



Sustainable Design of Takeout Product Service System of Milk Tea Drinks in Chinese University Campus Based on KANO Model

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Abstract. While milk tea drinks have gradually become the trend of consumption among young people, the consumption of disposable tableware such as milk tea cups and straws has brought great pressure to the environment. This study is aimed at Chinese university campus user groups. We first set up the product service system diagram, and clarified the relationships and interactions among the various stakeholders in the system. Then, we created the service blueprint and user journey, and used the Kano model to comb the user needs and the touch points of product and service system. Finally, we found the opportunities to optimize the system and explored the sustainable construction of the takeout product service system of milk tea drinks in Chinese university campus.

Keywords: Takeout product service system of milk tea drinks · Kano · Service blueprint · User journey · Sustainable

1 Subject Research Background

1.1 Demand and Market for Milk Tea

As a beverage for entertainment and leisure consumption, milk tea is popular in the market, especially with young consumers, for its fashionable and fast characteristics. In 2000, there were less than 1,000 milk tea companies across the country, and it has grown to more than 140,000 now. People's pursuit of milk tea has also been upgraded from the mainstream and fashion in restaurants and cafes to a composite experience of space, aesthetics, culture, and information exchange [1].

1.2 Consumption of Disposable Tableware of Milk Tea Products

The huge demand for milk tea brings about the consumption of a large number of disposable milk tea tableware, especially the consumption of milk tea cups. At present, the disposable plastic cups used in the market mainly include PE cup, PP cup and PET

cup, while the more environmentally friendly milk tea shop will use paper cup. But in fact, the separation of the plastic coating and the paper cup, the removal of the ink and beverage residue on the paper cup, all bring great problems to the recycling of the paper cup. In addition, young people now drink milk tea more inclined to take out, resulting in a lot of milk tea cups cannot be found. Therefore, we will focus on the milk tea shops in Chinese universities and apply the sustainable product service system to it [2].

2 Research on the Status of the Existing Takeout Product Service System of Milk Tea Drinks

2.1 Product Service System

According to the general operating mode of the existing milk tea shop in the university, the following product service system diagram has been combed out [3].

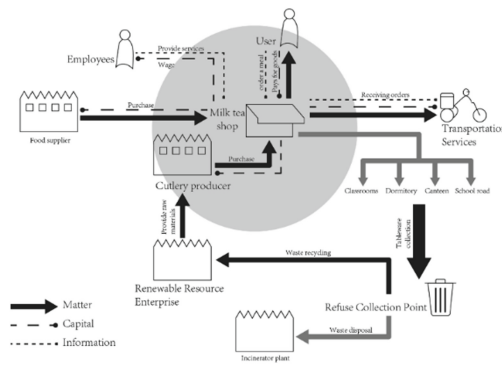


Fig. 1. Product service system diagram

Figure 1 clearly shows the relationship between various stakeholders, each link of the service, and the flow of material, capital, information and labor within it. Among them, the core stakeholders are milk tea shops, users and tableware producers.

2.2 Service Blueprint Based on User Journey Map

The service blueprint can clearly show the service process in the system, and visualize the emotions, satisfaction, expectations of users in each node of the service process, as well as the interaction of each component in the system [4]. We combined the user journey map and service blueprint to analyze the process of milk tea drinks industry providing services to consumers on university campuses.

Figure 2 and Fig. 3 are the service blueprints of consumers under online and offline ordering modes respectively. Figure 2 mainly shows that the waiting time is too long, the packaging quality and appearance affect the experience sense, and the post-meal waste disposal is inconvenient. In Fig. 3, the queuing time is too long, the environment of the



