Demand Research of Airport Chairs Based on Kano/Function Behavior Structure Model

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To improve the use experience of airport chairs, this study adopted morphological analysis to conduct systematic deconstruction, analysis, and statistics on the modeling features of existing airport chairs. The KJ method was used to determine the design requirements of airport chairs. The study combined the Kano model to classify the functional attributes and prioritize the requirements, and it merged the module and demand analysis to build a Function-Behavior-Structure mapping model. In this way, passengers' demand for airport chairs can be clearly defined, and airport chair configuration planning can be carried out according to the difference in preferences. Further, different module combination schemes can be formed to improve the functional allocation efficiency of airport chairs, optimize the overall service quality of airports, and provide some basis and reference for the future design of airport chairs.

DOI: 10.15376/biores.19.4.8443-8458

Keywords: Airport chair; Modularization; Demand analysis; Kano model; FBS model

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INTRODUCTION

With the rapid development of the global aviation industry, the number of civil airports is increasing year by year, and the economic investment in airport facilities is growing in various countries. As modern transportation hubs, airports not only address a large number of passengers' transit and waiting needs, but also represent the image and service level of a city. The quality of the design of airport chairs is critical as a key public facility. High-quality airport chair design not only meets travelers' resting needs, but also affects their overall experience and satisfaction. As an important indicator for assessing the construction of public service infrastructure and the development of modern cities, the design of airport chairs reflects the modernization level and humanistic care of a city.

Up to this point, research on airport chairs primarily has focused on three main areas: waiting psychology, product functionality, and spatial utilization. Research on waiting psychology aims to understand users' internal experiences and emotional needs during waiting periods. Comfortable lounging facilities are effective in slowing down the deterioration of users' waiting moods, which varies significantly among users of different ages (Ohmori *et al*. 2008). In addition to amenities, the service and environment during the waiting process also affect the perception of waiting time (Kim *et al*. 2020). On the basis of psycho-emotional research, scholars have further explored user behaviour to improve the functional design of airport chairs, *i.e.*, exploring travelers' needs to enhance the functionality of airport chairs through different research methods. Adopting a post-use assessment approach to observe factors such as travelers' gender, seat selection, number of companions, baggage, utilization rate, and behaviour can effectively improve the use of

airport chairs in terms of space, placement, communicativeness, and privacy (Zheng 2014). After designing chairs with different layouts for various types of activities in airports, the user's experience and emotions can be explored using 3D visualization and VR technology to obtain an evaluation of the chair design (Kefalidou *et al*. 2019). Hierarchical analysis and entropy value methods help to comprehensively analyse the demand for waiting chairs from the perspectives of the user and the producer, and to evaluate the corresponding design and to validation (Wo *et al*. 2022). The use of scenario method is used to observe and analyse the use process of waiting chairs. This method can accurately sort out the user's use of pain points and respond to the functional design (Wang and Wang 2023). The research on the use space of airport seats mainly focuses on environmental services and space atmosphere. The research method from space to individual can effectively grasp the scene effect and optimize the use experience. The matching effect between facilities is the basis for improving environmental services, and through the design of airport chairs and information display layout, the simulation of the matching effect of their arrangement direction and display helps to improve the effect of airport information services (Milbredt *et al*. 2017). In addition, the service factors of the overall environment in the waiting area, including queuing time in the airport, cleanliness, seating area, signs and a variety of other factors are the focus in relation to the quality of service in airports (Pholsook *et al*. 2024). Focusing on the presentation of cultural elements is an important factor in strengthening the spatial atmosphere, and the cultural experience of the place can be extracted from the elements of folk life and historical works to strengthen the interconnection of spatial function and airport chair design (Yang *et al*. 2022).

The existing research has achieved some results in spatial analysis and function mining; however, it still lacks in-depth research on the composition form of the airport chair itself, which leads to unreasonable functional response and limits the design optimization. The biggest difference between the airport chair and other public seats such as the auditorium chair is the discrepancy in the use of the scene. The particularity of the airport waiting area means that the airport chair requires a more targeted design. This study adopted morphological analysis, Kano model, and FBS (Function-Behavior-Structure) model integration to systematically analyze the constituent modules and user requirements of airport chairs and proposes modular configuration strategies. Flexible and diversified configuration strategies can provide scientific basis and reference for the design of airport chairs in the future, so as to optimize the overall service quality of the airport and improve the waiting experience of airport passengers.

EXPERIMENTAL

Technical Approach

Morphological analysis method

Morphological analysis, pioneered by Professor Zwicky of the California Institute of Technology, is a systematic approach to developing new product solutions. It involves deep analysis of the core components of a research object or problem. By dissecting these components individually and using mathematical principles of permutation and combination, a morphology matrix is constructed. This matrix generates diverse solution combinations, aiding in the evaluation and selection process (Wang *et al*. 2014). Today, it has been applied to many fields such as technology forecasting, product design, and risk management. In product design, morphological analysis is mainly used to conduct a quick

and regular combing of its shape and structure (Wang *et al*. 2021). Applying it to airport chair design enables a comprehensive understanding of their features.

