สถาบันวิทยาการจัดการแห่งแปซิฟิค
PACIFIC INSTITUTE OF MANAGEMENT SCIENCE

The Effect of Perceived Value, Brand Image, and Service Innovation on Student Usage of Mobile Services in Anhui Province

Xinhong Li, and Chalermpol Tapsai
Program in Management Innovation, The Graduate School, Suan Sunandha Rajabhat University,
Email: 741361118@qq.com

Received June 20, 2024 Revise August 13, 2024 June 22, 2024 Accepted August 31, 2024

Abstract

This study explores the use of mobile health services by Chinese students and the factors affecting their satisfaction. It focuses on service innovation, perceived value, and brand image in their behavior. The research aims to develop a factor model examining these factors, test this model, explain the relationship, and establish new criteria for service innovation. The sample size is 385 students from 22 universities in Anhui Province, including Fuyang. The target audience consists of students at two prestigious Chinese institutions: Anhui Agricultural University and Fuyang Normal University. These institutions promote research and innovation, fostering a culture of entrepreneurship among students. The study concludes with a systematic summary of the main conclusions, suggestions for improving mobile medical use intentions, and a critique of the research's shortcomings. This study explores the use of mobile health services by Chinese students and the factors influencing their satisfaction. It focuses on service innovation, perceived value, and brand image in their behavior. The study finds a strong positive correlation between service innovation, perceived value, branding image, and mobile health service characteristics, boosting credibility. Factors such as user readiness, willingness to use, healthcare professionals' role, perceived usefulness, ease of use, and accessibility were found to affect user satisfaction. A MHS survey also showed positive correlations between cognitive, emotional, and action-oriented behaviors. A factor analysis model for service innovation, branding, and mobile health care was validated, showing that these variables strongly correlated with mobile health service characteristics. Usability, perceived benefits, and quality determined system success. Research should be affordable and accessible, and understanding consumer behavior and perceived value is crucial. The study shows that branding image indirectly affects performance using the Sobel test, suggesting that effective marketing requires a deep understanding of consumer behavior and value.

Keywords: Mobile health services; Perceived value; Service innovation; Branding image

Introduction

The mobile health services market in China, valued at 48.8 trillion yuan in 2015, has seen significant growth since the 1960s, improving patient satisfaction and physician productivity (Organisation & MHealth, 2018; Zheng, He, Huang, Chen, & Liao, 2018). Service innovation is crucial for economic expansion and competitiveness, with investments in telemedicine, precision medicine, wearable devices, and health big data. The "Internet +" and "Healthy China" concepts have led to investments in telemedicine, precision medicine, wearable devices, and health big data. The growth of e-health has reduced healthcare costs, improved health outcomes, and increased resource allocation efficiency. Policymakers must understand the four dimensions of service innovation, including the emergence of a novel service concept, intangible attributes, innovative problem-solving approaches, and changes in interaction between service providers and clients. This understanding is based on the work of McKay et al. (2018) and Tian et al. (2019).

Service innovation is a transformative process that aims to deliver value to customers and generate revenue for the company. It involves analyzing customer experiences, prioritizing factors, collecting data, targeting loyal customers, segmenting the client base, and delivering value. (McKinsey Quarterly, 2015; Michel, S., 2020).The Customer Star concept helps organizations align their decision-making and operational activities with customer desires and preferences. Service innovation involves achieving managerial objectives, evaluating customer experiences, prioritizing factors, collecting data, focusing on loyal customers, segmenting the client base, and providing value-added offerings. In the contemporary market, businesses must consistently strive to enhance their customer experience to differentiate themselves from competitors. (McKinsey Quarterly, 2015; Michel, S., 2020).

The collection of client data is crucial for understanding their needs and preferences, enabling firms to customize their offerings. Focusing on loyal clients and segmenting the client base can boost conversion rates and revenue. A receptive mindset is essential for providing value that goes beyond expectations. The convergence of the Internet and medical services has led to advancements in medical models, cost reduction, treatment efficiency, resource allocation optimization, and improved health outcomes. The mobile healthcare sector has seen significant growth since 2015, relying on technological innovation and the integration of cutting-edge technologies like smartphones, wearable devices, and cloud big data. (Itani et al., 2019; Michel, S., 2020).

Mobile health services (MHealth) are a paradigm shift in computer-based health interventions, enhancing disease management and patient engagement. The COVID-19 pandemic has accelerated the development of virtual healthcare services, but challenges remain, such as robust identity authentication mechanisms and efficient medical insurance payment systems. The Chinese government's privatization of healthcare services has led to rapid growth in the private sector, particularly in the dental service industry. Service innovation, brand image, perceived value, and mobile health service use are crucial for maintaining customer loyalty. Performance expectations and product quality are essential factors influencing user behavior intentions. (Kim, Sankar, Wilson, & Haynes, 2017).

This study aims to determine the relationship between students' opinions on service innovations and the use of mobile health on the behavior of Chinese students. Understanding user acceptance behavior can help improve the effectiveness and efficiency of mobile medical services in China. (Alalwan et al., 2017) Factors affecting the acceptance of mobile medical services include privacy concerns, trust, and service provider type. By offering personalized medical

services, optimizing product design, and creating intuitive interfaces, service providers can encourage prolonged engagement and contribute to a more equitable distribution of medical resources.

Research Objectives

This study investigates service innovation, perceived value, and brand image in the use of mobile health service in the behaviour of Chinese students, utilising relevant theories. The following aspects will be investigated in this study using a combination of quantitative studies:

1) To create the factor model of perceived value, brand image and the use of mobile health service.

2) To test the model of service innovation, perceived value, brand image, and the use of mobile health services among Chinese students.

3) To explain the relationships between variables that affect the use of mobile health services.

4) To create new criteria for the development of service innovation to the use of mobile health services among Chinese students.

Research Hypothesis

The study reveals a significant relationship between service innovation, perceived value, and brand image, with brand image acting as a mediator, influencing the use of mobile health services.

