

**PUBLIC SPACE DESIGN OPTIMISATION
GUIDELINE: A CASE STUDY CHILDREN'S
HOSPITAL SERVICE DESIGN IN
GUANGZHOU, CHINA**

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HOSPITAL SERVICE DESIGN IN
GUANGZHOU, CHINA**

by

WANG JINGHAO

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LIST OF SYMBOLS

α	Significance level
$1-\beta$	Test performance
Cohen's d	Effect size
$z_{\alpha/2}$	Z-value corresponding to the significance level
z_{β}	Z-value corresponding to the power
s_1^2	Variance of the two populations
δ^2	Expected detected effect size
χ^2	Chi-square test

LIST OF ABBREVIATIONS

AI	Artificial Intelligence
AMOS	Analysis of Moment Structures
AR	Augmented Reality
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Combined Reliability
ED	Environmental Details
FL	Functional Layout
GFI	Goodness of Fit Index
HCD	Human-Centered Design
IT	Internet of Things
KMO	Kaiser-Meyer-Olkin
NVIVO	Non-numerical Unstructured Data by techniques of Indexing Searching and Theorizing
PO	Process Organization
RMSEA	Root Mean Square Error of Approximation
SE	Standard Error
SEM	Structural Equation Modeling
SF	Support Facilities
SFL	Standardized Factor Loading
SPSS	Statistical Package for the Social Sciences
UX	User Experience

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**GARIS PANDUAN REKA BENTUK RUANG AWAM OPTIMUM: KAJIAN
KES REKA BENTUK SERVIS HOSPITAL KANAK-KANAK DI
GUANGZHOU, CHINA**

ABSTRAK

Sejak pelaksanaan dasar tiga anak di China, terdapat peningkatan ketara dalam bilangan pesakit berpotensi di hospital kanak-kanak. Perubahan ini telah meningkatkan kesedaran tentang keperluan kanak-kanak dan mendorong hospital untuk meningkatkan kualiti perkhidmatan. Kajian sedia ada telah mengenal pasti beberapa isu dalam pengalaman perkhidmatan di ruang awam hospital kanak-kanak yang memerlukan analisis menyeluruh dan penyelesaian yang berkesan. Reka bentuk perkhidmatan semakin diiktiraf sebagai pendekatan yang berharga untuk meningkatkan pengalaman perkhidmatan dalam tetapan ini dan dijangka menjadi aspek utama dalam reka bentuk hospital pada tahun-tahun mendatang. Walau bagaimanapun, banyak kajian hanya memfokuskan pada elemen ruang atau hiasan, sering mengabaikan penjagaan berpusatkan manusia dan pertimbangan sistematik terhadap keseluruhan pengalaman perubatan. Kajian ini bertujuan untuk menganalisis dan mengoptimumkan pengalaman perkhidmatan di ruang awam hospital kanak-kanak. Dengan menggunakan pendekatan kuantitatif, data kepuasan daripada responden di dua hospital dikumpul dan dianalisis melalui tinjauan soal selidik. Berdasarkan analisis ini, satu set rancangan pengoptimuman telah dicadangkan dan kemudian disahkan melalui tinjauan tambahan. Dapatan kajian menunjukkan bahawa faktor-faktor yang mempengaruhi kepuasan terhadap perkhidmatan perubatan di ruang awam hospital kanak-kanak terbahagi kepada empat dimensi utama: susun atur fungsional, organisasi proses, kemudahan sokongan,

dan butiran persekitaran. Walaupun kanak-kanak dan pengiring mereka mengutamakan organisasi proses, kakitangan perubatan lebih menekankan kemudahan sokongan. Rancangan pengoptimuman yang dibangunkan dalam kajian ini menangani pelbagai keperluan kumpulan pengguna yang berbeza di ruang awam dan telah disahkan sebagai berkesan. Keputusan kajian menegaskan bahawa pendekatan reka bentuk perkhidmatan boleh meningkatkan pengalaman perkhidmatan di ruang awam hospital kanak-kanak secara signifikan. Dicadangkan agar kajian masa depan terus meneroka integrasi prinsip reka bentuk perkhidmatan dalam tetapan hospital untuk meningkatkan lagi kualiti penjagaan dan keseluruhan pengalaman pesakit.