Kano model

The Kano model, developed by Japanese quality management expert Professor Noriaki Kano in 1984, is a valuable tool for addressing user needs and analyzing problems quantitatively (Kano 1984). It highlights the non-linear relationship between product performance and user satisfaction, guiding product design and service optimization. The model categorizes user needs into five types: Must-have, One-dimensional, Attractive, Indifferent, and Questionable attributes, based on their impact on user satisfaction (Hartono and Chuan 2011). To apply the Kano model, data on user preferences is collected using a dual-factor questionnaire; then it is categorized using the Kano evaluation form. Kano models have been widely used in various design fields, such as architecture, product and service design. Applying the Kano model to understand passengers' preferences for airport chairs in waiting areas can effectively inform the functional design of these chairs.

FBS model

The FBS model is a design theoretical framework concerning Function-Behavior-Structure (Gero 2000). It illustrates the sequential mapping process among the domains of function, behavior, and structure in design. The FBS model initially characterizes the design problem of a product as function F. It then analyzes design principles that fulfill this function based on specific application examples B. Finally, by utilizing the mapping relationship between behavior and structure, it obtains the physical structure S that realizes these principles. The FBS model transforms abstract design principles into tangible, operational physical structures, thereby achieving the transformation from functional requirements to physical structures and providing a more efficient analysis method for the research of product modules (Beek *et al*. 2010).

Research Framework

Airport chairs are furniture facilities with strong functionality. The use of morphological analysis to deconstruct them in terms of constituent modules allows for the dismantling of complex systems into smaller, more manageable parts and facilitates the understanding of functional performance (Zhao *et al*. 2021). On this basis, the Kano model is used to filter out the functional requirements that need to be prioritized, and the FBS model is built to map the functions to the modules, so that the key requirements and the module forms correspond one by one, and a more logical scheme is provided for the selection and use of the modules.

The research framework is shown in Fig. 1, and the specific process is as follows:

Step 1: Collect existing airport chair cases as research samples, make preliminary module division of airport chairs based on components, and deconstruct the features of modules through morphological analysis;

Step 2: Discover the airport chair design requirements through interviews and literature research and form a Kano model through questionnaire survey results to categorize and prioritize the functional requirements, and clarify the airport chair functional requirements that need to be responded to.

Step 3: Create a FBS mapping model to link the airport chair function with the actions of waiting passengers and develop modules that implement the behaviors.

Step 4: Based on the analysis structure of the FBS model, build a module library

of airport chairs, analyze the specific needs of the scenarios according to the different use scenarios, and call the corresponding modules from the module library to form different combinations of configuration schemes.

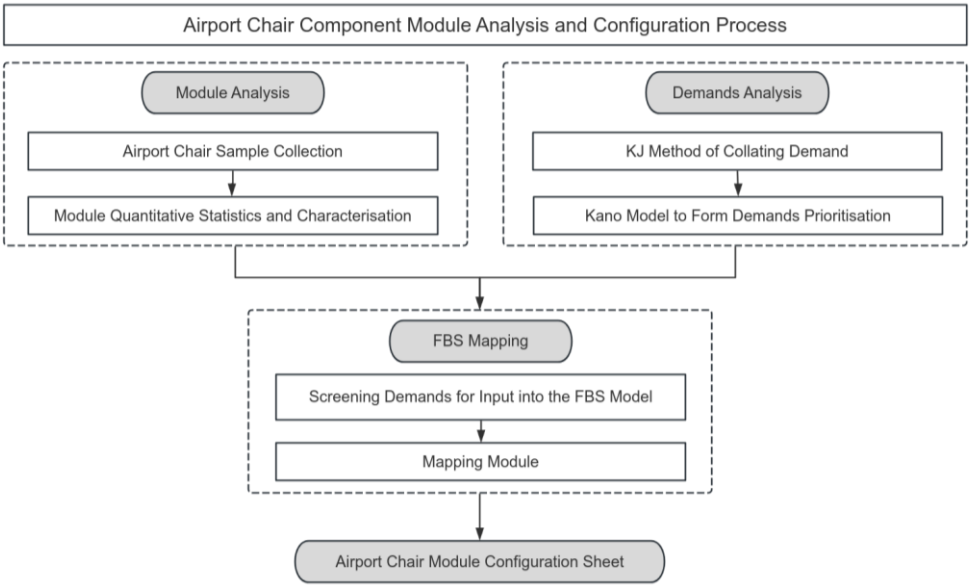

Fig. 1. Airport chair module analysis flow chart

RESULTS AND DISCUSSION

Component Module Analysis

Sample collection

According to the list of domestic public seating brands released by website Maigoo and the search results under the category of "public row chairs" in the global furniture website Archiproducts, a total of 90 cases of airport chairs at home and abroad were collected as research samples. These samples basically cover all the common features of existing airport chairs in terms of function and form.