H1: Service innovation has a significant impact on the use of mobile health services.

H2: Brand image has a significant impact on the use of mobile health services.

H3: Perceived value has a significant impact on the use of mobile health services.

H4: Brand image has a significant impact on service innovation

H5: Brand image has a significant impact on perceived value

H6: Service innovation has a significant impact on perceived value.

Research Methodology

This study explores the use of mobile health services by Chinese students and the factors affecting their satisfaction. It aims to develop a factor model to examine service innovation, perceived value, and brand image. The study targets 385 students from 22 universities in Anhui Province, including Fuyang, with a sample size of 385. The target audience includes students at Anhui Agricultural University and Fuyang Normal University, prestigious Chinese institutions that promote research and innovation. The study concludes with a systematic summary of main conclusions, suggestions for improving mobile medical use intentions, and critiques of the research's shortcomings.

This study investigates factors influencing mobile medical service usage, focusing on the health belief model. It uses literature research and a mixed method approach, combining qualitative

and quantitative methods. Content analysis and structural equation modeling were used to support the quantitative analysis. Small-scale user interviews were used to supplement the research. Data was collected through questionnaires and analyzed using SPSS and AMOS software. The study concludes with a systematic summary, suggestions for improving mobile medical use intention, and a critique of its shortcomings.

The research design is illustrated in Figure 1

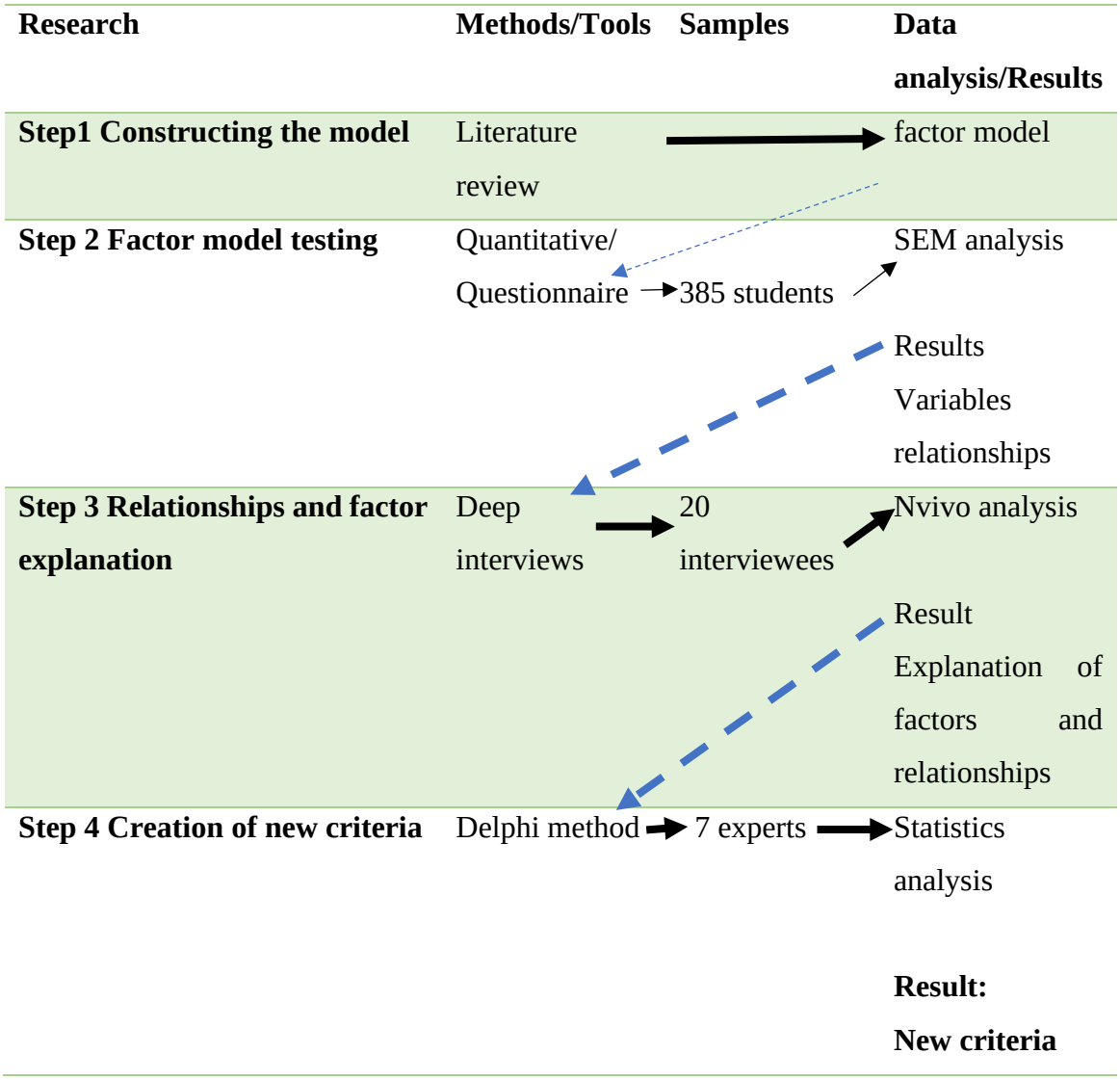

Figure 1 Research Design Framework

Research Results

This study investigates the use of mobile health services by Chinese students, focusing on factors influencing their behavior, the relationship between brand image and service innovation, and guidelines for improving service. The research aims to create a factor model, test this model,

explain the relationships between variables affecting mobile health service use, and develop new criteria for service innovation development among Chinese students.

Research objective 1) To create the factor model of perceived value, brand image and the use of mobile health service.

Research Step 1: Constructing the model

Research	Methods/Tools	Samples	Data analysis/Results
Step1 Constructing the model	Literature review	→	Factor model

Figure 2 The research step involves constructing the model.

Service innovation involves developing new ways to deliver value to customers through improvements in processes, products, and experiences. It includes mobile health service innovation, which improves patient outcomes through user-friendly interfaces and efficient healthcare solutions. Challenges include data security, privacy, training, and provider support.

