



Research article

Research on innovative design of community mutual aid elderly care service platform based on Kano model

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ABSTRACT

The mutual aid elderly care model is important to solve the world population's current aging problem. However, although mutual aid elderly care has been developing in China for more than 20 years, there is still a lack of a systematic way to participate in mutual aid elderly care services, which has led to a slow development of mutual aid elderly care. Therefore, in order to promote the development of mutual aid elderly care and the transition of social elderly care towards sustainability, this study analyzes the actual elderly care service needs and proposes new design strategies for mutual aid elderly care service platforms. In this study, first, the actual elderly care needs were obtained through interview methods and offline questionnaire surveys. The results showed that the elderly have a high demand for health, daily life, entertainment, and spiritual needs, which can be used to establish a comprehensive Kano model. Based on the priority of the needs hierarchy, mutual aid elderly care resources can be allocated rationally. For example, when applying the research results to the design of mutual aid elderly care service platforms, the "Must-be quality" is first satisfied, followed by the "One-dimensional quality" and the "Attractive quality" according to the actual situation. Furthermore, the mutual aid elderly care service platform is divided into a basic version and a professional version to promote the actual needs of different groups of elderly people. In conclusion, the study aims to promote the development of mutual aid elderly care and the transition of social elderly care towards sustainability. The research value of this study lies in its potential to alleviate the slow development of the current mutual aid elderly care model in China and provide a reference for solving the problem of global aging population.

1. Introduction

According to the seventh census of China, in 2020, the number of people aged 60 and over in the Chinese Mainland had reached 264 million, and the elderly population accounted for 18.4% of the total population. The overall pension situation in society was grim [1]. In November 2019, the State Council issued the "National Medium- and Long-Term Plan for Responding to Aging Population," which clearly stated that we must actively respond to China's aging population problem [2], advocating that the elderly must have a healthy lifestyle and more opportunities to participate in society, and promoting the transition of social elderly care towards sustainability. In reality, most elderly people lead relatively simple daily lives, with only a few of them able to enrich their elderly lives and realize their self-worth. However, with the emergence of the "mutual aid elderly care" model, the sustainable development of social elderly care has

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ushered in a new development opportunity [3].

Mutual aid elderly care refers to the seniors who have reached the national legal retirement age, but are still in good health, have good living ability and certain working potential can make full use of their free time and energy to carry out some volunteer activities [4], such as the life care and spiritual companionship services of the young elderly to the senior, to realize their self-worth and eliminate their bad feelings of having nothing to do. Social elderly care needs to consume a large number of social elderly care resources unilaterally [5], while mutual aid elderly care is to solve some basic elderly care needs through mutual assistance within the elderly group [6], which can alleviate the pressure of social elderly care to a certain extent. The mutual aid elderly care service model promotes a gradual shift from providing elderly care services to the elderly by young people to mutual support within the elderly population, reducing the social resources invested in elderly care services, and promoting the sustainable development of social elderly care in China.

In today's society, people have entered the era of intelligent development, and the Internet has gradually become a part of the daily life of the elderly. The traditional elderly care service model can no longer meet the modern elderly people's care service needs, especially in densely populated large urban communities. With the emergence of various service platforms, they not only help people live more conveniently, but also help some people achieve personal value. However, currently, there is still a lack of service platforms that focus on the elderly as the core users, especially for standardized and improved elderly care service platforms. Therefore, to better promote the sustainable development of social elderly care, it is very necessary to construct a mutual aid elderly care service platform based on the actual needs of the elderly.

As early as the late 1990s, Shanghai established China's first mutual elderly care "Time Bank" [7] and then began to develop throughout the country. However, it has not been widely promoted, and a standardized social development system has not been formed. Currently, it has not been fully accepted and well-known by society, and the participation rate is not high. Many scholars have also been committed to promoting the better development of mutual aid elderly care in China. Zhou Rongjun and others used multifactor logistic regression to analyze the influencing factors of the willingness to participate in mutual aid elderly care [8], pointing out that the willingness to participate in mutual aid elderly care is related to age, monthly disposable income, physiological state and cognitive ability, and the acceptance is different in different regions. He Xuefeng pointed out that mutual aid elderly care is in the development of rural areas [9], which needs to be built from the village environment and the cultural atmosphere of the village in order to build a benign, sustainable and high-quality mutual aid elderly care. Yuan Yuan and others proposed to provide corresponding remote nursing according to the service needs of the elderly in the community, especially remote emergency nursing [10]. Wang Shuo pointed out that the scattered elderly care resources should be integrated and utilized to fully meet the elderly care needs of "leave home but not leave the village, leave relatives but not lack affection" [11], so as to realize the sustainable development of mutual aid elderly care in the countryside. Cristina joy Torgé mainly proposed that it is sometimes desirable for elderly couples to take care of each other [12]. Samia and others proposed that elderly care services should focus on the needs of the elderly, and pointed out that this is the main challenge of elderly care services in the future. Victor W. Marshall and Mary. Altpeter proposed to enhance the health of the elderly through social activities [13], in order to deal with the aging problem in the community. By reviewing the research of the scholars mentioned above, the focus has mainly been on the willingness to participate in mutual aid elderly care, mutual aid elderly care in rural areas, and elderly care services. Overall, these scholars have conducted research from a sociological perspective on various aspects of mutual aid elderly care, such as policy formulation, practical guidance for promotion, service models, and resource integration, providing valuable insights and inspiration for the development of mutual aid elderly care. However, from a design perspective, designers need to focus on the actual needs of the elderly and consider how to provide more convenient and efficient mutual aid elderly care services. Currently, many studies lack a comprehensive analysis of the actual needs of the elderly and a good design strategy to promote the development of mutual aid elderly care.

Therefore, this article mainly focuses on the actual needs of community elderly people, takes promoting the development of mutual aid elderly care as the core, proposes innovative design and development strategies for mutual aid elderly care service platforms from the perspective of design, and promotes the sustainable development of social elderly care. Through the development strategies proposed in this study, a more convenient way for participating in mutual aid elderly care can be provided. This not only accelerates the rapid promotion of mutual aid elderly care service models, meets the elderly care needs of different groups of elderly people, but also effectively alleviates the social pressure of elderly care, helps the elderly better integrate into the Internet era, and promotes the positive aging of society. The main contribution and value of this study is to divide the actual needs of the elderly and to propose the integration of mutual aid elderly care with internet platforms based on this, in order to accelerate the development of mutual aid elderly care through innovative service platform models and achieve the sustainable utilization of elderly care resources.

This study mainly focuses on several aspects. The second section mainly focuses on theoretical research, discussing the main types of mutual aid elderly care, its advantages, analysis of the reasons for slow development, corresponding strategies, and an introduction to research methods. The third section focuses on the research process, mainly conducting a questionnaire survey and constructing a Kano model. The fourth section mainly presents data analysis and research results. Firstly, based on the Kano model, the ranking of elderly people's mutual aid elderly care service needs is calculated and divided by type. Secondly, based on the analysis results, a mutual aid elderly care service hierarchy demand tower is constructed. Finally, based on the mutual aid elderly care service hierarchy demand tower, design strategies and suggestions for an innovative mutual aid elderly care service platform are proposed. The fifth section discusses the significance and implications of the study, and the sixth section presents the conclusion.

2. The basic principles of mutual aid elderly care and Kano model

2.1. The main types of mutual aid elderly care

According to the data analysis chart (Fig. 1) of the papers published by scholars between 2011 and 2021 in the CNKI database, the research on the development of mutual aid elderly care has increased year by year, and mutual aid elderly care has become a hot topic of social development. The exploration of mutual aid elderly care service platforms has also begun to be explored and tested in some regions. For example, Qingdao tries to use an electronic time bank with an electronic social security card as the carrier [14], Chengdu uses blockchain technology to serve the “linked community” system [15], and Nanjing tries to store public welfare time in Alipay, which can better integrate mutual aid elderly care into social life [16]. At present, the development of mutual aid elderly care mainly has the following modes.