Table 1. The Component Module Matrix of Airport Chair

Module	Form 1	Form 2	Form 3	Form 4
Seat back	One-piece	Split	No back	Recliner back
Armrest	Ring-shaped	Cantilever-shaped	Barb-shaped	T-shaped
Kickstand	Triangular	T-shaped	Door-shaped	Square-shaped
Beam	Square	Hexagonal	Triangular	Round
Shelf	Low shelf	High shelf	-	-
Cup holder	Armrest ends	-	-	-
Power supply	Independent form	Embedded form	Wireless charger	-
Partition	Front and rear partitions	Side partition	-	-

Module splitting

The airport chair can be divided into eight modules: seat back, armrest, kickstand, beam, shelf, cup holder, power supply, and partition. The morphology analysis matrix of each module is shown in Table 1.

Module statistical analysis

In the actual production and application, not all samples contain eight modules. Statistical analysis of the percentage of each module in the sample shown in Fig. 2. As can be seen from the vertical coordinate, the seat back, kickstand, and beam components were present in 100% of the listed chair modules. By contrast, some other components of the airport chair, such as armrests, shelves, power supply, cup holders, partitions, and other components, can be regarded as optional. Such components, which will be designated here as auxiliary modules, accounted for 3% to 85%, according to the actual demand for trade-offs.

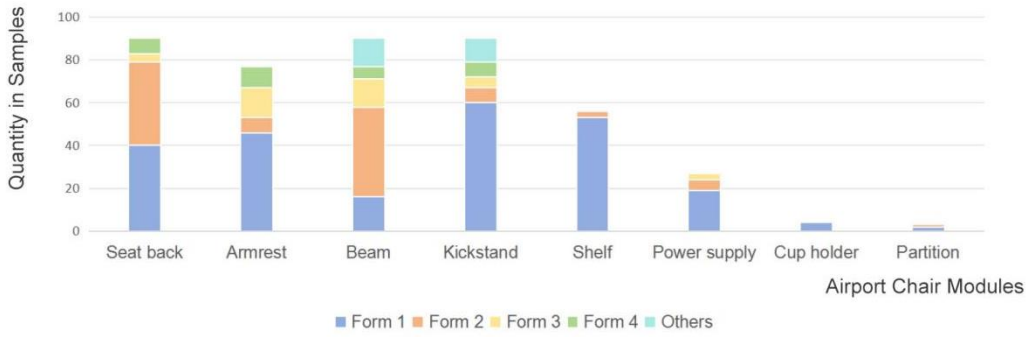

Fig. 2. Statistical chart of the number and shape proportion of airport chair modules

The necessary components of the airport chair include the seat back, kickstand, and beam, each with various forms that are crucial for design considerations. The seat back forms are categorized into four types: one-piece, split, no back, and recliner back, which accounted for 44.4%, 43.4%, 4.4%, and 7.8% of the samples. According to the performance of the function, the one-piece and split seat back, which are collectively referred to as the basic seat back, enables the rest function of the most common form. The two types of seat back quantity gap is not large, but each has its own advantages in the process. The one-piece seat back is usually made of polyurethane foam or stainless steel, which is prepared by mold at one time, thus saving the production cost and processing time. Split seat back with smaller units is a more important part of the design. It is comprised of smaller unit modules, which provides greater expansibility. The shapes of the backless and recliner backs can also be adjusted by increasing or decreasing the split seat back components, making it more convenient to add soft bags. The kickstand supports the overall weight and is the key to stability. Its modeling mainly includes triangular, T-shaped, door-shaped, and square-shaped options, among others, accounting for 66.7%, 7.8%, 5.5%, 7.8%, and 12.2% of the sample size respectively. In addition to stability, considering the stackability during transportation, the triangular kickstand occupies a higher advantage, thus becoming the most commonly used form in existing products. The beam is the structure connecting the seat back, kickstand, and armrest. It is composed of crossbar rod and decorative cover plate, mostly square, hexagonal, triangular and round as the crossbar rod cross-section shape, and accounted for 46.7%, 17.8%, 14.4%, 6.7% and 14.4% of the

sample size respectively. Cross-section shape affects the connection performance of the bracket. The polygonal cross-section can make the connecting place stick more firmly and not easily slide. Thus, the hexagonal plum blossom tube and square tube crossbar are more commonly used than the round tube.