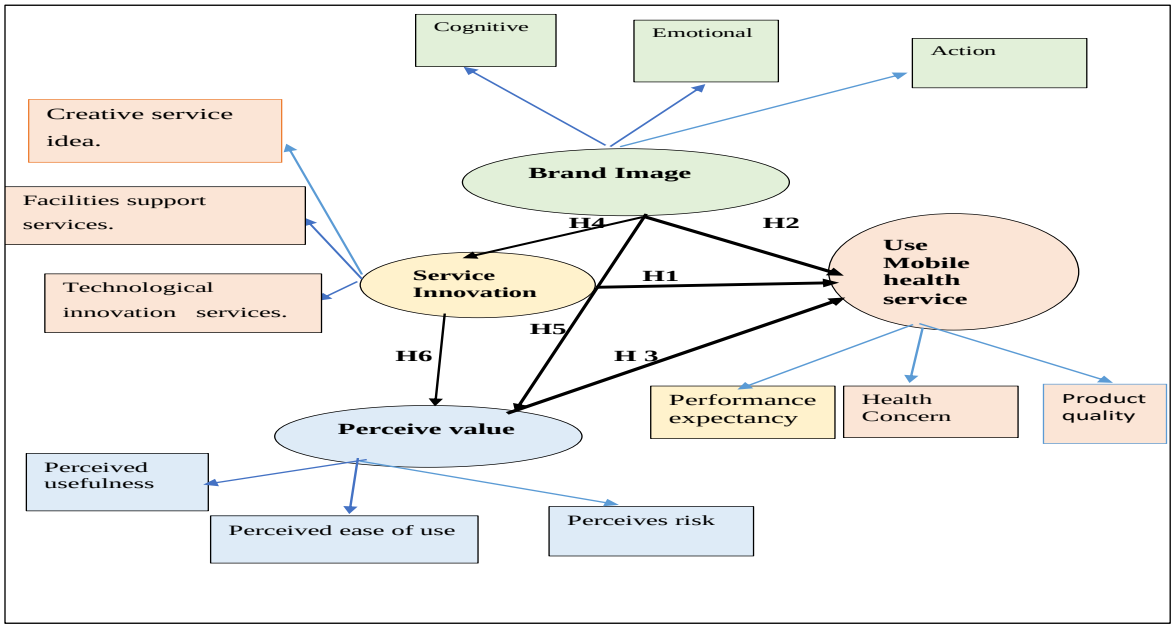

Figure 3 Summary of constructing the model

According to the previously mentioned conceptual model, after thoroughly examining the literature from the book, we constructed the model. There is an extensive body of research and articles. We have discovered that we can use this model to further examine various factors.

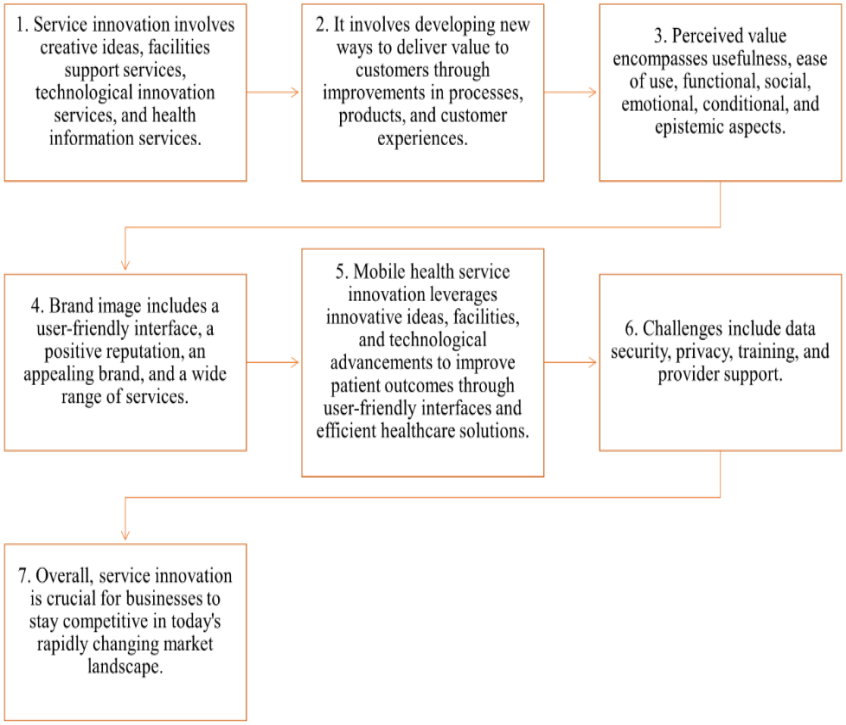

Figure 4 Summary of Variable Details

The study reveals user readiness, willingness to use, healthcare professionals' role, perceived usefulness, ease of use, and accessibility as strong predictors of adoption in mobile health services. Service innovation in mobile health services improves patient outcomes, leveraging innovative ideas, facilities, and technological advancements, but faces challenges like data security, privacy, training, and provider support.

Research objective 2) To test the model of service innovation, perceived value, brand image, and the use of mobile health services among Chinese students.

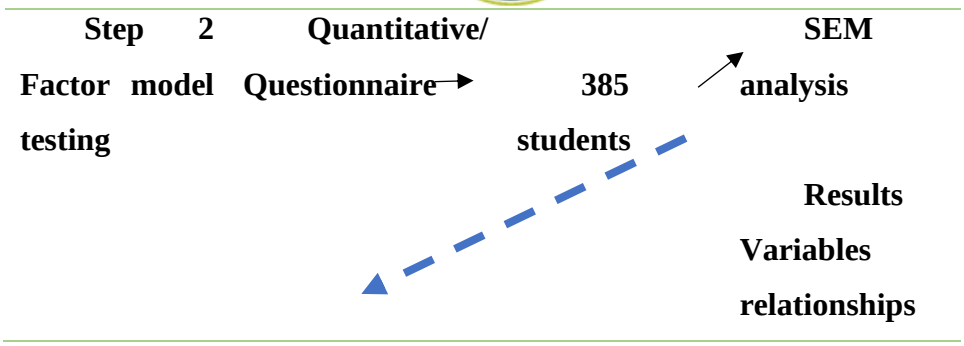

Figure 5 Test the model of factors

The survey involved 385 students aged 21-25, with 39.0% aged between 20 and 26. The majority were aged 21-25, making up 39.0% of the total sample. The age group aged 26 and older represented 22.0%, indicating a significant portion of young adults. The data may be skewed towards younger adults. Over a four-year period, the data showed a distribution of specific categories, with a slight decrease in percentage each year. The largest percentage was 25.2% in Year 1, then decreased to 24.7% in Year 4.