2.1.1. Cluster-based mutual aid elderly care model

The model takes the community neighborhood committee as the main manager and organizer and provides activity rooms for the elderly in the community. Community workers regularly organize activities based on different themes, through which people can find like-minded partners. For example, in 2008, the Feixiang District of Hebei Province initiated the “happy mutual aid home” for the elderly [17].

2.1.2. Pairing and grouping mutual aid elderly care model

The model relies mainly on community efforts and serves the elderly living alone in the community. Community workers will input the basic information of the elderly in the community in advance and update it regularly to provide a platform for elderly people in need to seek help. The information includes health status, service needs, and so on. And under the premise of mutual consent, the elderly and volunteers will carry out one-to-one, one-to-many service matching. For example, Miyun District of Beijing has launched the “neighborhood mutual aid point” elderly care service model [18].

2.1.3. The time bank mutual aid elderly care model

This mode encourages the young elderly to provide a certain length of nonprofessional services for the elderly, recording the service duration according to certain rules, and entering it into their own “time bank” to exchange for the same length of pension services in the future [19]. For example, in the late 1990s, Shanghai Hongkou District established China’s first mutual aid elderly care “time bank”, and the following year, Guangzhou Shouxing building also established a “time bank”.

2.2. The advantages of mutual aid elderly care

Against the backdrop of the accelerating pace of population aging, mutual aid elderly care has important practical significance for improving the sense of gain, happiness, and security of vulnerable elderly people, and for improving people’s livelihoods and building a positive aging society. It provides a concrete path to achieve the goals of “elderly care, elderly support, elderly participation, and elderly enjoyment” and promotes the sustainable development of social elderly care. Compared with traditional social elderly care models such as institutional elderly care and filial piety elderly care, mutual aid elderly care has the following three main advantages:

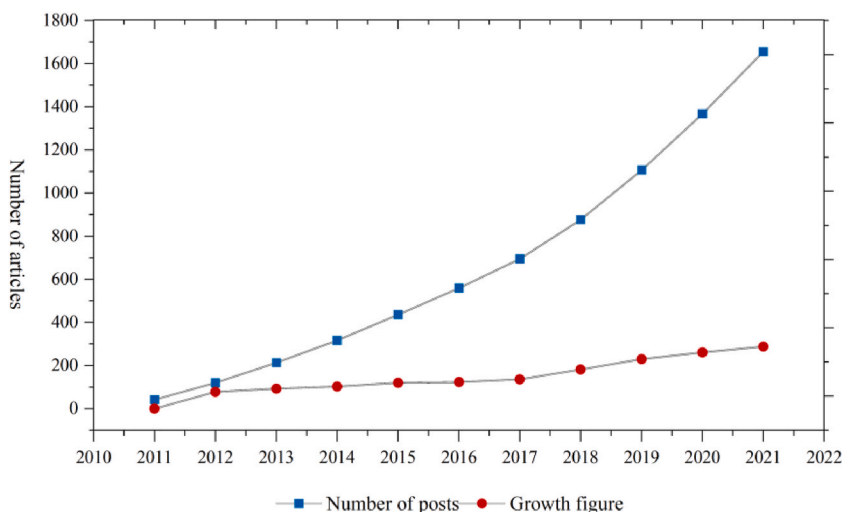


Fig. 1. The number of research articles in the field of mutual aid elderly care and its increase from 2011 to 2021 in the CNKI database.

- (1) More convenient access to diversified elderly care services. Due to the busy work schedules of many adult children, they have limited time to take care of their parents, and many elderly people now live alone, seldom voicing their service needs, both physical and emotional, to their children [20]. In addition, many community elderly care services are currently relatively single in type, while mutual aid elderly care can not only help the elderly to meet a variety of elderly care service needs but also make access and reservations more convenient.
- (2) Reducing the cost of diverse elderly care services. Elderly care is a high-consumption industry. Among the current major elderly care service models in China, institutional elderly care enjoys the most comprehensive elderly care services, but its cost is also the highest, so only a small proportion of the elderly can afford institutional elderly care services. Community elderly care is in a middle position, but its required service prices are also not low, so there is often an oversupply of resources in many areas, resulting in waste of resources. In fact, many elderly people do have relevant elderly care service needs, but they are deterred by the high costs [21]. Mutual aid elderly care, especially the “time bank” mutual aid elderly care, reduces economic expenses and children’s burden to a great extent by using volunteers to serve the elderly in need and storing “time” as a reward. Through relevant service platforms, home-based elderly care can also conveniently enjoy various elderly care services.
- (3) By realizing their self-worth, mutual aid elderly care helps seniors to achieve spiritual satisfaction. Under the traditional model of elderly care, many elderly people living alone rely on government aid and their children’s care to get through their retirement years, and they themselves may feel like a burden on society and their children [22]. However, most elderly people living alone are relatively healthy, with good energy and a lot of spare time in retirement. Mutual aid elderly care not only alleviates some of the pressure on elderly care services and serves society, but also helps to unleash the initiative and autonomy of the elderly [23]. It can expand their social circle after retirement and enrich their retired life, promote their physical and mental health, and improve their life skills [24], thereby enabling them to achieve and improve their sense of effectiveness and satisfaction in labor and generate positive self-evaluation.

2.3. Analysis of the slow development of mutual aid elderly care and corresponding strategies

The reasons for the slow development of mutual aid elderly care are mainly the following four points: (1) The influence of traditional concepts. In some regions, people still hold the traditional concept of “raising children to support themselves in old age” and believe that elderly care should be the responsibility of children. This concept affects the acceptance of mutual aid elderly care by the elderly. (2) Insufficient funding and policy support. Mutual aid elderly care services require a large amount of investment, but currently, the government’s support for mutual aid elderly care is still insufficient. At the same time, some local policies also have problems of insufficient support, which restricts the development of mutual aid elderly care. (3) Low service quality. China has a vast territory, and the economic development of different regions varies, as do the quality of elderly care resources. In some economically underdeveloped areas, the service quality is low, and the needs of the elderly cannot be met, leading to a decrease in the trust of the elderly in mutual aid elderly care, making it difficult to form economies of scale. (4) There is no unified circulation management channel. Currently, mutual aid elderly care platforms in various regions of the country are not unified, and most of the main places for mutual aid elderly care are offline communities, without unified management and standards. Moreover, in the context of frequent population mobility, a large number of “aging drifters” and “migratory elderly” exist [25], and there is currently no mutual aid elderly care platform or volunteer service statistical platform that can be uniformly declared, data shared, and facilitate circulation.

To better promote the sustainable development of mutual aid elderly care, joint efforts are needed from various aspects. Starting with user needs and combining with actual situations, this study proposes building a platform for a mutual aid elderly care service model combined with “Internet +” by analyzing the actual elderly care needs and the supply of elderly care resources, in order to avoid platform complexity and resource waste. Innovative design of the service platform can be used to promote the rapid development of mutual aid elderly care and to drive the transformation of social elderly care towards sustainability.

2.4. Kano model

Kano model is a two-dimensional modeling tool proposed by Professor Noriaki Kano of Tokyo Institute of Technology [26], mainly used for user requirements classification and prioritization classes. Kano model divides products or services into five quality types.