Armrests, shelves, power supplies, cup holders, and partitions belong to the auxiliary modules of the airport chair and are relatively stable in form. The armrest is the most frequently used component in the auxiliary module, whether to use the armrest depends on the consideration of privacy and seat use, the armrest in addition to the basic function of relying on the important role of spacing, to avoid the traveler lying horizontally at the same time to bring a certain degree of privacy (Li *et al*. 2020). The ring armrests connecting the chair back and the seat surface, the overall structure of the seat is more stable, and more commonly used in the design. The relative height of the shelf can be divided into two main options: It can have the same height as the seat surface, or it can be used to place luggage and bags of a low shelf, and with the armrests of similar height, to facilitate the temporary office of the high shelf. However, the terminal is generally equipped with a special bar table in order to serve as an office. For this reason, a high table plate is not much used in airport chairs. According to the installation method and supply method, the power supply can be divided into independent power supply, embedded power supply, and wireless charging. The independent power supply can be fixed on the beam and wired with the beam tube, which is simple and flexible. The embedded power supply is integrated in the seat structure, such as the armrest, although it is conducive to maintaining the compactness and aesthetics of the overall structure, but it is slightly insufficient in flexibility. The wireless charging is convenient to use, but the probability of occurrence is low due to the high cost. There are a few samples of cup holders and screens, which are not expanded here.

The form of each module of the airport chair is mostly designed on the basis of practical functions, and there is a more obvious convergence phenomenon in the form of each module. Therefore, it is necessary to further analyze the demand, better select the appropriate module form, and broaden the possibility of module selection.

Demand Analysis

After understanding the module characteristics of airport chairs, it is essential to clarify each module's role by analyzing the functional requirements they fulfill. The Kano-FBS model was used to prioritize and analyze these functions.

Demand mining with KJ method

Before using the Kano model, the functional requirements were first sorted out through the KJ method. In the form of interviews with groups with airplane travel experience, including students going out to school, office workers on business trips, and travelers, *etc*., for the use of feelings, habits and pain points, and combined with the relevant literature research and policy, the KJ secondary demand analysis table was compiled as shown in Table 2. The second-level needs are aesthetic, functional, and safety elements; the second-level needs under aesthetic elements include color matching, styling features, brand recognition, and cultural integration; the second-level needs under functional elements include sedentary comfort, charging convenience, placement of baggage items, personal privacy, and easy to clean and maintain; and the second-level needs under security elements include sturdiness and solidity, and green environmental protection.

Table 2. Airport Chair Demand Analysis

Serial Number	Level 1 Requirements	Level 2 Requirements
a1	Aesthetic Elements	Color Harmony
a2		Styling Features
a3		Degree of Brand Recognition
a4		Degree of Cultural Integration
b1	Functional Elements	Sedentary Comfort
b2		Charging Convenience
b3		Placement of Baggage Items
b4		Personal Privacy
b5		Ability to Lie Down
b6		Easy to Clean and Maintain
c1	Security Elements	Solidity
c2		Green Environmental Protection

Classification with Kano model

To understand user satisfaction with each functional aspect of airport chairs, the detailed analysis of each indicator includes a questionnaire where each chair function is briefly described, and users provide their satisfaction ratings through two-way questions. Each question offers five response options: "like", "should be", "optional", "tolerable", and "unsatisfactory". These responses are evaluated against criteria outlined in Table 3, which categorizes indicators into five types based on user needs: Must-have (M), One-dimensional (O), Attractive (A), Indifferent (I), and Questionable (Q). These categories reflect users' satisfaction levels and preferences for various functions (Tang 2012).

Table 3. Kano Model Analysis Standard

Positive Issue	Negative Issue				
	Like	Should be	Optional	Tolerable	Unsatisfactory
Like	Q	A	A	A	O
Should be	R	I	I	I	M
Optional	R	I	I	I	M
Tolerable	R	I	I	I	M
Unsatisfactory	R	R	R	R	Q

User Satisfaction Analysis

To collect users' satisfaction with the functions of airport chairs, 70 questionnaires were issued, 2 invalid questionnaires were excluded, and a total of 68 valid questionnaires were recovered. According to the Kano model analysis standard, the Kano attribute and quantity of each survey facility requirement were counted. The Kano attribute is determined by calculating the coefficient of satisfaction with the function of airport chairs, and the Better-Worse coefficient is introduced to characterize the category of functional demand for airport chairs. As shown in Eq. 1 and 2, the closer the absolute value of the Better coefficient is to 1, the greater the impact of the demand on the user's expectations. The value of the Worse coefficient is usually negative, and the closer the negative value is to -1, the greater the impact of the demand on user's expectations is. A greater negative the value of Worse coefficient implies a stronger negative effect on user expectations, which is manifested in a sharp decline in user satisfaction. Then, the demand sensitivity index coefficients are used to derive the demand importance ranking, as in Eq. 3. The summarized

results and ranking of the functional requirements of airport chairs are shown in Table 4.

$$Better\ coefficient = (A+O)/(A+O+M+I) \quad (1)$$

$$Worse\ coefficient = (-1)(M+O)/(A+O+M+I) \quad (2)$$

$$\omega = \sqrt{Better^2 + |Worse|^2} \quad (3)$$

In the Kano model, the priority ranking of requirements is Must-have Attributes > One-dimensional Attributes > Attractive Attributes > Indifferent Attributes.