Stages	Preparation stage		Dining stage		Post-dine stage
Physical contact	Mobile phones and other devices with ordering function		Catering & mobile phone	Catering	Waste tableware
User journey	Ordering by mobile phone	Waiting for meal	Take meal	Drinking	Handling disposable tableware
Problems	-Too many choices Quality is uncertain	-The waiting time is too long The quality of beverage is damaged during transportation	-There is a situation of someone else's drink by mistake Multiple plastic bags and disposable cups are used	-The quality of tableware affects the drinking experience	-Neither the cutlery nor the packaging can be reused Unclear waste classification
The phase that causes waste					
Opportunities	-The platform provides real user quality evaluation data	-Improve the production process -The shopkeeper contacted the rider in advance	-Design distinct marks on the package -Recycle cups -Find alternatives to packaging	-Explore more comfortable tableware to use	-Prepare your own tableware -Form a tableware recycling system
Front-end interaction	-Goods are displayed on the platform	-Shows whether the rider has received an order -Show the rider's position	-Call / SMS for meal		-The cleaners came to collect the rubbish
Backstage support	-The merchant accepts the order -Store updates product information	-Making drinks -The rider went to the store to pick up the meal -Riders deliver meals	-The rider informs the customer to pick up the meal -The rider delivers the meal to the designated place		-Incineration of non-recyclable waste -The recyclable garbage is sent to a special resource recycling park for recycling
Tools	-Mobile phones -Booking service platform		-Special electric vehicle for meal delivery -Setting of takeaway store	-Tableware	-Recycling bins -Plastic recycling technology and equipment

Fig. 2. Online ordering mode





Stages	Preparation stage		Dining stage		Post-dine stage	
Physical contact	Ordering machine / reception	Tableware	Catering	Tableware & Packaging	Waste tableware	
User journey	Line up to order on site	Take meals	1. Eat in	2. Take it out to drink	1. Handling disposable tableware	
Problems	-There are many people in the queue and the waiting time is uncertain		-The tableware is disposable	-The drink was contaminated by the dust from the street -The package is not sealed.	1. -The clerk threw it directly into the garbage can -Some stores will recycle for secondary use, but the cost is high.	2. -Users throw it into the nearby garbage can
The phase that causes waste						
Opportunities	-Show the waiting time		-Reusable tableware can be provided	-Redesign the cup -Reduce the drink's exposure to the atmosphere	-Design a cleaner and more transparent recycling system -Limit the distribution range of such waste to facilitate recycling	
Front-end interaction	-Place orders at the self-service machine -The clerk takes orders for customers	-The clerk prompted for your meal	-The store provides a relatively comfortable environment	-Provide disposable tableware -Provide disposable plastic or paper bags	-The clerk threw it away	-The cleaner cleared away the rubbish
Backstage support	-Making meal	-Food preparation information link to the applet	-Shop assistants check up regularly to ensure the hygiene and comfort of the dining area		-Incineration of non-recyclable waste -The recyclable garbage is sent to a special resource recycling park	
Tools	-Self-service machines	-Applet	-Sanitary tableware	-Tableware	-Garbage cans for sorting and recycling -Plastic recycling technology and equipment	

Fig. 3. Offline ordering mode

store needs to be improved, and the sealing, portability and pollution prevention of the packaging are not good enough.

Finally, we conducted a horizontal analysis of the service blueprint, and it was found that the waste mainly occurred in the dining stage and post dine stage. In the dining stage, customers were provided with disposable and non-recyclable tableware, whether

they choose eat-in or take-out service, which leads to the consumption and waste of resources. In the post dine stage, the imperfect garbage sorting and recycling system and people's weak awareness of environmental protection have brought greater challenges to sustainable development.

2.3 KANO Model

Overview of KANO Model. Professor Noriaki Kano, from Tokyo University of Technology, established the KANO model for the first time in 1982, which can be used to analyze the impact of user demand on user satisfaction and present the relationship between user satisfaction and product quality. However, this model is only an auxiliary tool to study customer needs, providing theoretical guidance for product development and design, and cannot measure user satisfaction. It divides user requirements into five divisions, namely, basic needs, performance needs, attractions, indifference, and reverse needs [5] (Fig. 4).