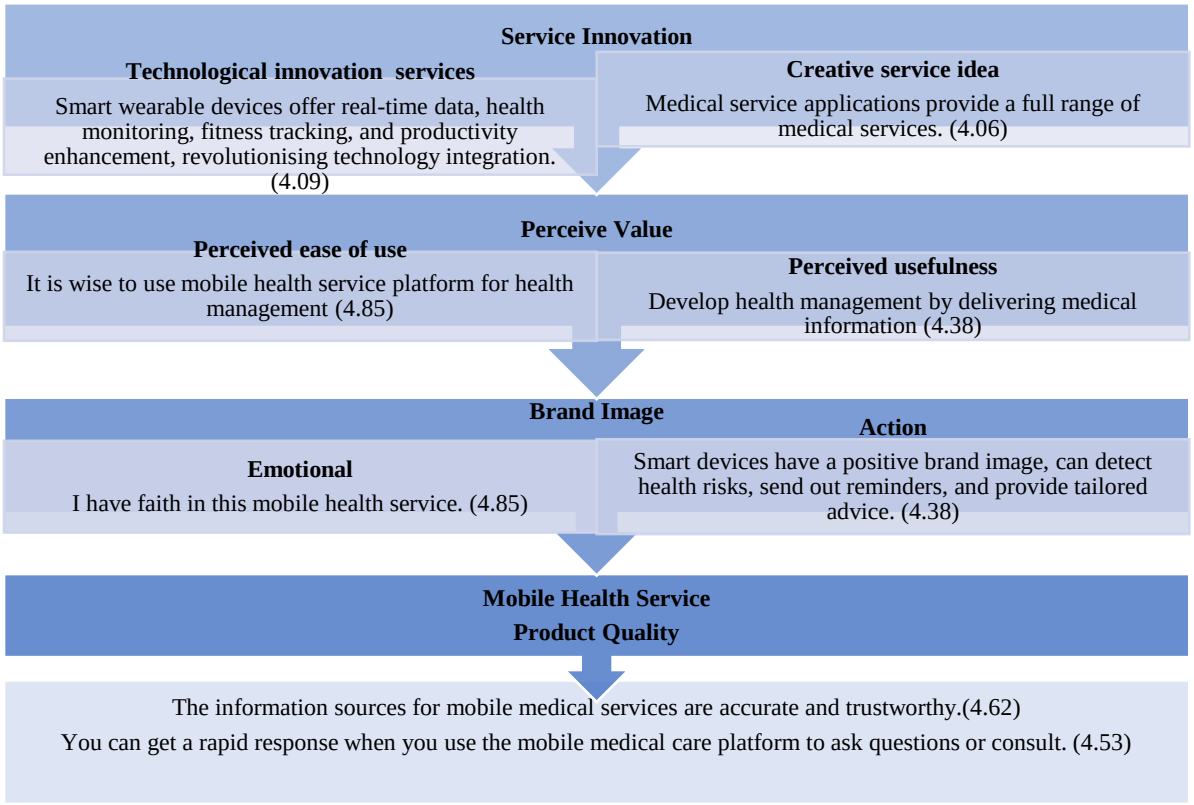

Figure 6 Values of variable levels

The study examined service innovation questionnaire data on creative service ideas, facilities support services, and technological innovation services. Creative services were most popular, followed by facility support and technological innovation. The study also found a significant relationship between perceived usefulness, ease of use, and risk, suggesting these factors can affect user satisfaction. A Mobile Health Service (MHS) survey revealed positive correlations between cognitive, emotional, and action-oriented behaviours. The study used factor analysis to find a strong positive correlation between service innovation, perceived value, branding image, and mobile health service, boosting credibility. Using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity, the data showed 18.677 total variance and 72.450% cumulative percentage. The study's findings suggest these components explain a significant portion, suggesting further research could yield meaningful conclusions.

The study validated a factor analysis model for service innovation, branding image, and mobile health care variables. Researchers found a strong correlation between these variables and mobile health service characteristics. The system's usability, perceived benefits, and quality influenced its success. The study suggests that research should be cost-effective and accessible.

We use AMOS21.0 to analyse the structural equation model and calculate the critical ratio (CR) and path coefficient. The path coefficients and critical ratio values show that SI) and (BI) affect perceived value. The strong correlation between SI, BI, and PV emphasises the importance of understanding consumer behaviour and perceived value. The study uses the Sobel test to show that branding image has a strong indirect effect on performance. According to the findings, effective marketing strategies require a thorough understanding of consumer behaviour and perceived value. Further research could examine how different marketing strategies can use these elements to influence consumer perceptions and purchases. The study uses Sobel's Z test to examine service innovation's indirect impact on performance through branding. The variables' z-value of 9.720 and P-value of 0.000 demonstrate a strong indirect effect on performance.

The study reveals that service innovation and brand image significantly influence the use of mobile health services among Chinese students. Factors like accessibility, cultural views, and personal preferences influence their choice. To increase adoption, healthcare providers should focus on service innovation, user experience, and data security. Wearable technology adoption depends on its ability to track health and provide accurate information. A strong brand image can help Chinese students trust mobile health services and stand out in a crowded market.