Table 4. Airport Chair User Satisfaction Analysis Results

Serial number	Coefficient of Satisfaction						Kano attributes	Better coefficient	Worse coefficient	ω Value	Rank
	M	O	A	I	R	Q					
a1	9	16	34	9	0	0	O	73.44%	-32.81%	80.44	3
a2	8	12	26	22	0	0	O	56.25%	-28.13%	62.85	8
a3	5	1	10	50	2	0	I	16.13%	-8.06%	17.88	12
a4	1	3	38	26	0	0	A	62.5%	-4.69%	62.67	9
b1	21	10	19	15	2	1	M	46.77%	-46.77%	66.14	7
b2	13	16	30	8	1	0	O	69.84%	-42.86%	81.94	1
b3	7	13	37	10	0	1	A	76.56%	-26.56%	81.04	2
b4	10	13	26	19	0	0	O	57.81%	-32.81%	66.47	6
b5	3	4	42	18	1	0	A	69.84%	-9.52%	70.49	5
b6	4	10	27	27	0	0	A	56.25%	-17.19%	58.82	10
c1	20	16	19	12	0	1	M	53.13%	-53.13%	75.14	4
c2	4	4	21	37	0	2	I	37.5%	-12.5%	46.14	11

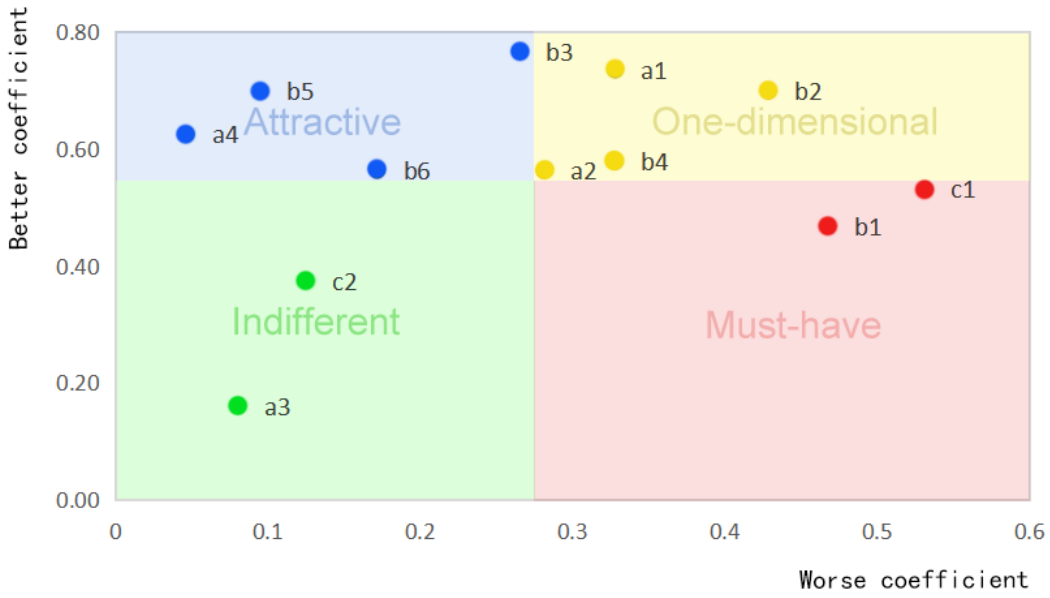

Fig. 3. Kano model demand quadrant scatter plot

Combined with the data in Table 4 and Fig. 3, sedentary comfort (b1) and solidity (c1) are classified as must-have attributes that must be satisfied; color harmony (a1), styling features (a2), charging convenience (b2) and personal privacy (b4) are one-dimensional attributes that should be satisfied in priority; the degree of cultural integration (a4), the placement of baggage items (b3), the ability to lie down (b5), and easy to clean and maintain (b6) belong to the attractive attributes that can be partially satisfied in accordance with the actual situation; the degree of brand recognition (a3) and green environmental protection (c2) belong to the indifferent attributes, which have less influence on the users whether the function is realized or not, and they cannot be considered in the design.

Functional Module Mapping

FBS model mapping

For the purpose of completing the transformation of requirements to module features more efficiently, the indifferent attributes can be eliminated, and the must-have attributes with the one-dimensional attributes and attractive attributes can be set as the design requirement targets. Styling features and color matching belong to aesthetic design elements, which can be intervened in the design from the aspect of appearance, but they need a good carrier, and the use of soft package or PU foam seat back helps to make the airport chair present a rich color effect, which can be prioritized in the subsequent module analysis. Sitting and lying comfort, charging convenience, space for luggage, personal privacy, easy cleaning and maintenance, and solidity belong to the functional design elements, and can be introduced into the FBS model for the "Function-Behavior-Structure" mapping transformation.