**PUBLIC SPACE DESIGN OPTIMISATION GUIDELINE: A CASE STUDY
CHILDREN'S HOSPITAL SERVICE DESIGN IN GUANGZHOU, CHINA**

ABSTRACT

Since the implementation of China's three-child policy, there has been a noticeable increase in potential patients at children's hospitals. This shift has heightened awareness of children's needs and driven hospitals to improve service quality. Existing research has identified several issues in the service experience of public spaces in children's hospitals that require comprehensive analysis and effective solutions. Service design is increasingly recognized as a valuable approach to enhancing the service experience in these settings and is expected to become a key aspect of hospital design in the coming years. However, many studies have focused primarily on spatial or decorative elements, often neglecting the human-centered care and systematic consideration of the overall medical experience. This study aims to analyze and optimize the service experience in public spaces of children's hospitals. By employing a quantitative approach, satisfaction data from respondents in two hospitals were collected and analyzed through questionnaire surveys. Based on this analysis, a set of optimization plans was proposed and subsequently validated through additional surveys. The findings indicate that factors influencing satisfaction with medical services in the public spaces of children's hospitals fall into four main dimensions: functional layout, process organization, support facilities, and environmental details. While children and their chaperones prioritize process organization, medical staff place greater emphasis on support facilities. The optimization plan developed in this study addresses the varying needs of different user groups in public spaces and has been validated as effective. The results

underscore that a service design approach can significantly improve the service experience in the public spaces of children's hospitals. It is suggested that future research continue to explore the integration of service design principles in hospital settings to further enhance the quality of care and overall patient experience.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The design and optimization of public spaces in children's hospitals are crucial components that significantly impact the service experience of patients, their families, and healthcare staff (Zhang et al., 2023). As healthcare facilities in China face increasing pressure due to the country's evolving healthcare policies, particularly the three-child policy introduced in 2021 (National Health Commission, 2022), it has become imperative to enhance these public spaces to meet rising demands. This research explores the application of service design principles to optimize public spaces in children's hospitals, aiming to improve user satisfaction and overall hospital experiences (Qi et al., 2021). The study focuses on Guangzhou Children's Hospital as a primary case, selected for its location in Guangzhou a first-tier city representing cutting-edge medical technology and its status as the largest children's hospital in South China, boasting the most comprehensive healthcare system in the region. These factors make it an ideal setting to investigate and propose innovative design solutions.

China's healthcare system has been undergoing rapid transformation, with an increasing focus on patient-centered services (Geng et al., 2020). This is particularly relevant in pediatric care, where the hospital environment must cater to the specific psychological and behavioral needs of children, their families, and medical staff (Fang et al., 2022). Public spaces in children's hospitals, such as waiting areas, playrooms, and lobbies, are often overlooked in traditional hospital design, yet they play a critical role in shaping the hospital experience. As hospitals shift towards

creating more humane and supportive environments, the design of these public spaces has become a focal point for enhancing both functionality and the emotional well-being of users. This research contributes to the broader discourse on improving healthcare environments, particularly in pediatric settings, through innovative design solutions.

Although existing literature highlights the importance of hospital environments in patient recovery, there is a noticeable gap in research on how public space design specifically impacts the service experience in children's hospitals (Shie et al., 2022). Current designs often prioritize aesthetic elements, with limited attention to the actual experiences of children, their families, and healthcare workers. Additionally, few studies explore the integration of service design principles with environmental psychology and Human-Centered Design into hospital space planning (Ye et al., 2023). Additionally, few studies explore the integration of service design principles into hospital space planning. This research seeks to address these gaps by analyzing user experiences in two pilot children's hospitals and providing a comprehensive framework for improving public space design.

The motivation for this study stems from the growing recognition that hospital environments, particularly public spaces, have a profound effect on patient satisfaction, staff efficiency, and overall healthcare outcomes (Li et al., 2023). Personal observations of the inadequacies in current public space designs such as poor navigation and lack of child-friendly features—combined with the increasing demand for high-quality healthcare services in China, have driven this research. By focusing on children's hospitals, where the emotional and psychological needs of patients and their families are particularly sensitive, this study seeks to offer practical solutions to enhance user experiences in healthcare facilities.

The purpose of this study is to investigate the specific design factors that influence user satisfaction and emotional well-being in the public spaces of children's hospitals and to develop an optimized design paradigm based on service design principles integrated with environmental psychology and Human-Centered Design. The research aims to bridge the gap between functional space planning and user-centered design, offering insights into how public spaces can be reimagined to improve patient and staff experiences. Through the analysis of satisfaction data from two pilot hospitals, this study will propose actionable recommendations that can be applied to children's hospitals across China, enhancing overall service quality and the well-being of patients and healthcare providers alike.

1.2 Background of Research

The field of healthcare design, particularly in pediatric settings, has garnered increasing attention due to its significant impact on patient outcomes and overall hospital experience (Yingqiao, 2021). The design of public spaces in children's hospitals is a critical component of this field, as these spaces serve not only functional purposes but also play a role in alleviating stress and anxiety for both patients and their families (Sharma, 2024). Despite the growing recognition of the importance of these spaces, there remains a need to explore how they can be optimized to better meet the unique psychological and behavioral needs of pediatric patients, their families, and healthcare staff (Feng et al., 2024).