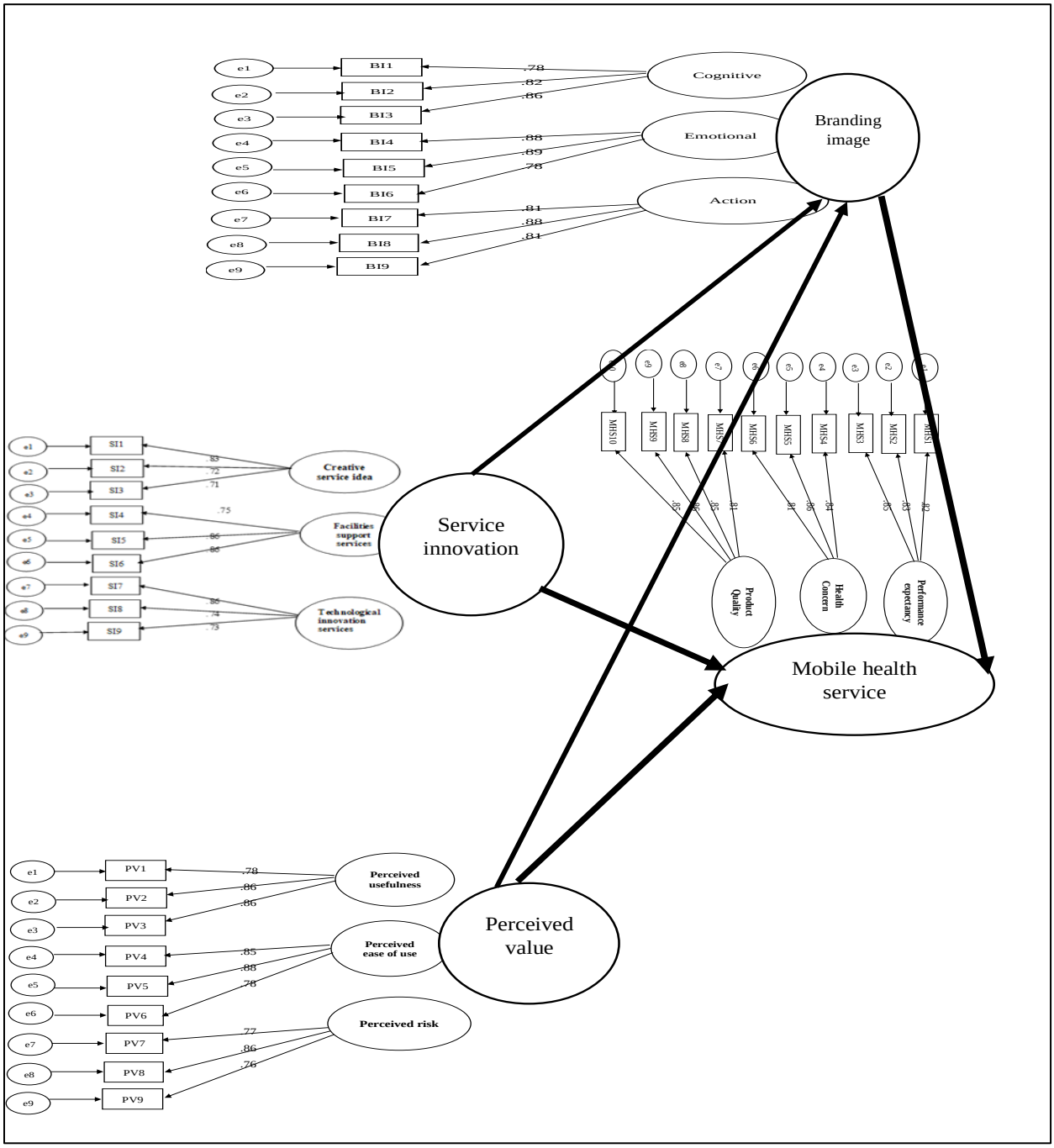

Figure 7 Relationship between service innovation, brand image, perceived value significantly influences mobile health service usage

The study reveals that service innovation significantly influences the use of mobile health services. Brand image also plays a significant role in this, as perceived value is influenced by the service. Furthermore, brand image significantly impacts service innovation, which in turn impacts perceived value. Overall, service innovation significantly influences mobile health service usage.

Research objective 3) To explain the relationships between variables that affect the use of mobile health services.

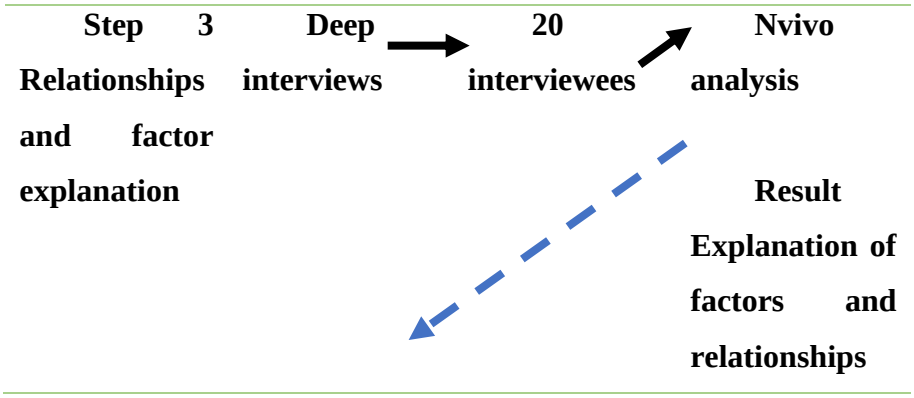

Figure 8 The relationships between variables that affect the use of mobile health services.

From step 3 found that Chinese students' adoption of mobile health services is influenced by factors such as accessibility, cultural views, and personal preferences. Wearable technology's ability to track health and provide accurate information is crucial. Age also plays a significant role in their perception of health-related technology. Policymakers emphasize service innovation in healthcare, including new technologies, customer feedback, and stakeholder collaboration. A good brand image can help Chinese students trust mobile health services. Companies can become trusted providers by focusing on quality and innovation, partnering with reputable universities, investing in advanced technology, training programs, and patient feedback. Telemedicine and remote monitoring can enhance mobile services, allowing quicker diagnoses and treatments, and promoting healthy habits. Ensuring data security and privacy protection is essential, and transparent pricing and clear communication are key to engaging this demographic.