As shown in Fig. 4, firstly, in the function (F)-behavior (B) mapping, the behavior behind the functional design elements was analyzed.

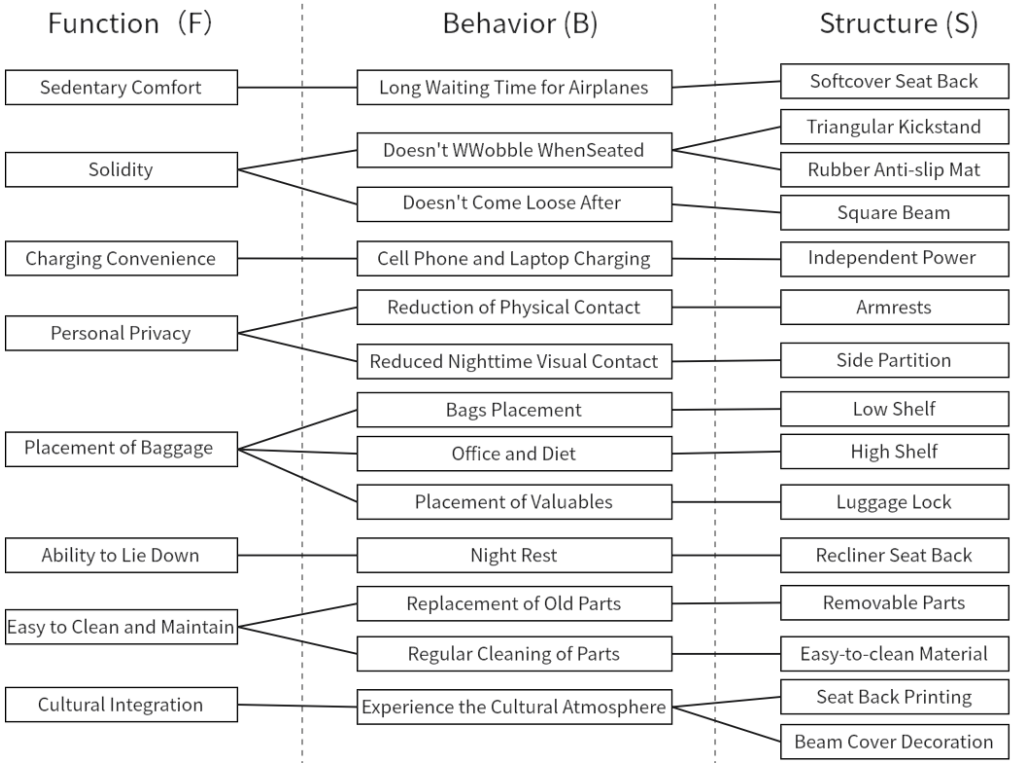

Fig. 4. FBS mapping transformation diagram of airport chair

Secondly, in the behavior (B)-structure (S) mapping, combined with the previous analysis of the modular form of the airport chair, the user's behaviors were transformed into the corresponding structural form or functional components, to complete the correspondence between the function and the modular components of the airport chair (Gong *et al*. 2006).

As must-have attributes, sedentary comfort and solidity are the most basic expectations of the user and need to be ensured that they are perfectly implemented in the design. Passengers wait for a long time at the airport, using the basic seat back to ensure the basic needs of passengers to sit, and additional soft bags to ease the pressure and discomfort of passengers sitting for a long time. To ensure stability and prevent passengers from shaking after sitting down, the support and connection function of the module can be considered. Using triangular kickstands to better enhance stability, together with rubber feet to firmly absorb the ground, and choosing a polygonal cross-section beam to increase the tightness of the joints.

One-dimensional attributes include convenience of charging and personal privacy, which need to be prioritized and implemented in the design. To improve the convenience of charging, the number of charging devices, installation location, and charging method should be considered. One charger per tower is the ideal number of power for travelers. Considering the cost, independent power sources can be arranged at the ends of each group of airport chairs and increase the number of interfaces, or reduce the type of interfaces and increase the number of power sources, *e.g.*, there are fewer intact sockets in the airport chairs of Zoeftig, but they are set up in the front end of each armrest USB interface (Fig. 5) to meet the charging needs of most people. The degree of travelers' need for privacy varies; for example, during the daytime waiting travelers pay more attention to personal space; thus needing armrests for spacing (Pasaribu *et al*. 2019). The need for privacy is stronger at night when resting. A screen is then needed to provide a higher degree of privacy in the space. Some designers of airport chairs choose to widen the back of the head of the chair to act as a screen to realize the sight blocking effect (Fig. 5). Although the frequency of the screen module is low in the sample, the corresponding need for privacy should be emphasized.