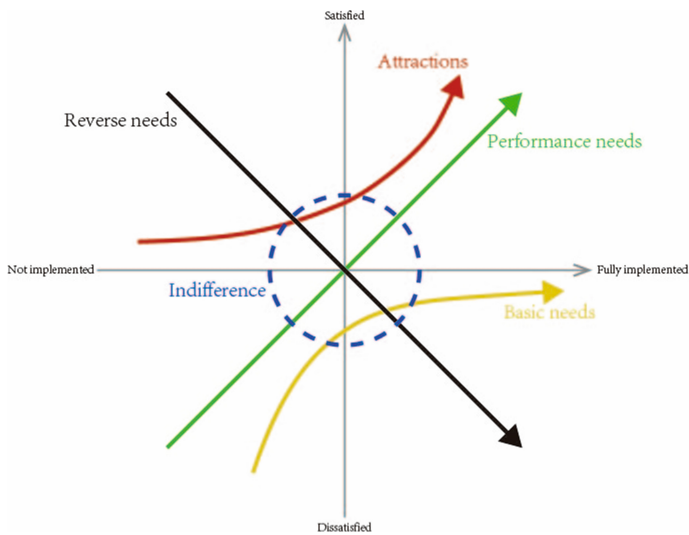


Fig. 4. Five divisions in KANO's model

User Requirements Analysis Based on KANO Model. Through literature review, observation, interview and summary of the service blueprint, we extracted the possible user needs and designed the questionnaire "Requirements of Milk Tea Drinks Consumption on Campus". Refers to the classified comparison table of Kano evaluation results, the questionnaire sets forward and reverse questions for each user needs to measure the user's response to the presence or absence of a quality feature [6]. We randomly distributed 350 questionnaires to different universities in China, and finally collected 317 valid questionnaires. In order to verify the credibility of the questionnaires, we divided all Chinese universities into three categories: technical university, undergraduate university and graduate university. Then, we randomly selected three samples from each

university, and analyzed the information of the samples. As can be seen from Table 1, the sample distribution is relatively uniform, indicating that the questionnaires have a certain credibility (Tables 2, 3 and 4).

Table 1. AHP table

People		P1	P2	P3	P4	P5	P6	P7	P8	P9
Colleges	Technical university	✓	✓	✓						
	Undergraduate university							✓	✓	✓
	Graduate university				✓	✓	✓			
Activities	Buy milk tea drinks online	✓	✓						✓	
	Go to the shop to buy milk tea drinks			✓		✓	✓	✓		✓
	Eat cakes from the milk tea shop				✓					
Usage scenarios	Canteen							✓		
	Dormitory								✓	✓
	On the campus road						✓			
	Classroom	✓	✓							
	Milk tea shop			✓	✓					
	Other places					✓				

Table 2. KANO evaluation result classification comparison table

Product/service demand	Degree	Negative (without this function)				
		I like it so much	It should be so	It doesn't matter	Accept reluctantly	I don't like it very much
Forward (with this function)	I like it so much	Q	A	A	A	O
	It should be so	R	I	I	I	M
	It doesn't matter	R	I	I	I	M
	Accept reluctantly	R	I	I	I	M
	I don't like it very much	R	R	R	R	Q

Table 3. Form of the questionnaire

Need	Degree				
	I like it so much	It should be so	It doesn't matter	Accept reluctantly	I don't like it very much
If the requirement A is met, what is your satisfaction?					
If the requirement A is not met, what is your satisfaction?					

In 1996, Berger proposed the Better-Worse coefficient. Quantify the user needs and user satisfaction from the effective questionnaires through the Better-Worse calculation formula. Put each need into the Better-Worse tetragonal potential coefficient analysis chart for data analysis and classification according to the absolute value of the Better-Worse coefficient.

$$\text{Better/SI} = (A + O)/(A + O + M + I) \tag{1}$$

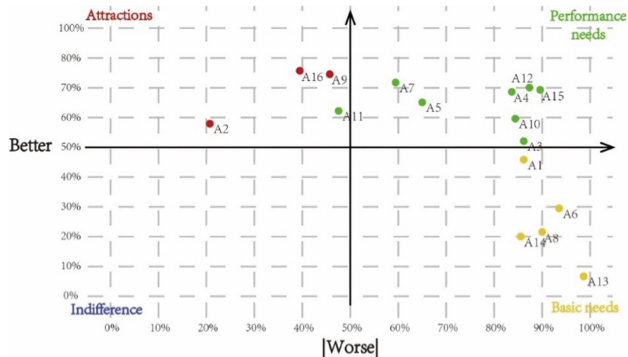
$$\text{Worse/DSI} = -1 * (O + M)/(A + O + M + I) \tag{2}$$

