1.Government

3.1.1 Ways of contact

- Email of Shenzhen Environmental Protection Bureau : jls@meeb.sz.gov.cn
- Email of Shenzhen Government : webmaster@sz.gov.cn

3.1.2 Content of promotion

- Improve environmental consciousness of people

Government has responsibility to increase people's knowledge in specific area. For example, the knowledges and consciousnesses of protecting environment. In this design, the slogan in box can be a source of environmental knowledge for users.

- Regulate and control economy

Negative consumption externality is the extra cost on society caused by consumption of goods, which leads to deadweight loss and allocative inefficiency of resources, slowing economic growth

For government, reducing this externality is its duty.

- Be the model of people

Government can be the environmentalism model for people so that people have less willingness in consuming goods causing negative externality.

If the government subsidies this design, the government can perform three functions mentioned above.

3.2 Consumers

3.2.1 Ways of popularizing

1)Online Action:

- Cooperate with other organizations

We will negotiate with some environmental protecting NGOs (eg: GoZeroWaste, CWCA) and utilize their popularity to propagandize our lunchbox's design by posting introduction article in their media platformO (eg:WeChat Official Account and website)

- Advertise on Short-Video Media Platform

We will post the creative videos on popular short-video media platform(eg: Tik-Tok and Kuaishou) to prompt the product.

2)Offline Action:

- We will attends fairs with the themes of environmental protection to introduce product and provide trial product, which can receive peers' advices

3.2.2 Content of promotion

- A reward mechanism (users can take the photos of printing pattern in the bottom of boxes and send to a platform to exchange coupons and gifts) to

stimulate the consumers' willingness of using this design.

-Printed attractive patterns on the wall of boxes to increase the enjoyment of usage.

-Printed warning slogans to increase users' environmental knowledges.

3.3 Producers

3.3.1 Ways of prompting

-We will contact with some local lunch box factories, and use our SWOT analysis and cost-benefit analysis to show the long-term benefits of this design.

3.3.2 Content of promotion

-The design of box is made up of only one part (collapsible clipboard are on the same paperboard with box bodies and it can be tore from paperboard) so that it can specialize in producing one things, which improve the efficiency.

-Since the designed boxes are adjustable in size, the producers can fit in the demand of more consumers with one kind of productive template.

4. Innovation in the solutions of problem

4.1 Improve the sustainability of product containers

Take the calico bag as an example. The usage of calico prolongs the service life of the containers from carrying the goods to keeping the goods. This design improves the sustainability of the product containers and eliminates the extra cost on keeping goods.

4.2 Reduce the energy cost of recycling

The process of recycling the tin-foil is easy: the tin-foil paper can be compressed easily and does not release toxic substance during the process of recycling. As a result, fewer costs in money and labor are needed in the transportation and recycle process.

 [Design sketch](#)

Prototype and Test

| Feedbacks learnt from users

172 people have involved in the survey in quest of consumers' acceptance towards our eco-friendly delivery boxes. The people of this survey are from different ages, such as students, parents, and teachers, proving the survey's statistical reliability to a certain degree.

1. Quantitative feedback

1.1 80.65% of the respondents consider that the waste of the delivery boxes will be disposed with other garbage. Only 16.13% of them think the waste will be recycled.

1.2 76.16% of the respondents are willing to use the products which can relieve the environmental contamination. Other 16.28% say they will adopt the products based on the price.

1.3 Up to 90% of the respondents think the structure (using new materials, buckle design-installing handles and adapting compaction) will not affect their eating habit.

1.4 89% of the respondents consider that the upper and lower nested structure will not affect their eating habit.

1.5 65.12% of the respondents think the patterns on the lunchboxes which set the reward mechanism will attract them from choosing the product.

1.6 87.21% of the respondents agree that the slogans indicating the seriousness of the pollution can improve their environmental awareness.

1.7 After viewing the prototype of our products, 59.88% of the respondents agree to use our product. Only 3.49% of them disagree with us. The rest of them, 36.63%, say they will use our product if the price can be acceptable.

2. Qualitative feedback

2.1 Some respondents think the papery box can't contain liquid or hot soup and easy to break.

2.2 Some respondents consider that the patterns may not that attractive to them.

2.3 One respondent regards the slogans as an important psychological factor so they encourage us to spend more time to design the slogans.

2.4 One respondent suggests that we can build business cooperation with other network platforms to popularize our new-designed boxes.