Fig. 5. USB port at front of armrest and head cover of the recliner

Attractive attributes include luggage placement, reclining, cultural integration, and easy cleaning and maintenance, of which luggage placement and reclining are of higher

priority and can be considered in the design. In the face of passengers' behavior of placing items, it is necessary to consider the type of items and the way of use. Thus, bags should be placed on the low table board next to the seat, cups, notebooks, and other things need to be placed on the high table board to match the behavior of passengers' food and office, *etc*. For some important items, it is possible to consider adding locks on the board to prevent the theft of the items. The demand for reclining is in response to "red-eye" flights, where many travelers need to sleep overnight, but regular airport chairs do not allow them to sleep in a more comfortable position (Fig. 6). The abolition of spacing armrests can allow passengers to lie down on ordinary chairs, and reclining seat back configuration will make the overnight experience more comfortable. Easy cleaning and maintenance is a lower priority and can be considered when the budget is sufficient, for example, in the design of airport chairs in important provincial capitals, the cultural attributes can be enhanced by customizing special patterns for the seat back fabrics or printing relevant cultural patterns and logos on the beams and backs of the chairs; as for the individual components that are not resistant to dirt and are prone to malfunctioning, removability can be improved to achieve the purpose of easy maintenance, such as removable upholstery.

Fig. 6. Passenger sitting in ordinary airport chairs

Module library construction

To improve the design efficiency and adaptability of the airport chair, a library of airport chair modules can be established, as shown in Table 5, including split seat back and reclining seat back to adapt to different resting needs, triangular kickstand and square tube beams to ensure the structural stability of the seat, independent power sockets to allow for flexible placement and charging, spaced armrests and screens to improve privacy, as well as a low shelf and high shelf. The low shelf and high shelf are convenient for passengers to store different items and can be equipped with luggage locks to ensure the safety of the items.

Through functional analysis, we can understand the actual needs and behavior patterns of users, and then analyze the modules required to meet these behavioral needs. This way can make the design of the functional module of the airport chair more tightly grasp the user's pain points, so as to facilitate the subsequent configuration of different airport chair modules according to the difference in needs, forming a personalized solution.

Table 5. Airport Chairs Constitute Module Library

Serial Number	Module	Serial Number	Module
A1	Split Seat Back	E1	Armrests
A2	Recliner Seat Back	F1	Side Partition
B1	Triangular Kickstand	G1	Low Shelf
C1	Square Beam	G2	High Shelf
D1	Independent Power Supply	H1	Luggage Lock

Strategies for Module Configuration

Airport chairs have a complexity of system characteristics and modular analysis can help the product decomposition and combination to generate new product features, integrated into a standardized subsystem that can be designed independently (Bao and Shi 2019). As shown in Fig. 7, according to the differences in airport scale and usage scenarios, the degree of user demand for airport chairs varies, and according to the functional priority derived from the Kano model, combined with the functional modules analyzed by the FBS model, the required modules are called from the module library to be combined and presented, and the configuration of multiple airport chairs shown in Table 4 can be proposed.

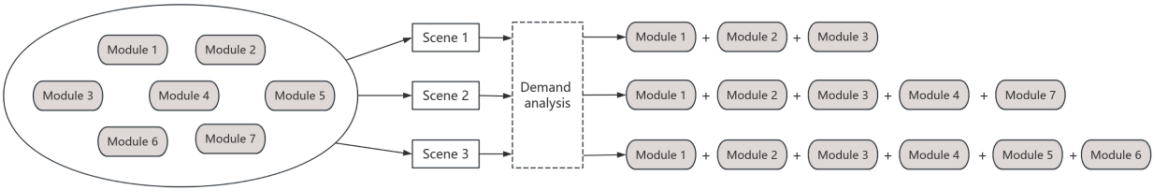

Fig 7. Configuration process of airport chair module

Table 6. Modular Configuration Scheme of Airport Chair

Configuration programme	Modules
Basic	Split seat back+triangular kickstand+rectangular beams
Multi-functional	Daytime: split seat back+triangular kickstand+rectangular beams+armrests+ independent power supply+low shelves+A few high shelves Nighttime: (a) recliner seat back+armrests+rectangular beams+triangular kickstand+independent power supply+low shelves+Side partition+luggage lock (b) split seat back+triangular kickstand+rectangular beams+independent power supply+low shelf
Thematic	Split seat back (Softcover in special fabrics) +armrests+rectangular beams (Cover decorations) +triangular kickstand+independent power supply+low shelves

Basic Airport Chair

When the size of the airport is small, the arrival time of passengers is usually more flexible. They generally will not need to enter the airport too far in advance, which greatly reduces the waiting time, reduces the use of airport chairs, reduces the degree of functionality of airport chairs. In such a case, the design of airport chairs should focus on the must-have attributes, *i.e.* sedentary comfort and firmness.

Therefore, the choice of a split seat back with a soft bag to ensure comfort, while the use of a triangular kickstand to maintain overall stability and balance, and the use of simpler rectangular beams to connect the various modules can be used, which not only meets the basic needs of travelers, but also effectively saves costs for the construction of small airport facilities.