SI indicates the degree of user satisfaction when the requirement is met, and its value is usually positive. The closer it is to 1, the greater the impact on user satisfaction will be. |DSI| indicates the degree of dissatisfaction of the user when the requirement is not met, its value is negative, usually the closer to 1, the greater the influence on user dissatisfaction. $SI > 0.5 \& DSI > 0.5$ is Performance needs; $SI > 0.5 \& DSI < 0.5$ is Attractions; $SI < 0.5 \& DSI < 0.5$ is Indifference; $SI < 0.5 \& DSI > 0.5$ is Basic needs [7].

In product optimization, the priority order of similar requirements is generally Basic needs > Performance needs > Attractions > Indifference. For similar requirements, the higher the SI, the higher the priority. Therefore, the overall priority order of user needs in the takeout product service system of milk tea drinks in Chinese university campus is: $A1 > A6 > A8 > A14 > A13 > A7 > A12 > A15 > A4 > A5 > A10 > A3 > A16 > A9 > A11 > A2$. We should ensure that Basic needs are met, Performance needs are satisfied as far as possible and appropriately meet the Attractions according to the business situation of the milk tea shop (Fig. 5).

Table 4. Analysis and category of user requirements

User demand	Num	A	O	M	I	R	Q	SI	IDSII	Classification
Meal delivery reminder	A1	29	119	156	13	0	0	0.467	0.868	M
Personalized label on the cup	A2	151	33	35	98	0	0	0.580	0.215	A
Delivery on time	A3	29	143	130	15	0	0	0.523	0.861	O
The drink is of good quality	A4	42	174	93	8	0	0	0.681	0.842	O
The drink will not be polluted during drinking	A5	76	130	81	30	0	0	0.650	0.666	O
Easy to carry	A6	2	91	206	18	0	0	0.293	0.937	M
Shop environment	A7	99	131	56	31	0	0	0.726	0.590	O
Heat preservation	A8	16	55	233	13	0	0	0.224	0.909	M
Nice-looking package	A9	148	85	63	21	0	0	0.735	0.467	A
The package does not affect the taste	A10	11	179	88	39	0	0	0.599	0.842	O
Drinks in moderation	A11	134	64	88	31	0	0	0.625	0.479	A
It's not easy to leak	A12	21	198	79	29	0	0	0.691	0.874	O
Safe material	A13	2	21	289	5	0	0	0.073	0.978	M
Easy to hold in one hand	A14	19	45	226	27	0	0	0.202	0.855	M
The cup is insulated	A15	15	203	80	19	0	0	0.688	0.893	O
It can be customized according to customers	A16	177	69	57	14	0	0	0.766	0.397	A

**Fig. 5.** Better-worse tetragonal potential coefficient analysis chart

3 Design Concepts About Sustainability

3.1 Sustainable Development Theory

In 2007, Munasinghe put forward the theory of “Sustainable Development Triangle” [8], which understands Sustainable Development from three dimensions: economy, environment and society. At the economic level, sustainable development implies a strong resilience of the economic system. On the environmental level, emphasis is placed on maintaining the resilience of the ecosystem. At the social level, ethics and fairness should be emphasized to enhance the vitality of social and cultural systems.

3.2 Sustainable Development Applications

Traditional products mostly focus on the function, appearance and durability of the product, but the requirements of sustainable development of the product will pay more attention to energy consumption, impact on the environment and the end-of-product life cycle management [9]. The key to applying sustainable development to the system is to clarify the interaction between various stakeholders in the system and transform the products sold into sales experience and make users and enterprises reach a consensus and tend to sustainable development consciously.

According to the system diagram analyzed above, we try to nest the interests of each member into the service process to make their behavior more sustainable.