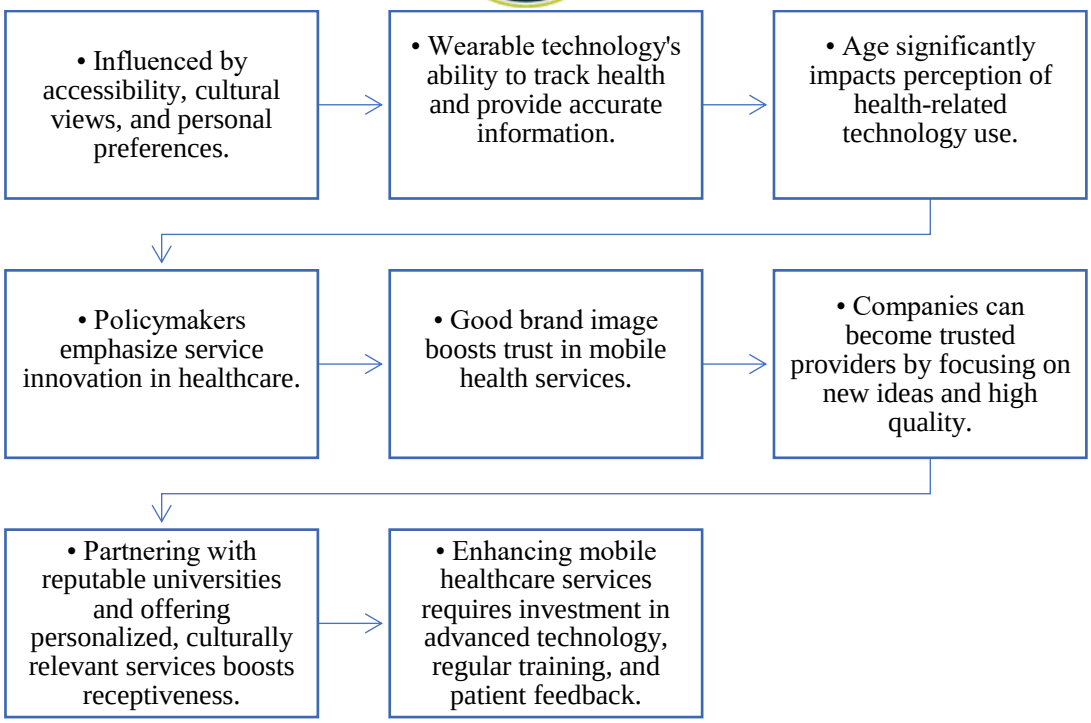

Figure 9 Chinese Students' Adoption of Mobile Health Services

Chinese students' adoption of mobile health services is influenced by accessibility, cultural views, and personal preferences. Factors like wearable technology, age, and service innovation are crucial. Companies can build trust by focusing on quality and innovation, partnering with reputable universities, investing in advanced technology, training programmers, and patient feedback. Including multilingual support and easy navigation can cater to Chinese students' diverse needs. Ensuring data security and privacy protection is essential. Transparent pricing and clear communication are key to engaging this demographic.

Research objective 4) To create new criteria for the development of service innovation to the use of mobile health services among Chinese students.

The Delphi method is a qualitative forecasting technique that uses expert opinions from multiple questionnaires to predict future events. It is a methodical and repetitive approach used in fields like economics, technology, and politics to forecast trends and make informed decisions. The process involves formulating questions, selecting a panel of specialists, distributing open-ended surveys, and examining responses to reach a definitive agreement. The Delphi method helps mitigate bias and individual influence in decision-making processes, generating precise and reliable forecasts of future events.

The study highlights the importance of service innovation and brand image in influencing Chinese students' adoption of mobile health services. It suggests that factors such as accessibility, cultural attitudes, and service awareness influence usage. Policymakers should prioritize service innovation for sustainable growth, enhancing the user experience, effectiveness, efficiency, and security measures. A good brand image can help Chinese students trust mobile health services, and companies can become trusted providers by focusing on quality, innovation, partnering with reputable universities, investing in advanced technology, training programs, and patient feedback. Telemedicine and remote monitoring can also enhance mobile services. (Sherer, S. A., et al.(2016).

The evaluation index screening threshold is a crucial tool in data analysis, determining the success or failure of an evaluation process. It uses a range of values from 75% to 83%, with the CV threshold set at 68.86%. The significance score and full mark frequency thresholds are set at 78% and 81.14%, respectively. The evaluation index screening threshold is calculated using an 85% screening threshold, with scores above this threshold considered acceptable. The CV threshold is calculated using a mean estimate of 90% and a standard deviation estimate of 4.29%. The significance score means the boundary is set at 90% minus 4.29%, resulting in 85.71%. The full mark frequency threshold is set at 90% minus 4.29%, providing a reference point for evaluating results. This approach ensures that only indexes with high confidence are considered for further analysis, improving the overall quality of the evaluation process.

The researcher is seeking a concise overview of the analysis findings obtained through the Delphi technique.