Multi-functional Airport Chairs

When the airport is larger, the number of flights in all time periods is increased significantly. The passengers' reserved waiting time is also longer, which requires simultaneous consideration of daytime and nighttime waiting for multiple needs. During this time, the airport chair should further satisfy one or two attractive attributes on the basis of guaranteeing must-have attributes and one-dimensional attributes. That is, it needs to give full consideration to the power supply and privacy, and according to the specific needs of the increase in items to place and reclining function.

For this purpose, the airport can be divided into a daily waiting area and night waiting area, and different types of airport chairs can be placed in zones. On this basis, the layout within the airport terminal can be according to the different needs of the region for functional configuration. In the daily waiting area, the flow of people is large, based on the configuration of the basic airport chair, and then increase the interval handrail to avoid lying behavior, to ensure the comfort of passengers and waiting order. At the same time, a reasonable layout of power supply and shelf space is required to meet the needs of passengers' charging and shelf items. In the night waiting area, taking into account the rest needs, the chairs can be configured either without armrests basic seats or as reclining seats with armrests. In order to create a more private sleeping environment, they can be set up next to the reclining seats screen or the head of the back can be widened to form a shield to reduce external interference. Each reclining seat can be equipped with a power supply and a shelf to reduce unnecessary nighttime activities and exchanges, and at the same time, a baggage locking system can be added to prevent the night baggage theft or loss. This can enhance the travelers' sense of security.

Thematic Airport Chair

For some important provincial capital city airports, which carry the responsibility of highlighting the characteristics of the city and improving the cultural atmosphere, there can be an opportunity to add more cultural elements in the airport chair design. The scale of such airports is generally larger, so on the basis of multifunctional airport chairs, adding decorative design, such as selecting regional characteristics of the pattern or color production of the seat back fabric, or in the beams of the decorative cover plate printing related logos and patterns, such as city landmarks, cultural symbols, or traditional patterns, *etc*., to achieve the effect of highlighting the theme cultural atmosphere. In addition, the orientation of the airport chair can be adjusted to play relevant videos with the central display screen, so that passengers can also experience the cultural atmosphere of the city while waiting for their plane. This not only enhances the overall appearance of the airport chairs, but also further strengthens the passengers' sense of belonging and identification with the city.

Overall, based on an in-depth understanding of the building blocks, the configuration of airport chairs can be based on the differences in specific scenarios, analyzing and identifying the demand attributes that need to be met, and then accurately determining the required building blocks. This modular approach to configuration not only

improves the adaptability of the airport chair, but also greatly simplifies the configuration process, making the configuration solution more targeted and practical.

CONCLUSIONS

1. Facing different waiting scenarios, airport chairs are serialized products with variability. In this study, the module composition and characteristics of airport chairs were analyzed in depth through morphological analysis. The Kano model was used to refine the important user requirements and the FBS model was used to establish the correlation between functions and modules, which effectively avoided the omission of functions and enabled the requirements to be accurately responded to the appropriate modules. On this basis, an airport chair module library was built to provide diversified module configuration solutions for different scenario requirements, which broadened the functional forms and application scenarios of airport chairs.
2. To enhance user experience, it was necessary to analyze the product form and its design principle first. The airport chair was divided into eight modules: seat back, armrest, kickstand, beam, shelf, cup holder, power supply, and partition. Module disassembly of airport chairs could clarify the functional requirements of each module. Analyzing the different forms of the modules could provide an in-depth understanding of the different needs of users for specific functions.
3. Using the Kano model made it possible to quickly identify key features in a design could improve design efficiency and reduce development costs. It could be seen from the data that sitting and lying comfort and solidity were must-have attributes that needed to be ensured. Color harmony, styling features, charging convenience, and personal privacy are one-dimensional attributes that should be given priority. Cultural integration, baggage placement, reclining, and easy cleaning and maintenance were attractive attributes that could be partially satisfied according to the actual situation. The filtered demands were input into the FBS model. Specific functions and modules were integrated, which enhanced the connection between demands and modules, thus ensuring the logic and practicability of the program.
4. Under the guidance of the FBS model, a complete airport chair module library was built, so that the modules of airport chairs could be flexibly configured according to the specific conditions and service requirements of airport construction. This approach not only solves different design needs and improves product flexibility and adaptability, but also effectively reduces development costs, bringing higher economic benefits and market competitiveness for enterprises.

ACKNOWLEDGMENTS

The authors are grateful for the support of the National Key RandD Program of China (2017YFD0601104), sponsored by Qing Lan Project (Jiangsu Teacher Letter [2022] No.51).

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Article submitted: July 5, 2024; Peer review completed: August 7, 2024; Revised version received: August 12, 2024; Accepted: September 1, 2024; Published: September 19, 2024.
DOI: 10.15376/biores.19.4.8443-8458