- (1) Must-be quality (M) is the basic satisfaction condition of a product or service. Must-be quality can ensure the maximum efficiency of resource utilization and avoid any form of resource waste.
- (2) One-dimensional quality (O) is the value enhancement point of a product or service. On the premise of meeting must-be quality, one-dimensional quality can increase the competitiveness of products in the same type.
- (3) Attractive quality (A) is a kind of additional demand that meets the user’s surprise, which makes it easier to attract users.
- (4) Indifferent quality (I) refers to that when a product or service serves users, this type of demand is optional to users and will not have a great impact on users.
- (5) Reverse quality (R) refers to that some demand services will reduce users’ satisfaction with products.

According to the relevant theory of the Kano model, a product or service pays more attention to whether the must-be quality, one-dimensional quality, and attractive quality are satisfied or not. Must-be quality is usually the basic essential function of products or services. When must-be quality is met, users will pay attention to and care about the one-dimensional quality. One-dimensional quality is a function expected by users, and user satisfaction is directly proportional to the satisfaction degree of the quality. Although users

can't think of attractive quality, satisfying attractive quality will surprise users and greatly improve their satisfaction [27]. Different needs and performances are defined by the relationship between demand attributes and consumer satisfaction. In the model, the abscissa represents the realization of demand attributes, while the ordinate represents consumer satisfaction (Fig. 2). In the final analysis, the problem of the sustainable development of mutual aid elderly care in this paper is the problem of elderly care service demand and experience. In essence, it is the research on the application of the sustainable service demand of mutual aid elderly care to the elderly care service platform. It has high applicability with Kano model. Therefore, this study uses Kano model to conduct a quantitative analysis of various demands.

To provide users with services that best meet their actual needs, Kano and others believe that it is necessary to consider attractive quality, one-dimensional quality, must-be quality, and indifferent quality. For developers and users, it is necessary to know which needs to be focused on. Therefore, the customer satisfaction index (CSI) is introduced to assist in the division of demand types, that is, the closer the absolute value of the user satisfaction increase index (SII) and the user dissatisfaction decrease index (DDI) is to 1, the greater the impact of the realization of a design attribute on user satisfaction is, and the closer it is to 0, the smaller the impact is, to judge the acceptance of users. See Formula (1) and Formula (2) [28] for the calculation formula of SII and DDI.

$$\begin{aligned} &\text{Better coefficient, Satisfaction coefficient} \\ &CS_i = (A + O)/(A + O + M + I) \end{aligned} \tag{1}$$

$$\begin{aligned} &\text{Worse coefficient, Dissatisfaction coefficient} \\ &CD_i = (O + M)/(A + O + M + I) - 1 \end{aligned} \tag{2}$$

Among them, A, O, M, and I are attractive quality, one-dimensional quality, must-be quality, and indifferent quality respectively. In the calculation results, the larger the satisfaction coefficient is, the higher the consumer satisfaction is. The smaller the dissatisfaction coefficient is, the higher the dissatisfaction degree is. Therefore, it is necessary to give priority to the demand function with a high coefficient. Since a high coefficient indicates that the effect of product improvement is better than a low coefficient, this method analyzes the improvement of a certain quality attribute to improve product quality and meet the needs of consumers.

3. Research process and questionnaire design

This study is mainly aimed at the slow development of mutual aid elderly care in China and proposes to promote the further development of mutual pensions in China from the perspective of sustainability [29]. First, it interviewed experts in related fields of social pension to confirm the research framework (Fig. 3), to avoid the impact of China's complex and diverse social elderly care status on this research [30]. Through interviews with experts, this paper discusses the preliminary classification and statistical methods of elderly care service needs in the community elderly care environment. Then, the questionnaire is designed according to the interview results, because this study is mainly aimed at the elderly, mainly offline questionnaires, supplemented by online questionnaires, to obtain the actual satisfaction of the elderly in the community. To reduce the uncertainty and imprecision of the questionnaire, an innovative procedure based on fuzzy similarity is introduced to make up for the hierarchical defect of elderly care services in the questionnaire [31]. Finally, according to the questionnaire survey results, a Kano model is established to obtain the satisfaction ranking of the elderly care service needs in the community, which is used in the design of the sustainable development service platform of mutual aid elderly care. In addition, the ethical approval about this study was approved from the Human Subjects Ethical Committee

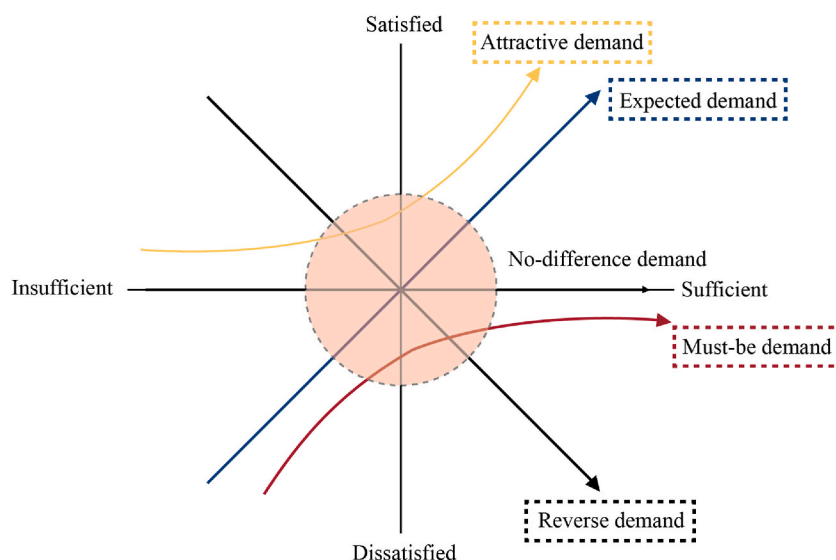


Fig. 2. Kano model.

