Analysis of Hot Spots and Trends in China's Shopping Aging Research Based on Knowledge Mapping

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Abstract. With the deepening of China's aging and the rapid development of silver hair economy, the shopping trend of the elderly population is changing towards online, and interactive aging adaptation is slowly developing into a research hotspot. In order to study the research hotspots, development process and future trends in the field of senior shopping, and to provide reference for the development of senior shopping-related industries. The article borrows CiteSpace6.R6 to visualize and analyze the annual publication volume, keywords, institutions, authors and other data of the sample literature from 2003 to 2023. Thematically, it can be focused on four related themes: the aging design of shopping products, the analysis of shopping psychology and characteristics, the analysis of shopping space and behavior, and the analysis of shopping risks and countermeasures. The research on target group segmentation, aging of shopping methods, changes in shopping methods, and consumption risks are the key research directions in the future.

Keywords: Shopping for seniors,smart shopping, interactive aging, quantitative analysis.

1 Introduction

At present, the world population has entered the stage of aging, focusing on the problem of old age and bridging the digital divide has become the focus of discussion, which is more significant after the COVID-19 pandemic[1] below. However, the development process of Internet and silver hair industry in different countries is not synchronized, and the analysis of factors influencing the consumption of the elderly also has its own focus[2][3]. China has entered the aging society since 1999 and is now in the stage of accelerated aging. In recent years, the development of the Internet has led to changes in the form of shopping, and the choice of shopping methods for elderly consumers has become diversified. However, the acceptance of online shopping among the elderly varies, and many of them face different degrees of obstacles. Therefore, research on the development of shopping and aging of the elderly has attracted extensive attention from scholars, but from the literature review, there is a lack of relevant literature in this field, and the research perspectives and focuses are relatively dispersed, lacking systematic summarization and comprehensive sorting. In this paper, we use CiteSpace econometrics software to systematically sort out and interpret the literature related to shopping for the elderly in China, analyze the development path of the elderly's shopping mode, study the elderly's shopping problem from a macro perspective, and put forward the relevant strategies of ageing-adapted shopping.

2 Data Sources and Screening of the Literature on Shopping for Older Adults

2.1 Date source

The data source was an advanced search of all journals included in the China Knowledge Network database (CNKI) platform as the data source. Literature was searched using the target user ("older people") and specific behaviors ("shopping") as keywords, and the search period was based on the last twenty years as a cycle, ranging from January 2003 to March 2023. Considering the development of shopping styles and the inclusion and relevance of the terms, the inclusion of "older people" was also replaced with "aging" and "aging in place", "shopping" was replaced with "buying" and other relevant words were used as subject terms for alternate search. In order to exclude irrelevant interferences, the sources, abstracts and keywords of the literature were used as secondary references during the screening process, and conferences, newspapers, individual academic achievements, unauthored literature, and literature with weak relevance and low influence were manually excluded, resulting in a final total of 204 pieces of available literature data.

3 Data Analysis and Interpretation of Shopping Literature for Older Adults

3.1 Analysis of Research Institutions and Authors

According to the CiteSpace Research Institutions Collaboration Network Analysis Mapping, it is possible to analyze the collaboration network between high-producing institutions and each institution in the field of subject words. The overall analysis shows that most of the institutions in China about research targeting subject words are colleges and universities, and most of the extramural institutions are research institutes and hospitals. The institutions are relatively independent and do not cooperate closely enough, and have not yet formed a better cooperation network.

From the Author Collaboration Network Knowledge Graph it is possible to present the relationships of scholars within the subject matter domain. The author graph contains a total of 253 nodes and 185 connecting lines. According to the statistics of the number of publications, the author with the highest number of publications is Hong Yang with 5 publications. Scholars from Northeastern University, Liu Chang and Guo Fu, and scholar from Qingdao University of Technology, Liu Weilin, formed a better cross-institutional cooperation network in related research.However, overall, there are fewer collaborative networks formed among scholars, and most of them are intra-institutional collaborations.