The theoretical background of this study is grounded in service design principles, which emphasize a user-centered approach to creating services that are both effective and emotionally supportive (Litwin et al., 2023). Service design provides a framework for understanding the complex interactions between users and

spaces, and for developing solutions that enhance the overall experience. This research integrates these principles with concepts from environmental psychology, which examines how physical environments influence human behavior and well-being (Holeman & Kane, 2019), and Human-Centered Design, which ensures a holistic focus on user needs (Jaušovec & Gabrovec, 2023), to create a comprehensive approach to public space design in children's hospitals.

A brief review of the existing literature reveals that while much has been written about the importance of hospital environments, there is limited research specifically focused on the design of public spaces within children's hospitals (Burbano, 2023). Studies have shown that well-designed hospital environments can improve patient outcomes, reduce stress, and increase satisfaction (Ahmad, 2022). However, most of these studies have concentrated on adult patients or clinical spaces, leaving a gap in the literature regarding the specific psychological and behavioral needs of children and their families in non-clinical areas of hospitals.

Historically, the design of hospital spaces has evolved from purely functional layouts aimed at efficiency to more holistic approaches that consider the emotional and psychological needs of patients (Jaušovec & Gabrovec, 2023). In pediatric hospitals, this evolution has been particularly significant, with a growing emphasis on creating environments that are not only safe and functional but also engaging and comforting for children (Yingqiao, 2021). Over time, the focus has shifted from clinical efficiency to patient-centered care, driven by China's healthcare reforms and the three-child policy since 2021 (National Health Commission, 2022), with public spaces becoming an integral part of the healing environment (Feng et al., 2024).

Recent trends in the field of healthcare design reflect a growing interest in integrating technology and interactive elements into public spaces to enhance user engagement and support the healing process (Zhang et al., 2023). Innovations such as virtual reality, interactive displays, and customized play areas are increasingly being incorporated into the design of children's hospitals. These developments, alongside rising urban healthcare demands in cities like Guangzhou, underscore the importance of creating dynamic and adaptable environments that can meet the evolving needs of pediatric patients and their families (Yang, 2023).

This study aims to build on these trends by exploring how service design principles integrated with environmental psychology and Human-Centered Design, can be applied to optimize public spaces in children's hospitals (Kopec, 2021), ultimately contributing to the creation of environments that support the well-being of all users.

1.3 Problem Statement

In the field of healthcare design, a pressing challenge is the inadequacy of public space design in children's hospitals to effectively meet the diverse needs of pediatric patients, their families (Poot et al., 2023), and healthcare staff. Current designs often prioritize aesthetic appeal and basic functionality over critical aspects such as spatial navigation, emotional comfort, and stress reduction, which are essential for supporting the unique psychological and behavioral needs of children. For instance, research indicates that poorly designed waiting areas with limited child-friendly features such as lack of play zones or excessive noise can increase anxiety among pediatric patients and their families. Similarly, inadequate signage and

cramped layouts have been shown to hinder efficient movement and exacerbate stress for both users and staff (Nyatuka & De La Harpe, 2021).

This issue is particularly acute in China, where the implementation of the three-child policy since 2021 has intensified demand for pediatric healthcare services, placing unprecedented pressure on hospital infrastructure (National Health Commission, 2022). Public spaces, such as waiting areas and lobbies, are critical for managing patient flow and providing respite, yet their design often fails to accommodate this surge in volume or address user needs effectively. A noticeable gap exists in the integration of user-centered design (UCD) approaches, which prioritize stakeholder input to enhance functionality and experience. For example, a review of 50 healthcare design studies found only three that applied UCD principles to children's hospital public spaces, highlighting a significant underutilization of this approach (Wang, 2023).

Furthermore, the application of service design principles such as co-creation with users and iterative testing remains limited in pediatric healthcare settings. Existing literature suggests that while clinical areas receive considerable design attention, public spaces are often overlooked, despite their role in shaping overall hospital experiences (Badawy & Radovic, 2020). This research addresses these deficiencies by investigating how UCD and service design principles can be leveraged to optimize public spaces in children's hospitals, ensuring they not only meet physical demands but also support the psychological and behavioral well-being and operational efficiency required in China's evolving healthcare landscape (Saparamadu et al., 2021).

1.4 Research Questions (RQ)

To attain the stipulated objectives, it is imperative to address a set of research questions. These inquiries are categorized into four sub-questions that serve as a guiding pathway for this study.

