The sitting-type furniture about the introduction of PSS theory for the old

Nan Huang¹, Jinfeng xu¹, Peijie Ren¹, Haiyue Lai¹, Lanyue Fan¹, Jifei Hu², Zhigang Hong¹*

¹Forestry College, Si chuan Agricultural University, Cheng Du, Si chuan, 611100, China
²Executive deputy general manager, Yadu Furniture Co., Ltd, Cheng Du, Si chuan, 610000, China

¹Corresponding author’s e-mail: hmj365@sicau.edu.cn

Abstract: Under the general background of population aging, suitable products of the old have been developed, among which furniture of the old has also received people's attention. Combining with the product service system (PSS), this paper studies the sitting-type furniture suitable for the elderly according to the psychological and physiological particularity of the elderly, and discusses the mode of PSS applied to the sitting-type furniture suitable for the aged, so as to promote the development of the sitting-type furniture suitable for the aged and better service for the old.

1. Summary of PSS

1.1. Definition of PSS
PSS is fully known as product service system, which is an innovative design method integrating physical products and non-physical services. The purpose of PSS is to better meet customers' requirements according to their specific needs. Product service system focuses on customer satisfaction, not only on product design and service itself, but also on customer satisfaction. According to the needs of customers, not only to achieve by the product, but also to improve by the service, therefore the enterprise will focus on the value of the traditional simple product design and gradually transfer to the current integrated products and services to provide customers with complete solutions plan [1].

1.2. Classification of PSS
Product service system design can be simply divided into three types (UNEP, 2002; Bainesetal., 2006; UNEP 2009): Product-oriented services, result-oriented services, and use-oriented services. Product-oriented, can be subdivided into product-related, consulting. Result-oriented, can be subdivided into behavior management, pay per service unit and functional results. Use-oriented, can be subdivided into product leasing, product renting or sharing, and product sharing [2].
2. Sitting-type furniture of the old

2.1. The definition of sitting-type furniture of the old
The furniture that meets the old people's living scenes, such as starting, sitting, leaning, resting and so on, to satisfy the needs of the elderly to use the scene function and the common life pattern of the elderly, including to meet all kinds of sitting posture. With the deepening of the global aging problem, the problem of old-age care has become a growing concern.

2.2. Present situation and problems of sitting-type furniture for the old
2.2.1. Demand is high, supply is low
Now, China's aging degree is deepening, and the elderly population is increasing year by year. However, domestic research on furniture for the elderly start lately, and elderly furniture research is still in the enlightenment stage, which means the supply is insufficient.

2.2.2. Product homogeneity
In the domestic furniture market, there are very few furniture products designed for the elderly. Most enterprises mistakenly regard the furniture used by the elderly as the solid wood furniture of traditional style. The research on the furniture for the elderly is not in-depth, including the design that is not professional, and the style and function of the furniture are single. The particularity of the elderly in the use of furniture and the real needs of the elderly are not considered [3].

3. PSS demand for sitting-type furniture for the old

3.1. Feasibility of PSS for sitting-type furniture for the old
PSS adhering to the "user center" design principles. Before the design of the user in-depth research, design can really meet the needs of the user design, and improve the satisfaction of users. Using this system, the object of the research is not only to the users themselves, but also into the survey market, which understands the economic situation of today's society, and people's needs in order to know more in-depth analysis of what users really need and what social needs. As the basis of the design, the survey results further strengthen the design process and make the "user center" run through the whole process of the design to increase the social identity and brand awareness of the design [4].

During the process of solving the problem of elderly people's inconvenient sitting, the elderly is the core, while their children or other nursing staffs are the main related group. The final product plan is to design and develop the furniture for the elderly, and PSS will become the intermediary and bridge between the three, connecting the three to improve the social situation of the elderly in daily life, psychological mood and so on [5]. PSS used for furniture design, and more reflect the customer-centered design concept, which more reflects humanistic care. Positioning focus on the elderly group, and to create a more safe and convenient, dignified living environment. The design can also be based on the different physical conditions of the elderly, for a certain type, such as: health type, nursing type, disability type, customized design of different functions of the seat. Moreover, from the perspective of the psychological level of the elderly, not only the sitting furniture appearance, material and other factors, but also to make it out of the cold and sick feeling, so that the elderly use more comfortable and secure.