3.2 Analysis of keyword research hotspots

3.2.1 keyword Anaiysis

The co-occurrence study of high-frequency keywords reveals the current research hotspots and connections between multiple hotspots in this direction. The graph (Figure 1) contains 267 nodes, 408 lines, network modularity index Q value = 0.8045 (greater than 0.3), and network

homogeneity S value = 0.9671 (greater than 0.7), which indicates that the network structure of this graph is reasonable and representative of the research hotspots in the field of shopping for the elderly. In order to avoid keyword repetition, the near-synonyms were merged, and the centrality was calculated by extracting the first 15 keywords to produce the following table (Table 1).

According to Figure 1 and Table 1, it can be seen that the elderly, aging, and online consumption are high-frequency keywords, appearing 75 times, 18 times, and 17 times, respectively. The keyword with the strongest closeness is "the elderly", with a centrality of 0.82, because this term is the target group of this field, which appeared for the first time in 2014, and it is strongly associated with many other keywords as shown in the graph. "Aging" is often a topic context in the literature, and many studies are centered on this context. The term "online consumption" first appeared in 2011, and since online shopping and aging are both major trends in socioeconomic development, the term "online consumption" has maintained a high level of research intensity since its emergence.
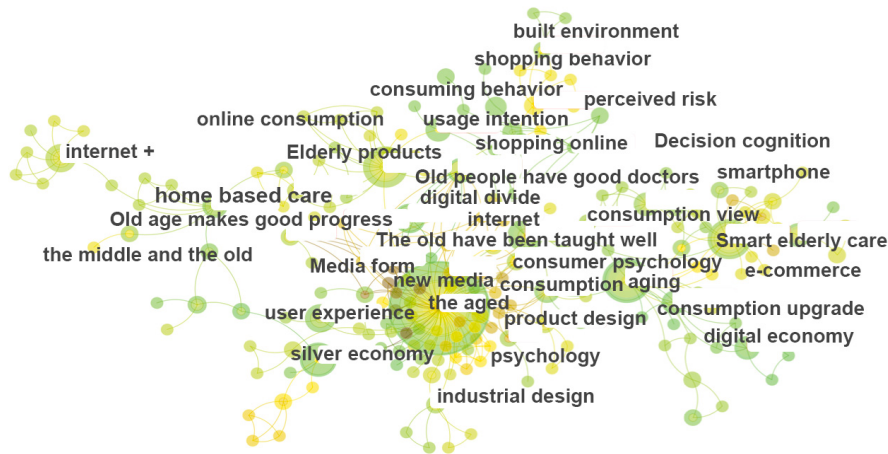

Fig. 1. Co-occurrence mapping of high-frequency keywords in the senior shopping space

Table 1. Analysis of the top 15 high-frequency keywords for seniors shopping

Serial Number	Frequency	Centrality	Earliest Year of Occurrence	Byword
1	75	0.82	2004	Older People
2	18	0.21	2014	Aging
3	17	0.23	2011	Online Consumption
4	14	0.15	2010	E-commerce
5	9	0.07	2009	Internet
6	9	0.07	2004	Eilver-hair Economy
7	7	0.10	2021	Digital Divide
8	6	0.04	2017	User Experience
9	6	0.06	2016	Internet+
10	5	0.05	2019	Home-based Care

3.2.2 Keyword Cluster Analysis

The top 12 clusters were screened by keyword clustering to get the following chart (Figure 2), and the top ten clusters were plotted according to Figure 2 (Table 2). As can be seen from the chart, the research hotspots of shopping for the elderly are centered around many keyword clusters. According to the presented clusters and the reading of the literature can be divided the research into four major themes: shopping product aging design, shopping space and behavior analysis, shopping psychology and feature analysis, and consumption risk and countermeasure analysis.