RQ1: What specific design factors influence user satisfaction and emotional well-being in the public spaces of children's hospitals?

RQ2: What psychological and behavioral needs of pediatric patients, families, and staff are met by current public space designs in children's hospitals?

RQ3: How can public spaces in children's hospitals be optimized from a service design perspective?

RQ4: How can the findings contribute to the design of public spaces in children's hospitals?

1.5 Research Objectives (RO)

Analyze data about user experience satisfaction in public spaces of children's hospitals and extract key factors affecting satisfaction. Compare the strengths, weaknesses, and satisfaction gaps of the two pilot hospitals and summarize the key factors for satisfaction optimization. Based on the service design concept, propose a higher quality service design paradigm and experience process. The optimized public space solution for children's hospitals is finally designed and validated to provide reference ideas for the design of public spaces in more children's hospitals.

RO1: To identify specific design factors impacting user satisfaction and emotional well-being in the public spaces of children's hospitals through a literature review.

RO2: To identify the psychological and behavioral needs of pediatric patients, families, and staff met by current public space designs in two pilot children's hospitals using satisfaction data.

RO3: To develop an ideal scheme for public spaces in children's hospitals based on service design thinking.

RO4: To evaluate research findings from the perspectives of different users and provide recommendations to enhance the development of public space design in children's hospitals.

1.6 Significance of the Study

This research makes significant academic contributions by expanding the existing body of knowledge in the field of healthcare design, specifically within the context of pediatric hospital environments. By applying service design principles to the optimization of public spaces in children's hospitals, this study provides a novel approach to understanding and improving the user experience in these critical environments. The findings will contribute to the academic discourse by offering new insights into how design can be both functional and emotionally supportive, particularly for vulnerable populations such as children and their families. This research also fills a gap in the literature by focusing on the intersection of service design and healthcare, a relatively underexplored area in the field.

In terms of practical relevance, the research findings have the potential to directly impact the design and management of public spaces in children's hospitals. By identifying key factors that influence user satisfaction, the study offers actionable recommendations that can be implemented by hospital administrators, architects, and designers to create more effective and supportive environments. These improvements can lead to enhanced patient and family experiences, reduced stress and anxiety, and ultimately, better health outcomes for pediatric patients. The practical implications of this research are not limited to the specific hospitals studied but can be adapted and applied to other pediatric healthcare settings across China and potentially in other countries facing similar challenges.

The broader impact of this research extends beyond immediate practical applications. The study has the potential to influence healthcare policy by highlighting the importance of user-centered design in hospital environments. Policymakers may use the insights gained from this research to develop guidelines and standards for the design of public spaces in healthcare facilities, ensuring that they meet the needs of all users, particularly children. Additionally, the research may inspire further studies in the field, encouraging other scholars to explore the application of service design in different healthcare contexts, thereby contributing to the ongoing evolution of best practices in hospital design.

1.7 Research Hypothesis (H)

Hypothesis 1: Based on existing evidence that user experience can be evaluated across multiple dimensions, we hypothesize that specific design factors in children's hospital public spaces—namely process organization, functional layout, support facilities, and environmental details—significantly influence user satisfaction

and emotional well-being (Zumelzu & Herrmann-Lunecke, 2021). We predict that these five dimensions will collectively form the overall evaluation framework of user experience in public spaces. To validate this hypothesis, we will conduct a survey with patients' families and healthcare staff, asking them to rate these five dimensions of public spaces to assess the importance of each dimension in shaping user experience.

Hypothesis 2: Based on existing research indicating that user feedback can clearly express specific needs, we hypothesize that user feedback will identify the psychological and behavioral needs met by current public space designs in children's hospitals (Tuline & Yolanda, 2015). We predict that users will provide insights into which psychological and behavioral needs are addressed, such as stress reduction or efficient navigation. To validate this hypothesis, we will collect detailed user feedback via surveys and quantitative analysis to identify the key needs met by existing designs.

Hypothesis 3: Based on previous research showing that users can identify pain points and areas for improvement in public spaces, we hypothesize that users will identify significant pain points and areas for improvement within public spaces, such as long waits, inadequate facilities, and a lack of child-friendly design (Liu, 2023). We predict that user feedback will focus on these critical issues and provide specific suggestions for improvement. To validate this hypothesis, we will conduct in-depth interviews or focus group discussions to gather users' opinions on the pain points in public spaces and analyze the data to determine the areas most in need of improvement.