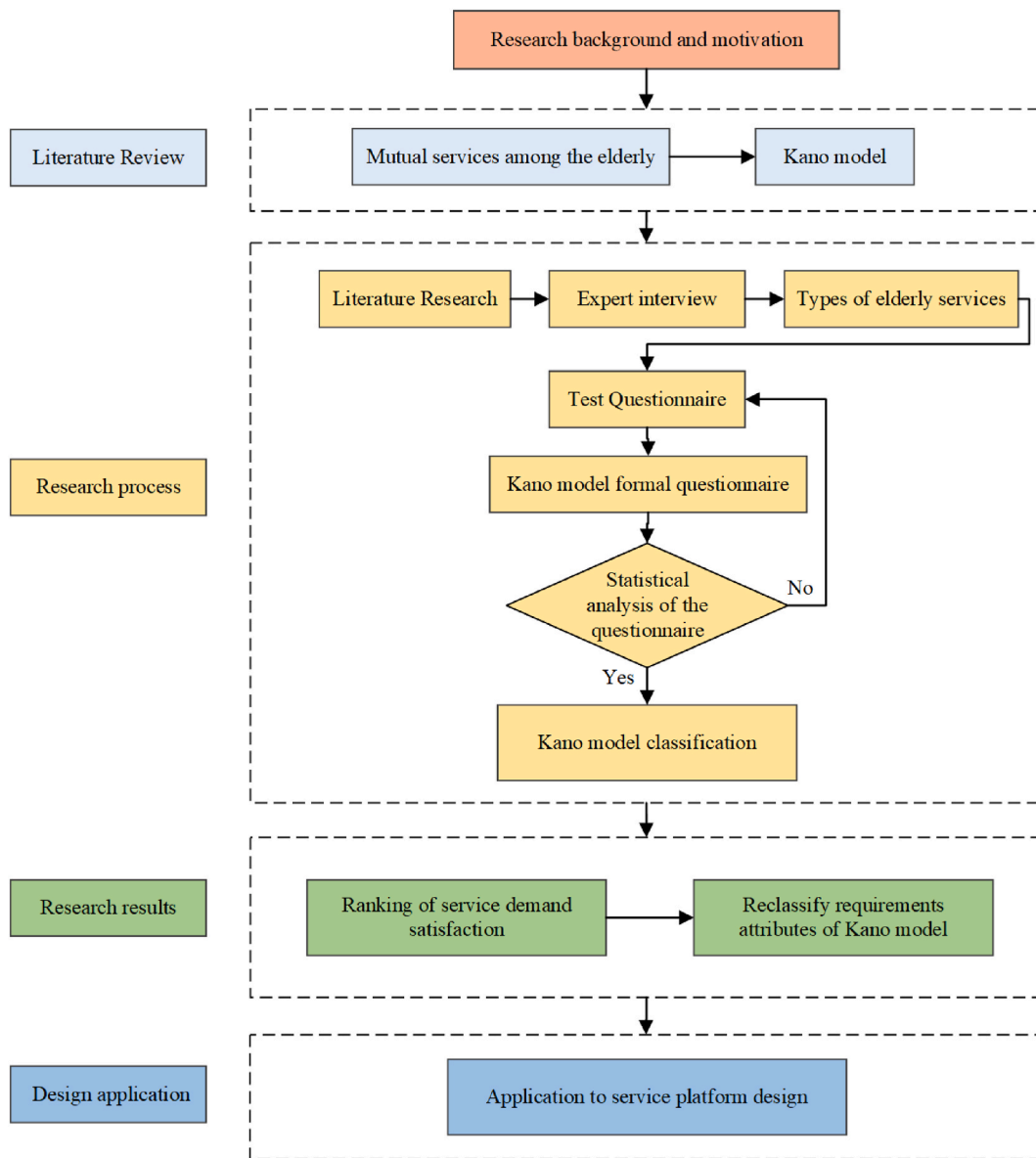


Fig. 3. Research framework for the design of sustainable development service platform for mutual aid elderly care.

of University of Science and Technology Liaoning.

3.1. Questionnaire design

The purpose of the questionnaire survey is to more accurately understand the actual needs and satisfaction of elderly care services. The questionnaire is mainly composed of two parts: the test questionnaire and the formal questionnaire (Fig. 4). Through literature research and expert interviews (Table 1), the types and items of community elderly care services were determined. According to the results of the test questionnaire, some irrelevant service items were excluded, and the part with more concentrated attention was

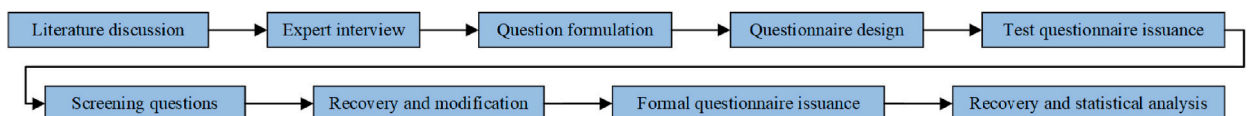


Fig. 4. The questionnaire design and implementation of this study.

Table 1

Interview list of experts related to elderly care services.

No.	Service agency	Position	Career (Year)
1	Civil Affairs Department of Anshan	Office staff	18
2	Anshan Tiedong Elderly office	Office staff	9
3	Xinhua elderly community activity center	Office staff	4.6
4	New valley community	Volunteer	2
5	Department of Architecture and Art Design , University of science and technology Liaoning	Associate professor	15

selected as the formal questionnaire (Table 2). As a result, 50 elderly care service demand items in five categories are obtained (Table 3 and Table 4).

3.2. Participants

3.2.1. Experts

All participants in this study confirm that they are aware of this research. The interviewed experts of this study are community elderly care managers from Anshan civil affairs department, the worker of Anshan Tiedong District Aging office, the worker of Xinhua elderly community activity center, Xinyu community elderly service volunteers, and professors in the field of social elderly care in the school of architecture and art design, University of Science and Technology Liaoning.

3.2.2. User groups

All participants agree to participate in this questionnaire survey. As the main target group of this questionnaire is the elderly, and it is difficult to implement the online questionnaire [32], the offline actual questionnaire distribution method is mainly selected, most of which are from some elderly communities in Anshan and Shenyang. The communities in Anshan that distributed the questionnaire included Xinhua elderly community, Xinyu elderly community, Shengousi District 7 elderly community, and Angang prosperous property elderly community. The communities that sent out the questionnaire in Shenyang included Hebei elderly community in Heping District, Zhongxing community in Heping District, Xinghuayuan community in Tiexi District, and Yongshan community in Tiexi District.

4. Demand analysis and research results of elderly care services

4.1. Pre-test questionnaire survey

The test questionnaire survey was conducted from September 23 to 30, 2021. All the elderly who participated in the questionnaire were from Dongping community, Lingxi community, Angang rural, and Shennan community in Anshan. According to Nielsen's testing principles, each community guarantees the collection of 5 valid questionnaires. In the test survey, a total of 20 valid questionnaire samples were collected, and all responses were processed by using SPSS 25.0. Item analysis was used to evaluate the decisive value of each item, and Cronbach's α was used to delete non-identifying questions, and reliability analysis was designed to increase the confidence of the facet by removing unnecessary questions from each facet. The analysis results will be used to evaluate the relevance of each service item to determine the service item attributes of the formal questionnaire.

4.1.1. Reliability and validity test

Reliability analysis removes unnecessary attributes from each category to improve the reliability of the analysis. The standard is the correlation coefficient <0.4 . The deleted attributes include Q13 - shaving and Q48 - painting, which belong to the needs of life and entertainment. Finally, the reliability coefficient of the questionnaire results reached 0.902, of which the positive question was 0.961 and the reverse question was 0.942, both of which were greater than 0.8. The reliability quality of the research data was high. In the validity test, the KMO measure value is 0.824, greater than 0.8, and the statistical significance probability of Bartlett sphere test is 0.000, less than 0.01, which is suitable for factor analysis. The results showed that five of the remaining 48 mutual aid elderly care demand attributes were deleted: Q1 - physical examination, Q12 - dressing, Q21 - laundry service, Q24 - changing light bulbs, and Q45

Table 2

Sample of community elderly care service project demand satisfaction questionnaire.

Question 1	
What do you think if someone can help you clean up in the community mutual aid elderly care life?	What do you think if there is no one who can help you clean up in the community mutual aid elderly care life?
<input type="checkbox"/> like	<input type="checkbox"/> like
<input type="checkbox"/> take it for granted	<input type="checkbox"/> take it for granted
<input type="checkbox"/> indifferent	<input type="checkbox"/> indifferent
<input type="checkbox"/> reluctantly accept	<input type="checkbox"/> reluctantly accept
<input type="checkbox"/> dislike	<input type="checkbox"/> dislike

Table 3
Attribute category and definition of mutual aid elderly care service project.

	Category	Definition
1	safety and health requirements	meet basic safety monitoring and health services
2	life requirements	provide services for various needs in life
3	learning and social needs	let the elderly not be separated from society
4	spiritual needs	give spiritual comfort to the elderly
5	entertainment needs	enrich the daily life of the elderly

Table 4
Mutual aid elderly care for the elderly service demand project.

Requirement description				
1 physical examination	11 cooking	21 laundry service	31 elderly tea party	41 chatting
2 exercise	12 dressing	22 repair household appliances	32 cooking competition	42 psychological counseling
3 rehabilitation training	13 shaving	23 pest controlling	33 foreign language learning	43 music appreciation
4 in-home medical service	14 haircutting	24 changing bulbs	34 sightseeing	44 calligraphy practicing
5 telemedicine	15 traveling	25 find items	35 party dating	45 chess and cards
6 take medicine	16 brushing teeth	26 picking up express	36 red song Club	46 square dancing
7 boil Traditional Chinese Medicine	17 washing hair	27 mowing the lawn	37 life skills learning	47 go to the park
8 sick caring	18 bathing	28 walking the dog	38 instructions for using electronic products	48 painting
9 legal consulting	19 food distribution	29 feeding birds	39 voluntary activities	49 playing Tai Chi
10 craft making	20 cleaning	30 purchase living goods	40 movie appreciation	50 musical instruments

- chess and cards. And after pre-test analysis, the attributes of Kano Model in this study include 43 product attributes of 5 categories (Table 5).