3.3 Sustainable Design Concepts

Based on the above analyses, we decided to use reusable cups made of wheat straw and straw made of disposable degradable straw, and proposed three design concepts (Fig. 6):

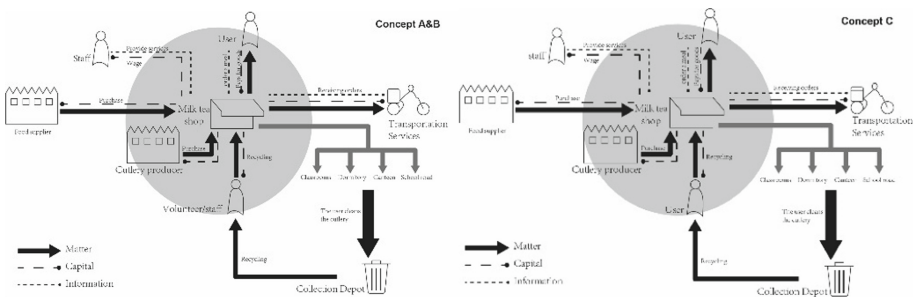


Fig. 6. System diagram of concept A, B and C

- a. Milk tea shop staff or volunteers to clean recycled tableware.
- b. Set up automatic cleaning machines. The staff only needs to go to the cleaning machines regularly to retrieve the tableware to the store.

- c. After drinking, the user cleans the cup and places it at the nearby recycling point. Each user must place a clean cup in it to get a new one. Users who bring cups to the shop can enjoy a discount.

The system diagrams of concept A and B are structurally similar. However, the automatic cleaning machine in concept B requires the investment of the milk tea shop, which is not economical. Concept C encourages users to recycle tableware through store preferential treatment, and then makes up for the reduced profit of it with reducing tableware consumption, so as to balance the interests of merchants and consumers. In conclusion, concept C seems more in line with the requirements of sustainability.

4 Design Practice

4.1 Determination of the Concept of the Beverage Cup



Fig. 7. Final design of the cup

The final design of the cup is determined according to the previous researches. Its shape and color are for reference only. The cup is made of insulated straw material that meets A8, A13, A10 and A15. The cups are designed in two sizes. Users can choose different sizes of cups according to their own needs, which meets A11. The small cup capacity is 350ml, the maximum diameter is 80 mm, the minimum diameter is 60 mm; The large cup has a capacity of 500 ml, with a maximum diameter of 90 mm and a minimum diameter of 55 mm. Suitable for most adults with one hand grip, meets A14. The top cover of the cup is opened in an upward way, which is convenient for users to drink milk tea while walking. After drinking, the top cover can be closed to prevent air pollution. They meet the requirements of A6, A5 and A12. Sliders on the cover provide a customized service for temperature and sweetness, meets A16 (Fig. 7).

4.2 Service Process Design Practice

To comply with the development of the data era and the trend of online operation, we will implant WeChat applet into the product service system. It will serve as a tool for verifying the identity in the process of ordering food and recycling to provide users with more convenient services. In the process of ordering meals, the applet provides functions such as selecting commodities, online payment, displaying the waiting time, reminding to take meals, etc. In the process of recycling, users can take and place the cups by identifying the QR code on the machine to complete identity verification. The user who chooses “Bring my own tableware” in the applet can get the discount.

5 Summary and Prospect

In this paper, system diagram, service blueprint, Kano model and other tools are used to study the sustainability and optimal design the takeout product service system of milk tea drinks in Chinese university campus. The final design meets the requirements of sustainable development from three dimensions: economic, social and environmental. On the economic level, the recycling of milk tea cups reduces the cost of milk tea products, increases the profit of milk tea shops and reduces consumer spending. On a social level, the design of milk tea cup makes it easier for the clerks to work. The customer's involvement in the recycling process raises awareness of sustainability and eases the work of the shop assistants. At the environmental level, giving up the use of disposable and non-recyclable tableware reduces the consumption and waste of resources and eases the environmental burden. By adjusting the interaction of the participants in the system, the design can arouse their enthusiasm to participate in environmental protection and provide a new idea for building a virtuous cycle of sustainable system. However, the application scope of this system is limited to the campus. If it is to be applied to the whole society, the sharing of drinks and cups can be achieved by referring to the form of shared bikes.

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