Hypothesis 4: Based on the identified pain points and areas for improvement, we hypothesize that an optimized design plan, developed using service design principles and user-identified pain points, will result in higher satisfaction ratings compared to previous evaluations, thereby proving the effectiveness of the optimization (Bulakh, 2021). We predict that targeted design improvements addressing the pain points identified by users will significantly enhance user satisfaction. To validate this hypothesis, we will implement the optimized design plan and conduct a post-implementation satisfaction survey, comparing the results with pre-optimization data to evaluate the effectiveness of the design improvements.

1.8 Limitation and Delimitation of the Study

This study conducted an in-depth investigation and analysis of the public spaces in two children's hospitals in Guangzhou, focusing on critical areas such as the registration area, waiting area, and outpatient hall. To fully understand the experience and needs of these public spaces, a survey was conducted among different target groups, including pediatric patients, their families, and medical staff. The core objective of the research is to analyze the survey results to comprehensively summarize and understand the needs and expectations of all parties in the hospital's public spaces, providing valuable references for future design and optimization of children's hospital spaces (Ghaffari et al., 2023; Shao, 2023).

1.8.1 Research Scope

Geographical Scope: The scope of this study was limited to two children's hospitals in Guangzhou due to time and budget constraints. While children's hospitals across China may share certain commonalities, the hospitals in different

regions exhibit unique characteristics shaped by regional differences in culture, demographics, and spatial usage challenges. For instance, the two hospitals in Guangzhou, as significant medical institutions in South China, experience distinct population densities, cultural customs, and patient demographics, which may lead to specific spatial conflicts. This focus was chosen deliberately to address design inadequacies under the intense urban healthcare pressures exacerbated by the three-child policy (National Health Commission, 2022), yet it restricts the study's ability to reflect conditions in rural or less urbanized regions, such as Northern China, where resource availability and patient profiles differ significantly (Qi et al., 2021). Therefore, the findings of this study are most applicable to the Guangzhou area. Although the results may have limited applicability in other regions, they still offer valuable insights and serve as a reference for hospital administrators and designers outside the region (Fang et al., 2024; Wu et al., 2024).

Sample Selection: To ensure the study's feasibility, the sample was drawn from patients and their families who visited the hospitals during a specific period. Given that the sample selection was based on patient flow during the study period, there may be limitations in representativeness, especially when considering the potential impact of seasonal variations or unexpected events (such as during pandemics) on patient volume. The choice of only two hospitals was further constrained by practical accessibility to the research team and their role as referral centers with high public space usage, aligning with the study's aim to investigate design challenges in high-demand settings (Rosenbaum et al., 2019); however, this excludes smaller facilities or those in diverse demographic contexts. While this delimitation may affect the generalizability of the findings, the study attempted to

mitigate this limitation by employing both qualitative interviews and quantitative surveys to capture data from multiple perspectives.

1.8.2 Research Limitations

Sample Representativeness and Data Collection Tools: Due to time and resource constraints, the sample size of this study was relatively small and concentrated in two hospitals in Guangzhou. Although extensive data were collected through surveys and interviews, the representativeness of the sample may still be limited, particularly in terms of capturing a broader socio-economic and cultural context. This limitation is compounded by the focus on only two urban referral centers, potentially missing diverse patient conditions or behavioral patterns in less urbanized settings (Nijkamp & Mobach, 2020). Additionally, while the questionnaires and interview tools used in this study were validated and adapted, they may not have fully captured all variables influencing user experience, especially when exploring the unique needs of pediatric patients with limited expressive capacity, such as subtle behavioral responses unarticulated in surveys (Piaget, 1970).

Low Participation of Medical Staff: A significant limitation of this study was the low participation rate among medical staff during the data collection process. Due to their busy schedules and time constraints, the number of responses from this group was relatively limited, which may have affected the comprehensiveness of the data from a medical perspective. Medical staff play a crucial role in this study because they directly interact with pediatric patients and have a deep understanding of their needs. This underrepresentation may skew findings toward patient and family perspectives, potentially overlooking staff-related operational design needs critical to public space functionality (Tran Thi Duc et al., 2023). Despite efforts to address this

limitation, such as offering flexible interview schedules and anonymous questionnaires, the limited data from medical staff may result in an incomplete representation of their insights, potentially impacting the overall findings (Fisher et al., 2020; Tran Thi Duc et al., 2023).

Regional and Cultural Limitations: China is a vast country with significant cultural, economic, and demographic differences across regions, all of which influence the design and usage needs of hospital spaces. Since this study focused primarily on two children's hospitals in Guangzhou, the findings may not fully apply to children's hospitals in other regions. The exclusive focus on Guangzhou, driven by its accessibility and high-demand context, excludes rural or smaller hospitals where resource constraints and patient demographics might yield different design priorities (Ayad, 2021). However, the study provides valuable insights by analyzing the use of public spaces in Guangzhou hospitals, identifying key elements that should be prioritized in the design and management of children's hospital public spaces, and proposing strategies to address spatial conflicts. These insights can serve as useful guidance for the design of children's hospital spaces in other regions (Ayad, 2021; Pabustan-Calleja et al., 2024).