4.2. Questionnaire survey with Kano's two-dimensional quality model

The survey was conducted from January 3 to January 15, 2022, and 175 questionnaires and 153 valid questionnaires were collected (Table 6 and Table 7).

4.3. Kano's two-dimensional quality model

The results of the questionnaire used the "relative majority ratio" of Matzler and Hinterhuber (Table 8). According to this principle, calculate the proportion of each service item attribute for 43 attributes: 14 attractive quality, 12 one-dimensional quality, 10 must-be quality, and 7 indifferent quality.

4.4. Ranking of mutual aid elderly care service demand index

According to the relevant theories of Kano model, must-be quality is the basic and necessary functions of products or services. If must-be quality cannot be met, user dissatisfaction will greatly increase. One-dimensional quality is the function that users expect to have. User satisfaction is directly proportional to the satisfaction degree of such quality. Although satisfying attractive quality can greatly improve user satisfaction, if not satisfied, it will have little impact on user dissatisfaction. Therefore, the importance of each Kano quality category is divided into must-be quality, one-dimensional quality, attractive quality, and reverse quality from large to small, and based on this, the importance order of four gradients is divided first.

Because the community elderly generally has low requirements for the service types and service quality of home-based elderly care or community elderly care, according to the classification standard determined by the demand category with a large proportion in the traditional Kano model, most of the Kano demand categories are attractive qualities, so the consumer satisfaction index (CS_i) is introduced to assist in dividing the demand types. The consumer satisfaction index (CS_i) and consumer dissatisfaction index (CD_i) are used to evaluate the satisfaction and dissatisfaction of the elderly in the community with the product attributes. "S" indicates the sensitivity of user satisfaction. S is the distance from the point with CS_i and $|CD_i|$ as coordinate values to the origin, that is, according to the characteristics of CS_i and CD_i , the larger the value of S, the higher the satisfaction, which means that whether a elderly care service is satisfied has a greater impact on user satisfaction, that is, the higher the importance of the elderly care service. Therefore, the importance of the same demand categories is ranked according to the size of satisfaction S. That is, the importance ranking of each mutual aid elderly care service demand can be seen in Table 9 and Table 10.

Taking $|CD_i|$ as the abscissa and CS_i as the ordinate, the demand matrix is established and substituted into various demand indicators. The results show that the $CS_i \in [0.33, 0.71]$ and $|CD_i| \in [0.35, 0.72]$ of each demand is concentrated, so the mean value of CS_i

Table 5
Classification and coding of mutual aid elderly care service demand items.

Primary requirements	Secondary requirements correspond to service items	Code
Safety and health requirements(A)	exercise	A1
	rehabilitation training	A2
	in-home medical service	A3
	telemedicine	A4
	take medicine	A5
	boil Traditional Chinese Medicine	A6
	sick caring	A7
Life requirements(B)	cooking	B1
	food distribution	B2
	haircutting	B3
	traveling	B4
	brushing teeth	B5
	washing hair	B6
	bathing	B7
	Cleaning	B8
	repair household appliances	B9
	pest controlling	B10
	find items	B11
	pick up express	B12
	mowing the lawn	B13
	walking the dog	B14
	feeding birds	B15
	purchase living goods	B16
	legal consulting	B17
Learning and social needs(C)	elderly tea party	C1
	cooking competition	C2
	foreign language learning	C3
	sightseeing	C4
	party dating	C5
	red song Club	C6
	life skills learning	C7
	instructions for using electronic products	C8
	craft making	C9
Spiritual needs(D)	Chatting	D1
	psychological counseling	D2
	music appreciation	D3
	movie appreciation	D4
	voluntary activities	D5
Entertainment needs(E)	calligraphy practicing	E1
	square dancing	E2
	go to the park	E3
	playing Tai Chi	E4
	musical instruments	E5

Table 6
Statistics of the questionnaire survey.

Type	Off-Line
Total number of returned questionnaires	175
Invalid questionnaires	22
Valid questionnaires	153
Effective rate	87.4%
Period	13 days

and $|CD_i|$ is used as the critical line to divide the demand quadrant of Kano model, and substituted into the satisfaction coordinates of each facility to form a scatter diagram, as shown in Fig. 5. The new Kano quality category judgment method based on user satisfaction is: when $|CD_i| < 0.53$, $CS_i < 0.55$, it is indifferent quality, when $|CD_i| > 0.53$, $CS_i < 0.55$, it is must-be quality, when $|CD_i| > 0.53$, $CS_i > 0.55$, it is one-dimensional quality, when $|CD_i| < 0.53$, $CS_i > 0.55$, it is an attractive quality.

4.4.1. Attractive quality

Attractive quality is also called exciting demand. Compared with other similar products, attractive quality can provide strong market competitiveness for this product, and improve users' satisfaction and loyalty to this product by exploring some unexpected potential service needs. The research results are shown in Table 9. After reclassification, there are 13 attractive qualities. For the safety and health requirements services, there are mainly rehabilitation training and telemedicine, which shows that they are more attractive

Table 7
Demographics of questionnaire respondents.

Basic Data	Item	Amount	Percentage Ratio
Gender	Male	81	52.94%
	Female	72	47.06%
Age	From 60 to 69	54	35.29%
	From 70 to 79	56	36.6%
	Over 80	43	28.1%
Education	Elementary school and below	51	33.33%
	Junior high school	59	38.56%
	Senior high school	23	15.03%
	College and university	20	13.07%
Occupation	farmer	62	40.52%
	politician	15	9.80%
	Public institution	19	12.42%
	Freelancer	26	16.99%
	worker	31	20.26%
Monthly income	RMB 2,000 and below	37	24.18%
	RMB 2000–3,000	61	39.87%
	RMB 3000–4,000	29	18.95%
	RMB 4000–5,000	22	14.38%
	RMB 5,000 and above	4	2.61%

in the existing community mutual aid elderly care life, but their satisfaction is not very high. For life requirements services, there are haircutting, repairing household appliances, and legal consulting. Among them, only legal consulting has a relatively high satisfaction degree, while haircutting and repairing household appliances are not too high. In terms of learning and social needs, there are mainly cooking competitions, party dating, instructions for using electronic products and life skills learning, among which party dating and life skills learning are highly satisfied. In terms of spiritual needs and entertainment needs, there are mainly psychological accounting, voluntary activities, and musical instruments, among which voluntary activities are highly satisfied. The research results suggest that at the attractive quality level, priority can be given to meeting the service needs with high satisfaction, such as legal consulting, party dating, life skills learning, and voluntary activities.

4.4.2. One-dimensional quality

One-dimensional quality is in direct proportion to user satisfaction. The more one-dimensional quality this product realizes, the higher user satisfaction will be. However, when some one-dimensional qualities are not satisfied, users will not significantly increase their dissatisfaction. In the results of this study, there are 8 one-dimensional qualities in the classification of various service needs of the community elderly for mutual aid elderly care. Safety and health requirements mainly include exercise, taking medicine, and boiling Traditional Chinese Medicine. Among them, exercise and boiling Traditional Chinese Medicine are highly satisfied, indicating that in daily life, the elderly want someone to help them with daily exercise and auxiliary decoction. Life requirements mainly include auxiliary bath service. Some elderly people are difficult to bathe alone at home, so they hope someone can assist them with a bath. Among learning and social needs, there are mainly foreign language learning and craft making. Among them, craft making has high satisfaction, which indicates that the elderly are also eager to learn or do some craft-making products in their daily life. In terms of spiritual needs and entertainment needs mainly include movie appreciation and calligraphy practicing, and their satisfaction is relatively high, indicating that the elderly also have expectations in terms of spiritual and entertainment needs.