3.2. Model of PSS for sitting-type furniture for the old
3.2.1. Custom model
Furniture manufacturers sell products to customers, and customers enjoy product ownership and necessary services relating to the product [6]. This kind of customer is generally based on the family, and children but the elderly may not have the same needs (Table 1). There are also individual
differences between the elderly, and they are generally divided into self-care elderly, care-assistance elderly, and care-giving elderly according to their self-care ability, physical conditions, and the degree of need for help [7]. The enterprise directly connects with customers, and after designing the renderings, three views, etc., after understanding the basic requirements of customers, and then interview customers to negotiate the details of the scheme, determine the style, color, operation method and material. Different stages of elder have different needs of furniture. Therefore, the enterprise should submit the customer about the most suitable plan according to the elder's self-care ability, physical condition and the degree of assistance needed. For example, the self-care elderly can live independently without relying on other people and have a wide range of activities at home, so they only need to adjust the height of the sofa, and sit deep which can increase the hardness of the cushions on the sofa. Facilities require special local design of the furniture. For example sofa and chair must have armrests to facilitate the elderly to get up, and chairs 'height and wheelchairs are easy to dock, etc. So enterprises should provide customers with the most appropriate solutions according to the elder's self-care ability, physical condition and the degree of assistance that they need, which requires the caregiver to be taken into account in the design of the furniture. After the plan is determined, the contract price is calculated and the agreement is signed to pay the deposit. The enterprise produces the parts according to the final drawing. After a period of time, the workers come to install and receive the final payment [8]. Under this model, enterprises directly participate in the design, production, and maintenance of suitable furniture for the old, which can reduce a large number of intermediate links and save considerable time, energy and costs. Customers can buy products that match their expectations, without having to pay for designs beyond their needs. Some additional value-added services, such as regular maintenance and extended warranty time, can be set as additional paid content. This model can better understand the needs of the elderly and advocate in the design of suitable furniture for the elderly. Most elderly people will go through the above three stages, and the self-care ability is declining, while the special needs for furniture are increasing. Therefore, the replaceable modular design is also a solution.

| User category | Key needs |
|---------------|-----------|
| Elderly       | Get the care and companionship of their children; product is easy to learn |
| Children      | Able to comprehensively understand the physical conditions and mental needs of parents; improve the daily living function of the elderly |
| Government    | Better to have a professional service team; be used by most elderly people |

### 3.2.2. Rental model
Enterprises can produce some universal products, such as wheelchairs and lift sofas, which meets to customers with temporary needs. The content paid by customers is the right to use the product rather than ownership. Provide short-term rental services to potential target groups who are short-term or in need of such equipment. For such products, enterprises can launch products with different shapes, materials, and colors on the basis of ensuring the rationality of functions to meet users with different aesthetic needs and economic conditions. Customers can determine whether they need to extend, shorten the lease time or purchase the product to obtain ownership according to their needs, and can also obtain other related products and services by purchasing value-added services. Enterprises and customers need to agree on product-related matters, such as damage compensation, pre-purchase and return details, to avoid unnecessary disputes in the future. Adopting a direct business model by enterprises can reduce intermediate links, while companies have greater profit margins; consumers have a stronger willingness to choose such products. Enterprises can recover costs and profits by collecting rents and additional value-added services.

### 3.2.3. Shared model
Furniture manufacturing enterprises can cooperate with other enterprises or the government to put them in densely populated places such as old-age centers, parks, and squares, and arrange
corresponding suitable products for the elderly, or send their own service personnel to provide services. These places have complete supporting facilities and complete functions, which can meet the daily activities of the elderly. The elderly can obtain the right to use products, supporting facilities and services for free or for a fee. This model not only help companies establish a corporate image, but also collect user need in the process of use, and upgrade and update products and services. Such products should be concise and popular in shape, satisfying the aesthetics of most elderly people; in the elderly care institutions, the self-care level of the elderly is not the same, and the nursing staff is involved in the daily life of the elderly. Therefore, the functional design of furniture not only needs to consider the use needs of the elderly but need to care of the nursing staff. There is also a focus on the durability, economy, and ease of cleaning and maintenance of furniture in public places.

4. Conclusion
This paper introduces the PSS theory into the sitting-type furniture of the old, not only analyzes the feasibility of the furniture for the furniture of the PSS, but also discusses the model of the furniture for the furniture. Through these models, we can better design furniture, and achieve the win-win between the enterprises and customers.

Acknowledgments
Thank you for the design fund of Ya Du Furniture Co., Ltd. and the support for this project

References
[1] JiangPY,ZhuQQ,ZhangDH. (2011), Industrial product service system and its research status, computer integrated manufacturing system, 17:1-2
[2] LiuCH, ZhangQS, WangZ. Status and intelligentization of product and service system classification [A]. Vitality research, 1004-2768 (2018) 01-01-01-41-04.
[3] MaXX, Research on furniture age-appropriate design in home-based old-age care model [D]. Beijing forestry university, 2016, (06).
[4] HuangXF,OuyangXX, Designing for Left-behind Children: Design Research Based on Product Service System. J. Journal of Shandong Institute of Arts and Design, 2017 (6) :16-20.
[5] FuQ,WangS.(2016)Service design and product service system.Industrial design,(05):63-64.
[6] LiXL. (2013) Furniture Design Development for Older People under Different Pattern of Endowment. J. Furniture Interior Design, 1: 16-17.
[7] LuoS. (2016) Research on the design of furniture suitable for the aged. J. Journal of Mudanjiang University, 6:30-32.
[8] YuanF, FuYC. (2019) On the contemporary prevailing custom furniture. J. Art Science and Technology, 2:10-11.