 [research](#)

| Improvement for next iteration

1. Some respondents concerned that the structure may be easily crushed. We have re-tested our design boxes and find out that boxes' tenacity has no problem.
2. In response to respondents' sanitary concerns about our overlaying design, particularly oil from nether boxes may shed upon the bottom of upper boxes, we put a layer of silver paper, which can be recycled easily, to insulate oil spilling.
3. Some respondents reported that the slogans printed on the boxes are not attractive enough for the public, we can make slogans that present timely pollution data or assemble traditional Chinese idioms
4. Some respondents reported that the patterns printed on the boxes are not attractive enough for the public, we can print down the matrix codes, which becomes a kind of common culture in modern life, that contains reward mechanisms to attract public attention.
5. One respondent suggests that we can build business cooperation with other network platforms to popularize our new-designed boxes, so we plan to negotiate with Wechat and Alipay about gaining credits of a public welfare activity called Ant Forest by buying our take-out boxes. In the Ant Forest activity, credits can buy the opportunity to plant a tree in reality.

Appendix

| Presentation File

 [Solve the problem of delivery food\(Waimai\)'s over-packaging with new package design](#)

| Team Credits

陈楷沅 Chen Kaiyuan : I am in charge of our evaluation of our product. Like analysis the score from the questionnaire or test the feasibility of our product. I also take part in the design of some detail of our product. I am in charge of our evaluation of our product. Like analysis the score from the questionnaire or test the feasibility of our product. I also take part in the design of some detail of our product.

段志杰 Duan Zhijie : 我负责的部分是写criteria , 和提供餐盒的设计 , 此外我还购买了材料。 I wrote the criteria and designed the inner structure of our lunchbox. Besides, I bought the environmental material needed.

莫亦琳 Mo Yilin: I provided ideas to design our lunchbox and wrote the "generate solutions" part.

李欣妍 Li Xinyan : Li Xinyan is responsible for writing the design concept part, organizes meetings and takes note during meetings. Li Xinyan also integrates materials and the presentation powerpoint.

黄骏飞 Junfei Huang: I am responsible for the promotion plan for two stakeholders, consumers and producers.

高慧琳 Huilin Gao: I am responsible for writing Action Plan part, organizing and writing promotion plan, making questionnaires , providing several detailed ideas for our design , and making preliminary powerpoint.

梁厚鑫 Houxin Liang : In this project, I am in charge of the challenges and the prototype and test. First, We discussed with my group members and found out the challenges that we faced. After doing the research and design, I integrated the data and finished the part of the prototype and test. It is a good team and everyone in it is important.

Judge Comments

" General comment: Your project addresses a very important problem and is very concise from the identification of the challenges and root causes, to the implementation and refinement of a solution. This project is very well done!
Comment on the report: Your "challenges" section reviews a number of problems related to package waste which shows that you did in-depth research on the matter. Root causes then are narrowed down to three main causes, and the solutions relate back again to a variety of approaches that could be taken to overcome the package waste problem related to take-out. These solutions are then assessed against criteria that want to gauge the feasibility of the innovation. Designing of food containers is then seen as the most promising solution and the action plan then goes from the design of a prototype to strategies of how to best promote the prototype among different stakeholders. Both qualitative and quantitative research is carried out to gain feedback, and from this, a variety of steps are derived to improve the prototype and its marketing. Your research is very concise and thoroughly implemented.
Comment on the presentation: The presentation slides are very well structured and presented.

"

" note - On average, under normal environmental conditions demoposition of most plastic bag takes more than a 100 years. Please refer/include sources with these numbers. Privacy, as you have listed here, is only a very small % of the actual problem "

" Low cost items in the food sector are amongst the toughest to tackle from a waste management and environment perspective. The team has done a great job of tackling this complex challenge. Congrats on using iterative feedback to improve your prototype.

I have some suggestions and wish you the best in hopefully taking this further forward.

(i) As I mentioned, packaging for prepared food is among the most complex sections to tackle. Do not forget to integrate findings from restaurant and store owners into your finding. I do not see enough representation from them in the survey responses. Their answers are likely to give you different constraints and different design ideas. Quality and sanitation are two things that very few people will willingly sacrifice. As an example, cardboard boxes (at a slightly higher price than Styrofoam) never became really popular because it just didn' t have the same ability to hold liquids. Adding a layer of tinfoil to that significantly reduces its

compostability as silver would need to be separated (most consumers do not do that)

(ii) The food sector is heavily regulated by the government in most countries from a human health perspective. Bear in mind that any design used for food packaging is likely to require rigorous testing for the type of chemicals/materials that went into design.

(iii) You might have been using plastic interchangeably with other types of packaging materials as part of your report. I suggest clarifying this well when you discuss the project.

Good luck!

"