4.4.3. Must-Be quality

Must-be quality should be met in the needs of mutual aid elderly care services. If must-be quality cannot be met, the dissatisfaction of the elderly will greatly increase. In the research results, there are 13 must-be qualities in total. They are in-home medical services and sick caring in safety and health requirements, especially sick caring, its satisfaction is high, and it is very necessary to have someone to help the elderly take care of them when they are sick. Among life requirements, there are cooking, food distribution, washing hair, cleaning, picking up express, and purchasing goods, among which food distribution and purchasing goods have high satisfaction. Among learning and social needs, there are early tea parties and red song clubs, with high satisfaction. The spiritual needs and entertainment needs mainly include chatting, square dancing, and going to the park, among which square dancing and chatting are relatively satisfied.

4.4.4. Indifferent quality

Indifferent Quality has little impact on user satisfaction. In this study, the research results show that most of the indifferent quality are service items that some elderly people can complete alone or only a small number of special groups of elderly people need, a total of 9 items. It is mainly in the aspects of life requirements, learning, social needs, and spiritual needs, including traveling, brushing teeth, pest controlling, finding items, moving the lawn, walking the dog, feeding birds, foreign language learning and music approval, and its satisfaction degree is not high, indicating that this part of service demand has little impact on the elderly in the community. This item can be ignored in the subsequent service platform design.

Table 8
Kano's quality classification of mutual aid elderly care service.

Facet	Attribute	Proportion of Each Type of Kano Quality Attribute (%)						Classification Attribute
		A	O	M	I	R	Q	
Safety and health requirements (A)	exercise(A1)	31.37	34.34	22.50	11.29	0.00	0.50	O
	rehabilitation training(A2)	35.76	22.06	24.19	17.84	0.00	0.15	A
	in-home medical service(A3)	19.90	33.99	26.64	19.32	0.00	0.15	O
	telemedicine(A4)	39.87	19.61	26.64	18.88	0.00	0.00	A
	take medicine(A5)	22.06	33.66	23.53	20.25	0.00	0.50	O
	boil Traditional Chinese Medicine(A6)	22.22	35.29	23.37	17.92	0.70	0.50	O
Life requirements(B)	sick caring(A7)	18.53	34.97	36.88	9.62	0.00	0.00	M
	cooking(B1)	21.08	30.72	25.98	22.07	0.00	0.15	O
	food distribution(B2)	17.76	29.82	38.33	14.04	0.00	0.50	M
	haircutting(B3)	35.37	21.56	23.78	19.14	0.00	0.15	A
	traveling(B4)	32.03	21.12	17.89	28.96	1.00	0.15	A
	brushing teeth(B5)	15.00	15.56	18.92	42.32	7.7	0.50	I
	washing hair(B6)	22.35	25.58	37.38	14.19	0.00	0.50	M
	bathing(B7)	24.49	32.57	26.97	15.92	0.00	0.50	O
	cleaning(B8)	19.61	24.54	36.60	19.10	0.00	0.15	M
	repair household appliances(B9)	30.72	29.76	16.45	22.37	0.70	0.00	A
	pest controlling(B10)	17.70	27.22	18.56	36.37	0.00	0.15	I
	find items(B11)	19.81	19.03	20.49	40.52	0.00	0.15	I
	pick up express(B12)	17.89	35.89	19.40	26.32	0.00	0.50	O
	mowing the lawn(B13)	20.98	28.78	13.49	36.60	0.00	0.15	I
	walking the dog(B14)	21.98	25.98	8.75	43.14	0.00	0.15	I
Learning and social needs(C)	feeding birds(B15)	19.44	23.56	11.11	45.39	0.00	0.50	I
	purchase living goods(B16)	23.28	24.64	41.18	10.75	0.00	0.15	M
	legal consulting(B17)	36.60	30.72	15.69	16.84	0.00	0.15	A
	elderly tea party(C1)	22.84	29.06	34.64	13.31	0.00	0.15	M
	cooking competition(C2)	35.29	25.40	20.93	18.38	0.00	0.00	A
	foreign language learning(C3)	32.29	20.18	18.37	29.01	0.00	0.15	A
	sightseeing(C4)	24.69	32.68	22.17	20.31	0.00	0.15	O
	party dating(C5)	34.64	29.41	21.57	13.88	0.00	0.50	A
	red song Club(C6)	23.59	29.37	37.25	9.29	0.00	0.50	M
	life skills learning(C7)	37.91	29.23	17.99	14.87	0.00	0.00	A
	instructions for using electronic products (C8)	36.60	23.23	19.30	20.72	0.00	0.15	A
	Spiritual needs(D)	craft making(C9)	30.72	40.42	18.20	10.51	0.00	0.15
chatting(D1)		26.19	28.39	39.87	5.40	0.00	0.50	M
psychological counseling(D2)		33.33	28.60	20.71	17.21	0.00	0.15	A
music appreciation(D3)		20.26	18.93	26.67	33.99	0.00	0.15	I
movie appreciation(D4)		30.20	32.17	27.26	10.22	0.00	0.15	O
Entertainment needs(E)	voluntary activities(D5)	39.22	29.41	18.29	12.58	0.00	0.50	A
	calligraphy practicing(E1)	26.38	38.87	25.16	8.39	0.70	0.50	O
	square dancing(E2)	20.26	27.45	37.25	14.98	0.00	0.15	M
	go to the park(E3)	21.76	25.58	33.99	18.52	0.00	0.15	M
	playing Tai Chi(E4)	27.45	39.22	12.42	20.41	0.00	0.15	O
	musical instruments(E5)	35.95	28.20	12.10	23.60	0.00	0.15	A

Note: "A" stands for attractive quality, "O" stands for one-dimensional quality, "M" stands for must-be quality, "I" stands for different quality, and "R" stands for reverse quality.

4.5. Research results

Based on the above data analysis results, a hierarchical tower of demand for community elderly care services is established, as shown in Fig. 6. The demand levels from bottom to top are indifferent quality, must-be quality, one-dimensional quality, and attractive quality, and the importance of facilities at the same level decreases from left to right and from top to bottom. According to the important relationship of various requirements in Kano model, a product should be based on ensuring must-be quality, meeting one-dimensional quality as much as possible, further meeting attractive quality, and avoiding indifferent quality and reverse quality. When most qualities cannot be met, facilities belonging to the same demand level are selected according to their importance.

When mutual aid elderly care participation is low and promotion is limited, only the basic version of the mutual aid elderly care information service platform is usually set up [33]. By releasing demands and providing services through the basic version of mutual aid elderly care for the aged platform, the information service platform providing basic care for the aged can meet the needs of all types of elderly people, no matter in the elderly community or ordinary community, especially must-be quality. Therefore, according to the importance ranking of functional modules, sick caring, red song club, and food distribution have the highest importance, which is in line with common sense. From the results, in the function module, must-be quality is more inclined to the level of life requirements, that is the most basic material life services for the elderly living alone in life. Most of the elderly have relatively simple spare time

Table 9
Ranking of mutual aid elderly care service demand index.