1.Shopping Product Design for Aging

Shopping product aging for the elderly is divided into physical product aging and interactive product aging. A review of the literature reveals that product aging is mainly focused on shopping carts. On the one hand, scholars have designed the application of shopping carts for the elderly based on existing principles and theories, for example, Chen Lijun [4] will be the combination of UCD and TRIZ theory in order to explore the user needs, to guide the design of the elderly shopping cart. On the one hand, new design principles are proposed for shopping cart aging, for example, Xia Yunfei et al [5]proposed the design principles of shopping cart for the elderly based on the theory of brain activity hierarchy. E-commerce aging mainly focuses on mode aging and shopping interface aging, such as Lu Yiping [6]multi-dimensional comprehensive consideration of community fresh food e-commerce application aging mode. Yun Zhe et al [7] summarized the interface design principles and design points with the orientation of technology for the elderly.

2.Shopping Space and Behavior Analysis

etermines that their demand for shopping space is necessary to be included in commercial planning considerations. The research on this topic mainly starts from the spatial perspective to analyze the interaction between commercial forms and shopping of the elderly [8], so as to form an understanding of the spatial characteristics of the shopping behavior of the elderly in order to improve the planning of shopping space and supporting facilities in cities and towns. Because of the late development of research in this direction in China, the current research on this topic is usually carried out for specific cities, which are generally selected as more economically developed coastal areas. For example, Cao Lixiao et al [9] comparatively analyzed the spatial patterns of daily shopping activities of the elderly in different neighborhoods in Shanghai, and explained the differences in terms of changes in commercial space and retail formats, accessibility to commercial facilities, and the shopping decision-making process of the elderly.

3.Shopping psychology and profiling

This theme mainly analyzes the psychological characteristics and needs of the elderly, and provides corresponding marketing strategies to the related silver hair industry. A reading of the literature reveals slightly different perspectives of analysis. Part of the scholars analyze the general shopping psychology of the elderly under the universal shopping scene, such as Tian Lili [10], who puts forward corresponding marketing strategies on how to activate the silver-hair market according to the transformation of the psychological characteristics of the elderly. A part of scholars focus on a shopping scene for targeted psychological analysis. For example,

Yu Fangyan [11] analyzes the consumption psychology and behavior of the elderly from the elderly tourism scene, and puts forward design suggestions to stimulate the consumption of elderly tourism.

4.Shopping Risk and Countermeasure Analysis

The purpose of the study on shopping risks and countermeasures is to improve the quality of consumption of the elderly and promote the healthy development of the silver hair market [12]. This theme analyzes the shopping risks of the elderly in the process of shopping and proposes a path of avoidance. On the one hand, scholars summarize the common consumption traps of the elderly in order to build the risk awareness of the elderly, and on the other hand, they explore the causes behind the elderly's vulnerability to deception as well as countermeasures research. For example, Guan Guifeng [13] focuses on health lectures, free repairs, and the temptation of high profits and high returns according to the consumer complaints of the Beijing Municipal Bureau of Industry and Commerce in 2017, and provides targeted reminders to elderly consumers. Wu Yongchun et al [14] analyzed the pre- and post-shopping psychology of elderly travelers for the consumption traps of tour groups, and proposed that enhancing the rational consumption and rights awareness of elderly travelers can effectively curb the vicious development of low-priced tours and shopping groups.
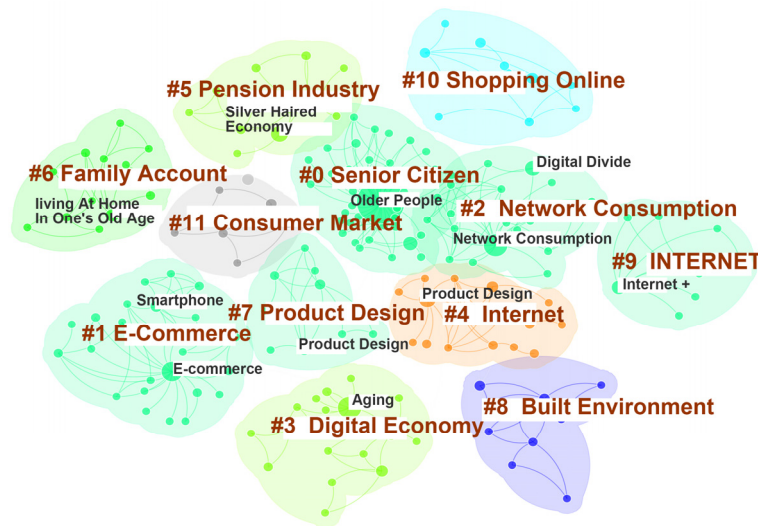