Time and Resource Constraints: The study was limited by the time available and the resources allocated, which restricted the ability to conduct longitudinal research or cover more hospitals. The limited duration of the study constrained the depth and scope of data collection, particularly in observing seasonal variations or long-term trends. The decision to limit the study to two hospitals was a pragmatic response to these constraints, prioritizing depth over breadth to align with the aim of addressing urban design challenges (Shao, 2023), yet it precluded capturing evolving user needs or testing interventions over time. Resource

constraints also impacted the use of advanced environmental measurement tools, such as noise or air quality monitors, limiting precision in assessing environmental details one of the study's key design factors (Ghaffari et al., 2023), potentially affecting the precision of environmental factor measurements. Future research could overcome these limitations by expanding the sample size, extending the study duration, and increasing resource investment, thereby obtaining more generalizable conclusions.

1.9 Operational Definition

In this study, several key terms are central to understanding the research and its findings. These terms are defined specifically within the context of pediatric hospital design and service design to ensure clarity and relevance.

1.9.1 Pediatric Patient

A pediatric patient is an individual who is below the age of 18 years at the time of receiving medical care or being involved in a research study. According to Jean Piaget's theory, children's language skills develop until age 7, making complex sentence comprehension and vocabulary usage challenging. Additionally, children's nascent reading skills may hinder independent comprehension of complex texts. Hence, this study defines the age range of child patients as 7-18 years, focusing on their needs and feedback about hospital public spaces (Piaget, 1970).

1.9.2 Chaperone

A chaperone is a family member or legal guardian who accompanies the child during treatment, primarily providing emotional support, ensuring the child's comfort

in the medical environment, collaborating with the healthcare team in decision-making, and assisting with daily care activities (Fisher et al., 2020).

1.9.3 Medical Staff

Medical staff refers to professionals, including doctors and nurses, who provide consultation, diagnosis and treatment services to pediatric patients in hospitals. They ensure patients receive timely and appropriate treatment based on their professional knowledge and skills (Ayad, 2021).

1.9.4 Public Space Design

The operational definitions of public space design encompass a series of specific standards to ensure functionality, aesthetics, safety, and sustainability. First, different functional zones are planned to meet the needs of leisure, cultural activities, and sports, while ensuring accessibility for all. Then, the aesthetic appeal of the space is enhanced through landscape design, architectural styles, and material selection, while safety is ensured in terms of pedestrian flow, monitoring systems, and emergency exits. The design should also adopt sustainable materials and principles to minimize environmental impact, while encouraging public participation in the design and management process to meet community needs. Lastly, diverse spaces and activities should be provided to cater to people of different ages, interests, and cultural backgrounds (Pabustan-Calleja et al., 2024).

1.9.5 Children's Hospital Public Space

Children's hospital public spaces are open areas within a children's hospital designed for the provision of non-direct medical services. These areas may include

waiting areas, lobbies, corridors, rest areas, children's play areas and other shared spaces for patients' families and visitors. The primary function of these public spaces is to provide a place where patients and their families can rest, wait, or engage in other non-medical activities while ensuring their safety and comfort. When designing and managing public spaces, consideration also needs to be given to providing child-friendly amenities, toys and interactive activities to ensure that children are also comfortable and relaxed in the hospital environment (Fang et al., 2024).

1.9.6 Optimal Design

Optimal design involves improving existing processes to ensure they achieve optimal results in terms of resource utilization, efficiency and quality. Through systematic analysis and the principles of continuous improvement, it aims to identify and eliminate waste, streamline processes and ensure services meet user needs. The process typically includes data collection, process analysis, improvement implementation, and outcome evaluation to achieve an efficient, sustainable feel for the space (Tran Thi Duc et al., 2023).

1.9.7 Service Design

Service design is the process of systematizing, innovating and thinking strategically about a service with the aim of improving its user experience, meeting user needs, increasing efficiency and ensuring that the service is delivered in a coherent and orderly manner across all touch points. This involves understanding user needs and expectations, defining aspects of the service such as processes, tools, environments and people interactions, and how these aspects will be realized throughout the service cycle. To achieve these goals, service design uses a variety of

methods and tools, such as user research, prototyping, journey mapping, and scenario simulation, to ensure a coherent and organized service delivery from the front-end user experience to the back-end (Shao, 2023).