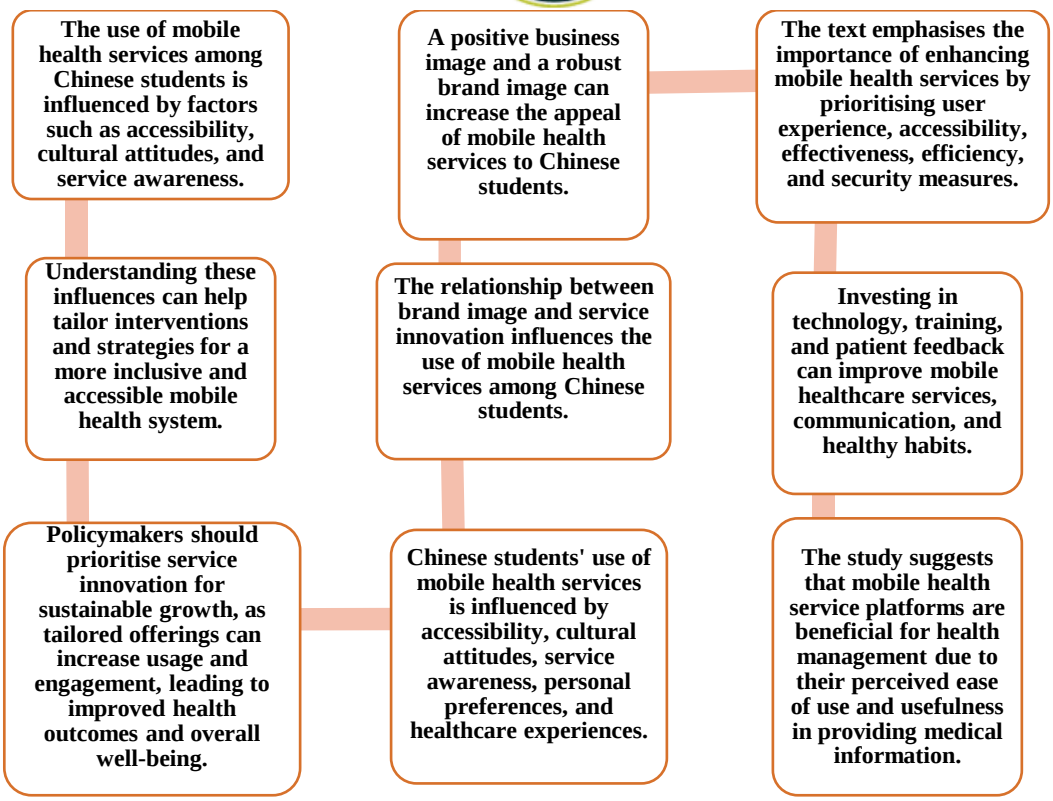

Figure 10 Delphi analysis summary.

The study examines the adoption of mobile health services among Chinese students, focusing on accessibility, cultural attitudes, and healthcare experiences. It emphasizes the importance of brand image, perceived ease of use, and usefulness. To improve services, healthcare organizations should focus on user experience, accessibility, effectiveness, efficiency, and security measures. Positive healthcare experiences are more likely to encourage adoption. Healthcare providers can improve their services by focusing on service innovation, quality, and patient feedback.

Discussion

This study examines the use of mobile health services by Chinese students, focusing on factors influencing satisfaction, service innovation, perceived value, and brand image. The research aims to develop a factor model, test it, explain the relationship, and establish new criteria for service innovation among Chinese students. Challenges include data security, privacy, training, and provider support.

From research objective 1, the research aims to create a factor model based on perceived value, brand image, and mobile health service use. The model will be constructed using methods, tools, samples, data analysis, and results. The model will address challenges such as data security,

privacy, training, and provider support in service innovation. The study reveals user readiness, willingness to use, healthcare professionals' role, perceived usefulness, ease of use, and accessibility are key predictors of the adoption of mobile health services. The researcher's objective is to emphasize the significance of modeling in light of the aforementioned findings, as they will facilitate the development of mobile health service delivery and enhance healthcare outcomes. Healthcare providers can ensure widespread usage and acceptance of services by customizing them to meet the diverse needs of patients by identifying key predictors.

Research objective 2, the study reveals that creative services, facility support, and technological innovation are the most popular mobile health services among Chinese students. It also highlights the importance of understanding consumer behavior and perceived value. Healthcare providers should focus on service innovation, user experience, and data security to increase adoption. The brand image also plays a significant role in influencing Chinese students' decisions. The study found 18.677 total variance and 72.450% cumulative percentage in the data, indicating significant components that could lead to further research. The study's findings clearly establish a correlation with the research outcomes reported by Utomo, P. et al. (2021) explore the impact of performance expectancy, Effort Expectancy, and habit on behavior intention in using mobile healthcare applications. The research found that 93% of respondents are female, mostly pregnant mothers, candidates, and health service officers. The study also highlighted the need for collaboration between healthcare providers, patients, and app developers. And found that the study by Jabour et al. (2021) examined the adoption of mobile health services among university students in health colleges. It found that perceived usefulness, ease of use, and accessibility were strong predictors of adoption. The study also identified barriers that prevent the use of mobile health services, with fitness and dietary-related services being more common. The findings suggest that students will continue to use mobile health services.

From research results found that the study reveals a strong correlation between SI and BI, highlighting the importance of understanding consumer behavior and perceived value. It also highlights the indirect effect of branding image on performance, highlighting the need for effective marketing strategies. The study also uses Sobel's Z test to examine service innovation's indirect impact on performance through branding, demonstrating a strong indirect effect on performance. This is also consistent with the findings of Luo, Li, & Sun (2022) found that consumers' perceived value positively influences energy-saving product purchase intention. Factors like functional, emotional, conditional, and green value also influence consumer satisfaction. The adoption of mobile health services among university students is influenced by perceived usefulness, ease of use, accessibility, performance expectancy, and smart wearable technology adoption.

Research objective 3, the study reveals that Chinese students' adoption of mobile health services is influenced by accessibility, cultural views, and personal preferences. Factors like wearable technology, age, and service innovation contribute to this adoption. Companies can build trust by focusing on quality, innovation, and transparent pricing. This is also consistent with the

findings of Luo, B., Li, L., & Sun, Y. (2022) found that investigates consumer satisfaction with energy-saving products using appraisal-emotional response-coping theory, finding that functional, emotional, conditional, and green value positively influence satisfaction.