Fig. 2. Keyword Clustering Co-occurrence Mapping in the Elderly Shopping Domain

Table 2. Shopping Clusters for Seniors

Serial Number	Clustering Topic	Silhouette	Highly Relevant Keywords
#0	Older People	0.987	User Experience; E-commerce Platforms; Older Adults
#1	E-commerce	0.94	Countermeasures; Smartphone; Interface Design
#2	Online	0.971	Online Shopping; Impulse Spending;

	Consumption		Cybersecurity Awareness
#3	Digital Economics	0.917	Community Business; Consumption Upgrade; Population Aging
#4	Internet	0.973	Mobile Payments; Cognitive Abilities; Integration
#5	Pension Industry	0.993	Elderly Population; Silver Economy; Silver Industry
#6	Affinity Account	0.976	Interaction; Smart Aging; Aging in Place
#7	Product Designs	0.978	Fuzzy Evaluation Method; Senior Shopping Carts; Color Schemes
#8	Built Environments	0.964	Neighborhood Settlements; Healthy Aging; Living Streets
#9	Internet+	0.917	Cultural Feedback; Innovative Development; Fitness Consumption

3.3 Analysis of the evolutionary path of emergent words

A list of the top 15 emergent words in terms of emergence intensity was plotted based on the emergent words generated by CiteSpace (Table 3), and the subject words appeared to change over time, showing their development trajectories and research frontiers. According to the emergence intensity values, "online consumption" in 2015, "aging" in 2019, and "digital divide" in 2021 are key nodes for keyword emergence. Nodes. Based on the time of emergence, senior shopping research can be categorized into three phases.

The first phase is from 2004 to 2013, which is mainly centered on the research of offline shopping for the elderly, with the keywords of "elderly population", "consumer psychology" and "consumer market" discussed. The main keywords discussed are "elderly population", "consumer psychology" and "consumer market", and the content of the research is mainly to analyze the consumption characteristics and needs of the elderly in order to provide suggestions for the development of the silver-hair economy. Since 2012, scholars have initially explored the possibilities and problems of online consumption by the elderly. At this time, e-commerce for the elderly is still an emerging industry in China.

The second stage is 2014-2018, which is the preliminary exploration stage of online smart shopping for the elderly. In this period, with the popularization of online shopping and the development of 5G technology, the research on online shopping for the elderly has increased, and the keywords of high intensity are "shopping behavior", "e-commerce", "online consumption" and "smartphone". The keywords of high intensity are "shopping behavior", "e-commerce", "online consumption" and "smartphone". Some scholars analyze the influencing factors of online shopping behavior of the elderly, and some scholars explore the online shopping mode.

The third phase, from 2019 to the present, is the research phase of ageing shopping in the face of the digital divide, which mainly discusses several high-intensity keywords such as "aging", "digital divide", "aging in place", "Internet", etc. "digital divide", "ageing at home", "Internet" and other high-intensity keywords. Among them, the term "aging" has the strongest mutation rate, appearing in 2019-2020. 2020, the State Council issued the "Implementation Plan on Effectively Resolving the Difficulties of Older People in Using Intelligent Technology", and scholars began to analyze and bridge the digital barriers encountered by older people using

smart shopping terminals. Among them, mobile payment adaptation and interface optimization and design have become hot topics.

Table 3. Keyword analysis of 15 mutability before shopping in the elderly

serial number	byword	dissociation	Starting year	Ending year
1	Older people	1.25	2004	2006
2	consumer psychology	1.21	2011	2013
3	consumer market	1.21	2011	2013
4	Elderly population	1.24	2012	2014
5	shopping behavior	1.81	2014	2015
6	e-commerce	1.62	2014	2016
7	online consumption	2.7	2015	2017
8	E-commerce platform	1.11	2015	2016
9	smartphone	1.21	2018	2021
10	aging	2.93	2019	2020
11	living at home in one's old age	1.84	2019	2020
12	Internet	1.56	2020	2023
13	digital divide	2.73	2021	2023
14	mobile payment	1.31	2021	2023
15	consumer upgrading	1.16	2021	2023

4 Trend Outlook

Combined with the previous analysis, the topics related to shopping for the elderly in China will be deepened in the following four directions in the future.