1.9.8 User Satisfaction

User satisfaction in the context of this study refers to the degree to which the needs and expectations of hospital users specifically pediatric patients, their families, and healthcare staff are met by the design of public spaces. Satisfaction is measured through surveys and interviews, focusing on factors such as comfort, accessibility, and emotional support.

1.9.9 Healthcare Environment

The healthcare environment in this study includes all physical spaces within a hospital that contribute to the overall experience of patients, families, and staff. This term encompasses non-clinical public spaces, with a focus on how these environments can be designed to support health and well-being.

1.10 Expected Result

Based on the literature review, this research is expected to identify a series of key factors that influence user satisfaction in the public spaces of children's hospitals. These factors may include, but are not limited to, environmental comfort, the smoothness of medical processes, facility convenience, cleanliness, signage guidance, and doctor-patient communication (Ghaffari et al., 2021; Zhu & Zhou, 2023). By analyzing satisfaction data from two pilot hospitals, it is anticipated that significant differences in public space experience satisfaction will be observed among different

user groups, possibly related to factors such as age, gender, and the hospital visited (Taufiq et al., 2023).

Utilizing service design thinking, the study is expected to propose an ideal plan for the public spaces in children's hospitals, focusing on user experience, functional layout, comfort, safety, and seamless integration with medical processes (Shan et al., 2023). The research results are expected to be evaluated from the perspectives of different users, and based on their feedback, recommendations will be provided to enhance the development of public space design in children's hospitals. These recommendations may include improvements to existing facilities, the addition of child-friendly elements, and measures to alleviate the stress experienced by medical staff (Abulawi, 2023; Eren et al., 2021).

1.11 Outline of the Study

As illustrated in Figure 1.1, the structure and methodology of this dissertation are designed to provide a comprehensive understanding of the current status and development trends in optimizing the design of public spaces in children's hospitals. The study progresses from the conceptual phase to practical application and analysis, ultimately offering feasible recommendations for improvement.

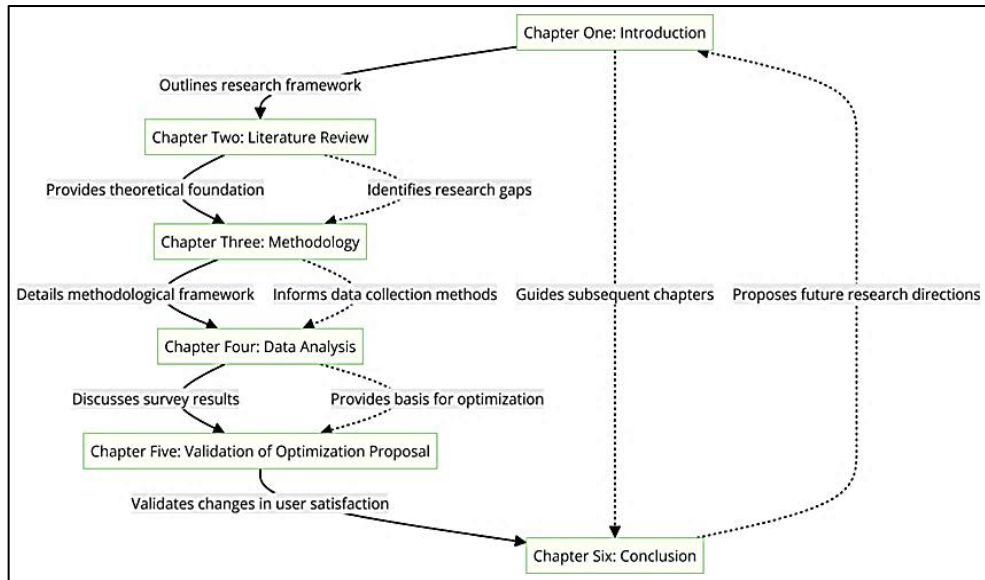


Figure 1.1 The framework of research process

Chapter One: This chapter introduces the foundational framework of the study, including the background, problem statement, research objectives, significance of the study, and the overall structure of the dissertation. It sets the stage for the research by guiding readers through the study's motivation and direction, ensuring clarity and coherence in understanding the purpose of the research.

Chapter Two: This chapter provides a comprehensive literature review, establishing the theoretical foundation of the study. It examines the current status, challenges, and research gaps in the design of public spaces in children's hospitals. The insights gained from this review direct the subsequent research methodology and data collection processes, highlighting the importance of addressing identified gaps.

Chapter Three: This chapter elaborates on the research design, detailing the methods of data collection and the statistical tools employed in this study. It ensures that the research methodology is rigorous and scientifically sound, allowing for the systematic investigation of the research questions and hypotheses.