Research objective 4, The evaluation index screening threshold is a crucial tool in data analysis, determining the success or failure of an evaluation process. It uses values ranging from 75% to 83%, with the CV threshold set at 68.86%. The significance score and full mark frequency thresholds are set at 78% and 81.14%, respectively. These thresholds help ensure that only high-quality data is included in the evaluation process, leading to more accurate and reliable results. By setting specific criteria for inclusion, researchers can better assess the effectiveness of their methods and draw meaningful conclusions from their analysis. Additionally, these thresholds also help to reduce the risk of bias and ensure that the data used is representative of the population being studied. Overall, setting screening thresholds is an essential step in ensuring the validity and credibility of data analysis in research. The study suggests that healthcare providers should prioritize both service functionality and brand perception to cater to the preferences and expectations of this demographic, leading to higher adoption rates and customer loyalty.

Research Suggestions

The researcher presented the consistent and correlated quantitative and qualitative research results as suggestions for additional academic and managerial benefits.

1. The findings indicate that clear criteria for data inclusion filter out low-quality or unreliable information, ensuring accurate conclusions, actionable insights, and validity of research outcomes. Additionally, clear criteria for data inclusion also help to streamline the research process by guiding researchers on what information to prioritize and analyze. This systematic approach ultimately saves time and resources, allowing for a more efficient and effective research study.

2. From research results, found that Chinese students favor creative services, facility support, and technological innovation in mobile health services, emphasizing the need for healthcare providers to enhance user experience. Additionally, the research suggests that incorporating personalized features and user-friendly interfaces could further improve the adoption of mobile health services among Chinese students. Overall, prioritizing user satisfaction and convenience is crucial for the successful implementation of digital healthcare solutions in this demographic.

3. By considering cultural nuances, researchers can develop interventions that are more likely to be accepted and utilized by the target population. This approach can lead to improved health outcomes and increased accessibility to healthcare services for Chinese students. Incorporating cultural beliefs into mobile health services can bridge the healthcare gap, addressing

specific health concerns and promoting well-being among Chinese students, thereby increasing engagement and trust.

4. Additionally, future studies could explore the impact of cultural preferences and attitudes towards technology on the utilization of mobile health services among Chinese students. Understanding how cultural factors influence technology adoption can provide valuable insights for designing more effective and culturally tailored healthcare solutions for this demographic.

References

De Souza R, et al. (2021). Participatory research methods for investigating digital health literacy. Conjunctions 8. https://doi.org/10.7146/tjcp.v8i1.117800

Dehling T, Gao F, Schneider S, Sunyaev A. (2015). Exploring the far side of mobile health: information security and privacy of mobile health apps on iOS and Android.JMIR mHealth uHealth 3:e8

Kim, K. K., Sankar, P., Wilson, M. D., & Haynes, S. C. (2017). Factors affecting willingness to share electronic health data among California consumers. BMC medical ethics, 18, 1-10.

Kurnia, G., & Sulistiani, P. B. (2019). Influencing Consumer's Behavior: Perspective of Information Quality and Consumers Reviews on Airyrooms. PEOPLE: International Journal of Social Sciences, 5(1).

Lahap, J., Ramli, N.S., Said, N.M., Radzi, S.M. and Zain, R.A., (2016), A Study of Brand Image towards Customer's Satisfaction in the Malaysian Hotel Industry. Procedia—Social and Behavioral Sciences, 224, 149-157.

Lahap, J., Ramli, N.S., Said, N.M., Radzi, S.M. and Zain, R.A., (2016), A Study of Brand Image towards Customer's Satisfaction in the Malaysian Hotel Industry. Procedia—Social and Behavioral Sciences, 224, 149-157.

service by patients: an empirical study based on the elaboration likelihood model. Computers in human behavior, 114, 106581.

Luo, B., Li, L., & Sun, Y. (2022). Understanding the Influence of Consumers' Perceived Value on Energy-Saving Products Purchase Intention. *Frontiers in* Psychology, 12, 640376. https://doi.org/10.3389/fpsyg.2021.640376

Nina M. Stukalenkoa, Bariya B. Zhakhinaa, Asiya K. Kukubaevaa, Nurgul K. Smagulova, Gulden K. Kazhibaevaa (2016) Studying innovation technologies in modern education, International Journal of Environmental and Science Education 2016. Vol.11, No 14, 6612-6617.

Sherer, S. A., et al.(2016). Applying institutional theory to the adoption of electronic health records in the US. Information & Management, 53(5), 570-580.

Shiferaw, K. B., & Mehari, E. A. (2019). Modeling predictors of acceptance and use of electronic medical record system in a resource limited setting: Using modified UTAUT model. Informatics in Medicine Unlocked, 17, 100182. Slight,

Tabassum, M. Roknuzzaman, M. and Islam, M. M. (2015). Usage of digital library system at a university in Bangladesh, Annals of Library, and Information Studies, 62, 94-103.

Utomo, P. et al.(2021) The Effects of Performance Expectancy, EffortExpectancy, Facilitating Condition, and Habit on Behavior Intention in Using MobileHealthcareApplication, International Journal of Community Service & Engagemente-ISSN: 2746-4032Vol. 2, No. 4, November 2021.

Wen Xi, (2022), Analyzing the Relationship between Hotel Brand Image, Service Quality, Experience Marketing, and Customer Satisfaction under the Environment of Social Network, Research Article | Open Access, Volume 2022 | Article ID 1064712 | https://doi.org/10.1155/2022/1064712.

Wu, D., Lowry, P. B., & Zhang, D. (2015). Patient compliance behavior in a mobile healthcare system: An integration of theories of rational choice and planned behavior. Paper presented at the 2015 48th Hawaii International Conference on System Sciences.

Yuqing Song , Hong Chen (2021) Evaluating Chinese Mobile Health Apps for Ankylosing Spondylitis Management: Systematic App Search, JMIR Mhealth Uhealth. 2021 Jul 14;9 (7) :e27234. doi: 10.2196/27234

Yang Zhao, Qi Ni, Ruoxin Zhou (2018), What factors influence the mobile health service adoption? A meta-analysis and the moderating role of age, International Journal of Information Management, Volume 43, December 2018, Pages 342-350.