1.Crowd Analysis Refinement

When the current literature studies the target group, most of them only analyze the general characteristics of the elderly group. According to the previous study, the heterogeneity of elderly consumers is obvious, and elderly people at different age stages have different needs for shopping. In the future, scholars will more often conduct population segmentation for the elderly group, personalized analysis of the needs of the elderly group to meet their diversified shopping needs, and break the "standardization" and "stereotypes" in the study of shopping for the elderly.

2.Changing Shopping Patterns

With the promotion of the policy of active aging, the concepts of "aging at home", "community aging", "intelligent aging", "consumer aging "and other concepts continue to emerge, and gradually develop many different new aging models. At the same time, the shopping aspect of the elderly will also change with the changes in the aging mode and technology enhancement to continuously carry out the shopping mode iteration. For example,

the community business model based on O2O, which has been studied more recently. The use of online integration of pension resources, narrowing the scope of offline services, in order to meet the demand for socialized pension services. The future of aging e-commerce will be differentiated from traditional integrated e-commerce, will no longer be limited to a single network model, but to do a combination of online and offline, so that the elderly in the enjoyment of the convenience of online shopping at the same time to enhance the offline service experience.

3.Shopping for the Aging

The aging industry will be more networked in the future, so how to break the digital divide in shopping to enhance the shopping efficiency and willingness of the elderly population will continue to generate research heat in the future. The aging-friendly design of shopping apps will not only emphasize the visual aspect, but also study the interaction flow, information architecture, interaction details and other aspects. Interaction aging will be analyzed based on the physiological characteristics and interaction habits of elderly users, and the interaction pain points of online shopping for the elderly will be improved, such as increasing fault tolerance in interaction, enhancing step-by-step guidance and operational feedback, etc., so that the shopping interface will be more in line with the mental model of elderly users. In addition, the future of shopping for the elderly will be based on big data, cloud computing and other technologies to locate user needs, through scientific and technological means to break the information shackles.

4.Consumer risk prevention and control

As the elderly are prone to impulsive consumption and gullibility, and the relative complexity of online shopping has brought about problems such as privacy leakage, after-sale inconvenience, and difficulty in defending their rights. Therefore, while discussing shopping for the elderly, the issue of consumer risk should not be ignored. Existing studies have analyzed the scams from the perspective of popularization of science and strengthened the guidance to improve the individual's awareness of fraud prevention and the ability to perceive risks. In the future, it is necessary to enhance the protection of the rights and interests of elderly consumers by strengthening supervision and law enforcement and improving laws and regulations from a macro governmental perspective.

5 Summarize

we used CiteSpace to analyze the research literature related to shopping for the elderly in China from 2003 to 2023 in terms of the number of annual publications, institutions, authors, keywords, clustering, and emergent words. In terms of the annual publication volume, the number of related studies began to increase year by year from 2014, and will maintain a rising trend in the future. The research institutions are located in many universities and research institutes, and the institutions are relatively independent from each other, and the cooperation relationship is weak. Through keyword clustering, the research hotspots can be divided into four major themes: ageing design of shopping products, analysis of shopping space and behavior, analysis of shopping psychology and characteristics, and analysis of consumption risks and countermeasures. From the research trend, with the development of Internet

technology and the deepening of human-centered design, the research on the segmentation of the target group, the aging of the shopping mode, the change of the shopping mode and the consumption risk is the key research direction in the future.

In addition, in the analysis, it was found that the theme word research contains management, economics, and other disciplines, and there is not a strong intersection between the disciplines, and in the future, multi-disciplinary cross-penetration should be realized, and the breadth of the research can be further broadened.

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