Chapter Four: In this chapter, the collected data is analyzed and interpreted to validate the research hypotheses. The analysis assesses the effectiveness of the proposed optimization strategies for public space design, providing valuable insights into how such spaces can be improved to better meet the needs of users.

Chapter Five: This chapter focuses on evaluating changes in user satisfaction following the implementation of the optimization strategies. It incorporates new surveys and expert feedback to verify the reliability and practical applicability of the recommendations, ensuring that the proposed solutions are both effective and relevant.

Chapter Six: The final chapter summarizes the key findings of the research, revisits the research questions, and presents the conclusions and practical implications of the study. It also discusses the limitations of the research and offers suggestions for future research directions, providing a roadmap for subsequent studies in this field.

1.12 Summary

Chapter One has provided a comprehensive overview of the research, beginning with the introduction of the study's significance in the context of pediatric hospital design. The background of the research was outlined, highlighting the increasing demand for improved public spaces in children's hospitals due to evolving healthcare needs. The problem statement clearly identified the gaps in current design practices, particularly the lack of a user-centered approach that adequately addresses the unique needs of pediatric patients and their families. The objectives of the study were established, aiming to apply service design principles to optimize these critical

spaces. Additionally, the chapter provided operational definitions of key terms, ensuring a solid foundation for the research.

As we move forward, Chapter Two will delve into a detailed literature review, exploring existing studies on hospital design, service design, and the specific challenges faced in pediatric healthcare environments. This chapter will also identify further gaps in the literature that this research aims to address. Chapter Three will then outline the research methodology, explaining the data collection and analysis methods that will be employed to achieve the research objectives. Following this, Chapter Four will present the results of the study, analyzing the findings in relation to the research questions. Chapter Five will design an optimization plan based on the findings and verify it using questionnaires and expert interviews. Finally, Chapter Six will discuss the implications of these findings, offering practical recommendations and highlighting the potential for future research in this area.

In conclusion, this research is poised to make significant contributions to both academic knowledge and practical applications in the field of healthcare design. By focusing on the optimization of public spaces in children's hospitals through a user-centered approach, this study not only addresses a critical gap in current design practices but also has the potential to influence broader healthcare policies and improve the well-being of pediatric patients and their families.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The literature review chapter presents a comprehensive examination of existing knowledge relevant to this study, with a focus on optimizing public spaces in children's hospitals. It begins by outlining the theoretical and conceptual frameworks that guide the research, rooted in service design theory, environmental psychology, and human-centered design. These frameworks are elaborated to provide a structured lens for synthesizing prior research and identifying gaps linked to the study's research questions (RQs). By critically assessing how these frameworks intersect, this chapter not only organizes the review but also highlights their potential to address complex design challenges in pediatric healthcare settings. In this chapter, the development of service design in children's hospitals will be explored, especially its impact on the service experience in public spaces. By reviewing relevant research, theories, and practices, the study aims to identify gaps in the literature and establish a basis for achieving its research objectives.

As the focus on improving patient experience in healthcare environments increases, service design has gained increasing attention as a strategic approach. This chapter first discusses the principles and evolution of service design in healthcare, then examines its specific application to public spaces in children's hospitals, integrating insights from environmental psychology and human-centered design to address RQ1 (how specific design factors influence user satisfaction and emotional well-being), RQ2 (what psychological and behavioral needs of pediatric patients, families, and staff are met by current designs), and RQ3 (how public spaces can be

optimized from a service design perspective). Importantly, this review critically evaluates the extent to which these disciplines have been integrated to create holistic solutions, revealing areas where theoretical synergy remains underexplored, and sets the stage for RQ4 (how these findings can contribute to future design practices). Following the frameworks, this chapter first discusses the basic concepts of service design and its application in healthcare environments, and then delves into specific research related to the design of public spaces in children's hospitals, focusing on the challenges and progress in this field. In addition, the methodologies used to evaluate and improve service experience are reviewed, providing a comprehensive overview of current practices and emerging trends.

Through this review, it is hoped that a clear context will be provided for the study and how to expand and extend on the basis of existing knowledge. The insights gained in this chapter will inform the subsequent analysis and optimization of the service experience in public spaces in children's hospitals, and promote the development of more effective and human-centered design solutions, with the theoretical and conceptual frameworks serving as critical tools to guide the exploration of service design applications and their implications.

2.2 Theoretical Framework

This study adopts a theoretical framework grounded in three interrelated theories: Service Design Theory, Environmental Psychology, and Human-Centered Design. These theories were selected because they collectively address the multidimensional aspects of public space design in healthcare settings, particularly in pediatric environments where user experience, emotional well-being, and functional efficiency are paramount. For instance, Stickdorn and Schneider (2010) argue that