Facet	Attribute	CS _s %	CD _s %	Category	New category	S	Satisfaction ranking	Importance order	
Safety and health requirements(A)	exercise(A1)	66.04	57.13	O	O	0.873	4	16	
	rehabilitation training(A2)	57.91	46.32	A	A	0.742	31	31	
	in-home medical service(A3)	53.92	60.72	O	M	0.812	17	6	
	telemedicine(A4)	56.65	44.05	A	A	0.718	34	34	
	take medicine(A5)	56.00	57.48	O	O	0.802	19	20	
	boil Traditional Chinese Medicine(A6)	58.21	59.37	O	O	0.831	10	18	
	sick caring(A7)	53.50	71.85	M	M	0.896	3	1	
Life requirements(B)	cooking(B1)	51.88	56.79	O	M	0.769	25	11	
	food distribution(B2)	47.60	68.18	M	M	0.832	9	3	
	haircutting(B3)	57.02	45.41	A	A	0.729	33	33	
	traveling(B4)	53.17	39.01	A	I	0.660	35	35	
	brushing teeth(B5)	33.29	37.56	I	I	0.502	43	43	
	washing hair(B6)	48.17	63.28	M	M	0.795	20	8	
	bathing(B7)	57.09	59.57	O	O	0.825	11	19	
	cleaning(B8)	44.22	61.23	M	M	0.755	30	13	
	repair household appliances (B9)	60.91	46.54	A	A	0.767	26	28	
	pest controlling(B10)	44.99	45.85	I	I	0.642	38	38	
	find items(B11)	38.90	39.58	I	I	0.554	42	42	
Learning and social needs(C)	picking up express(B12)	54.88	55.57	O	M	0.781	23	9	
	mowing the lawn(B13)	49.83	42.33	I	I	0.654	36	36	
	walking the dog(B14)	48.03	34.78	I	I	0.593	40	40	
	feeding birds(B15)	43.22	34.84	I	I	0.555	41	41	
	purchase living goods(B16)	47.99	65.92	M	M	0.815	16	5	
	legal consulting(B17)	67.42	46.48	A	A	0.819	15	26	
	elderly tea party(C1)	51.98	63.80	M	M	0.823	12	4	
	cooking competition(C2)	60.69	46.33	A	A	0.764	27	29	
	foreign language learning(C3)	52.55	38.61	A	I	0.652	37	37	
	sightseeing(C4)	57.46	54.93	O	O	0.794	21	21	
	party dating(C5)	64.37	51.24	A	A	0.822	13	24	
Spiritual needs(D)	red song Club(C6)	53.23	66.95	M	M	0.855	6	2	
	life skills learning(C7)	67.14	47.22	A	A	0.821	14	25	
	instructions for using electronic products(C8)	59.92	42.59	A	A	0.735	32	32	
	craft making(C9)	71.25	58.71	O	O	0.923	2	15	
	chatting(D1)	54.85	68.60	M	M	0.771	24	10	
	psychological counseling(D2)	62.02	49.38	A	A	0.793	22	27	
	music appreciation(D3)	39.25	45.67	I	I	0.602	39	39	
	movie appreciation(D4)	62.46	59.52	O	O	0.863	5	17	
	voluntary activities(D5)	68.97	47.94	A	A	0.840	8	23	
	Entertainment needs (E)	calligraphy practicing(E1)	66.04	64.81	O	O	0.925	1	14
		square dancing(E2)	47.78	64.80	M	M	0.805	18	7
go to the park(E3)		47.41	59.66	M	M	0.762	28	12	
playing Tai Chi(E4)		66.77	51.72	O	A	0.845	7	22	
musical instruments(E5)		64.25	40.36	A	A	0.759	29	30	

Table 10
Importance ranking of mutual aid elderly care service demand based on demand classification.

Sort order	Importance order
must-be quality	A7>C6>B2>C1>B16>A3>E2>B6>B12>D1>B1>E3>B8
one-dimensional quality	E1>C9>A1>D4>A6>B7>A5>C4
attractive quality	E4>D5>C5>C7>B17>D2>B9>C2>E5>A2>C8>B3>A4
indifferent quality	B4>B13>C3>B10>D3>B14>B15>B11>B5
safety and health requirements	A7>A3>A1>A6>A5>A2>A4
life requirements	B2>B16>B6>B12>B1>B8>B7>B17>B9>B3>B4>B13>B10>B14>B15>B11>B5
learn and social needs	C6>C1>C9>C4>C5>C7>C2>C8>C3
spiritual needs	D1>D4>D5>D2>D3
entertainment needs	E2>E3>E1>E4>E5

activities, while the attractive quality basically focuses on spare time life, mainly including playing Tai Chi, volunteer activities, party dating, and learning life skills. In addition, most of the elderly are gradually divorced from society in their retirement life, so they also need some rich and colorful activities to enrich their retirement life. Therefore, calligraphy practicing, craft making, exercise, and movie appreciation are one-dimensional qualities. Because most of the elderly who are in good health tend to be less dependent on

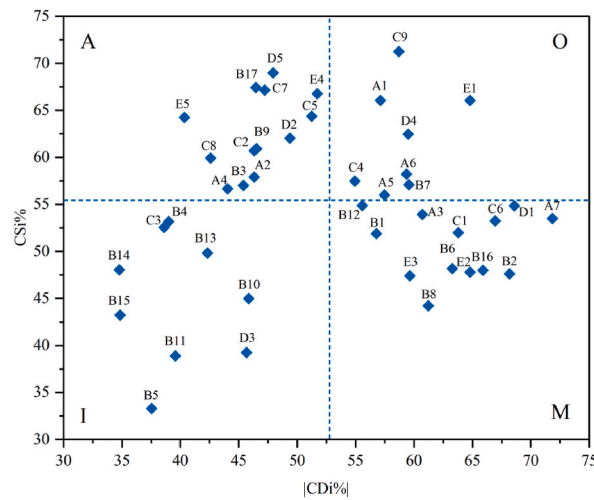


Fig. 5. Demand quadrant scatter diagram of Kano Model.

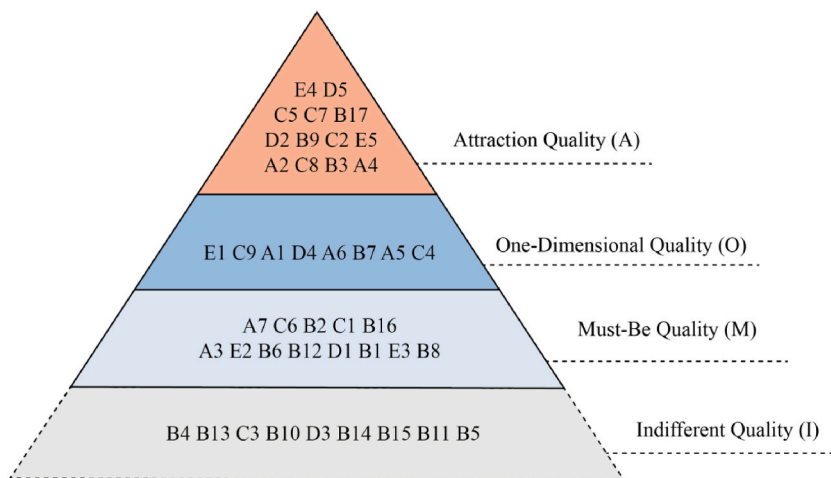


Fig. 6. The hierarchical tower of elderly care service platform demand.

what they can do, that is, they are not very sensitive to whether the elderly care information service platform provides more multi-dimensional life services, so most of the life service needs that can be completed alone belong to indifferent qualities.

4.6. Design of mutual aid elderly care service platform

The basic strategy of the function module configuration of the mutual aid elderly care service platform is: first, it should build a unified management information service platform, and the basic version can take We-Chat and other mature platforms as the carrier. Second, complete the function module in a separate app, and users can choose the basic version of mutual aid elderly care service or the professional version of elderly care service. For example, considering the different economic levels of various regions, there is also a certain gap in the types of services that can be provided. In some economically developed regions, the professional version of mutual aid elderly care services can better meet the elderly care needs. The basic version of the mutual aid elderly care platform should ensure the coverage of basic elderly care needs and appropriately meet some one-dimensional qualities. The professional version should further meet the attractive qualities of the elderly in the community based on the basic version and choose whether to meet some indifferent qualities according to the actual situation, as shown in Table 11.

Small program mutual care service platforms often have a higher coverage nationwide, and their functions can be realized only through the existing mature network platform as a carrier. Therefore, the basic version of the mutual care service platform should provide some basic life services and rehabilitation physiotherapy services to meet must-be qualities, such as food distribution, in-home medical service, and sick care. However, rehabilitation training, taking medicine, boiling Traditional Chinese Medicine, and exercise are highly important in safety and health requirements and related to physical health, so the basic version of the mutual care elderly

Table 11
Suggestions on facilities configuration of mutual aid elderly care service platform.

Service platform type	Function module
Small program basic version	food distribution, cooking, in-home medical, service sick caring washing hair, cleaning, pick up express, purchase living goods elderly tea party, red song club, chatting, square dancing, go to the park take medicine, boil Traditional Chinese Medicine, exercise, rehabilitation training (as appropriate)
App professional version	+instructions for using electronic products, voluntary activities, playing Tai Chi + cooking competition, party dating, haircutting, repair household, appliances +legal consulting, life skills learning, psychological counseling +bath, foreign language learning, craft making, movie appreciation, calligraphy practicing + musical instruments, traveling, pest controlling, walking the dog, feeding birds, mowing the lawn (as appropriate)

care service platform should be considered as one of the functional modules.

App professional mutual care elderly care service platform should first meet the must-be quality, and the service personnel participating in mutual care elderly care are more professional, which can be equipped with pre-job professional training. Due to the impact of regional economic development, the functional configuration of the professional mutual care elderly care service platform is more selective and has more configuration schemes. First, it further meets the one-dimensional quality. The configuration provides functional modules such as calligraphy practicing, craft making, exercise, and movie appreciation, and then provides functional modules such as playing Tai Chi, voluntary activities, party dating and learning life skills. Finally, choose whether to provide an attractive quality function module and the indifferent quality function module to be enjoyed according to the situation. For example, walking the dog and feeding birds can be considered to be configured in urban living communities, and moving the town and pest controlling can be considered to be configured in communities around small towns.

5. Discussion and implications

The main purpose of this study is to propose corresponding strategies for the design of a mutual aid elderly care service platform based on the actual service needs of the elderly, in order to promote further development of mutual aid elderly care and the sustainable transformation of social elderly care. The study concludes with the following types of qualities, example, 13 must-be qualities such as food distribution and sick caring, 8 one-dimensional qualities such as exercise and rehabilitation training, and 13 attractive qualities and 9 indifferent qualities. Thus, it can provide a reference for the design of mutual aid elderly care service platforms according to the importance and satisfaction of each demand. Therefore, this article has some guiding significance for promoting the development of mutual aid elderly care and the sustainable transformation of social elderly care by analyzing the actual needs of elderly care services and proposing strategies for the design of mutual aid elderly care service platforms.

By using Kano model to analyze the satisfaction and importance of various needs of community elderly care, it can be found that two service needs in must-be quality belong to safety and health needs, and are sick caring and in-home medical service, and then six belong to life requirements, two are learning and social needs, two entertainment needs and one spiritual needs. From the result distribution, it can find that in addition to the basic safety and health needs, most of them are concentrated in life services. In the previous relevant literature research, it is found that the community elderly care or the existing mutual aid elderly care is also basically focused on life services, which is consistent with this study. Among the one-dimensional quality services, three are safety and health requirements, namely, telemedicine, boiling Traditional Chinese Medicine, and take medicine services. It can be found that the elderly in the community has a high demand for health services. In addition, there are two other needs for learning and social interaction, and the rest of life requirements, spiritual needs and entertainment needs are one. According to the previous literature analysis, at present, only some elderly care institutions and health care centers can provide relatively perfect safe and healthy elderly care services, and there are few community life services [34]. Therefore, the design of the mutual aid elderly care service platform needs to take into account the basic functional configuration in terms of safety and health demand services. According to the analysis of attractive qualities, there are 13 attractive qualities in this paper, and most of them are concentrated in the amateur life of the elderly, which is also fully in line with Maslow's needs theory, that is, after meeting physiological and safety needs, people begin to pursue social needs, looking for belonging and love [35]. Therefore, in the context of the rapid development of the Internet [36], this paper proposes a new and reasonable classification of mutual aid elderly care service needs according to Kano model and provides theoretical support for the design of mutual aid elderly care service platform according to the order of must-be quality, one-dimensional quality, attractive quality, and indifferent quality. In general, the results of this study show that in future research on the sustainable development of mutual aid elderly care, it is necessary to accurately and reasonably classify the needs of mutual aid elderly care services, and give priority to the categories with high needs according to the actual importance, such as food distribution, sick caring, etc. mentioned in this study. In addition, this method can also be used in the design of various elderly care services, such as medical care services combined with Traditional Chinese Medicine [37], which jointly promote the sustainable development of elderly care in China.

6. Conclusions

In order to find a new way out for social provision for the aged, mutual aid elderly care can be a breakthrough to solving the problem of population aging, but the development is very slow in China. The social support for the elderly needs to consume a lot of

social resources, and pushing the social endowment to sustainable development is expected to relieve the pressure of the current social support for the elderly [38]. In this paper, the development of the existing mutual aid elderly care service is investigated and summarized by combining relevant literature, and the demand for community mutual aid elderly care service is specifically analyzed by using Kano models, and certain design ideas are provided for the design of mutual aid elderly care service platform according to the research results. So as to promote the sustainable use of mutual aid elderly care endowment resources. This article mainly through to the service requirements of a community mutual aid elderly care as well as the important category of satisfaction degree of sorting, mutual aid elderly care service platform design is put forward in combination with the existing platform as the carrier, such as WeChat and pay treasure to the platform, based on small program version and APP pro two functional configuration proposal, hope to put forward the proposal of mutual aid elderly care in the development of China. Increase the participation of the elderly and promote the sustainability of community elderly care. In future research, it is necessary to gradually increase the service type research on the basic needs of mutual aid elderly care, improve the quality of services for the elderly, promote the mutual integration of mutual aid elderly care and community support for the elderly, and provide an effective solution for China to cope with the acceleration of population aging.

Although this study proposes a design strategy for a mutual aid elderly care service platform that can effectively promote the sustainable development of social elderly care and provide fundamental support for the future development of mutual aid elderly care service platforms, there are also some limitations. First, the sample distribution of this study is relatively concentrated and cannot cover the entire country. Therefore, in further research, it is necessary to expand the scope of the survey to cover typical areas throughout the country as much as possible in order to obtain more comprehensive user needs and improve the design of the mutual aid elderly care service platform. Second, as the times change, the needs of the elderly are also changing. Therefore, it is necessary to regularly understand the changes in the elderly service needs and update the actual needs of the elderly in a timely manner on the platform. Finally, the literature review on mutual aid elderly care research has limited data on the design of mutual aid elderly care service platforms, which makes it impossible to conduct more comprehensive comparative analysis. However, this also highlights the importance of this study.

Author contribution statement

Zhengjun Zhou: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Ling Wang: Performed the experiments.

Yanbo Dong: Performed the experiments; Contributed reagents, materials, analysis tools or data.

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Data availability statement

The data used to support the findings of this study are available from the corresponding author upon request.

Declaration of interest statement

The authors declare no conflict of interest.

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