

RESEARCH REPORT

Interdisciplinary Insights for Enhanced Pre-design Strategies

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Interdisciplinary Insights for Enhanced Pre-design Strategies

DECLARATION OF ORIGINALITY

I declare that the mini-dissertation, Interdisciplinary Insights for Enhanced Pre-design Strategies, which has been submitted in fulfilment of part of the requirements for the module of DIT 801, at the University of Pretoria, is my own work and has not previously been submitted by me for any degree at the University of Pretoria or any other tertiary institution.

I declare that I obtained the applicable research ethics approval to conduct the research described in this dissertation.

I declare that I have observed the ethical standards required in terms of the University of Pretoria's ethics code for researchers and have followed the policy guidelines for responsible research.



Signature

Date: 04/07/2024

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Abstract

This integrative review aims to develop a framework for interior spatial design by integrating methodologies from Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD). Traditional approaches often overlook the interconnected nature of user experience, spatial qualities, and programmatic requirements. This study synthesises insights through a systematic integrative literature review to propose a framework that leverages BPD for process optimisation, SD for enhancing user experiences, and ISD for effective spatial design. Practical tools such as service blueprints, BPMN diagrams, and customer journey maps are integrated to ensure user-centred, operationally efficient designs aligned with stakeholder needs. The review demonstrates the framework's application in diverse interior spatial design contexts, highlighting its potential to enhance user experience, programmatic requirements, spatial qualities and stakeholder satisfaction while addressing complex design challenges.

Keywords:

User experience, programmatic requirements, spatial qualities, business process design (BPD), service design (SD), interior spatial design (ISD), pre-design phase, methods, tools, integrated framework

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1. Introduction

1.1 background

In the context of spatial design, understanding the interplay between people (user experience), programme (processes), and place (physical environment) is important for developing a holistic design approach. These three components form an interconnected system where each element influences and informs the others. However, a significant issue arises when one of these aspects is prioritised over the others, leading to imbalanced and ineffective designs (Reijers, 2002). For instance, architects often focus on spatial qualities and programmatic requirements at the expense of user experience (Yuan, Liu and Rui, 2021). In architectural practices, there is a prevalent emphasis on spatial design (place) and programmatic requirements (programme), often at the expense of user experience (people) (De Rosa, 2022). This lack of a holistic approach results in unclear spatial requirements and dysfunctional designs that do not fully accommodate the complexities of user interactions.

This imbalance poses a critical question: How can spatial design mediate between programme, place, and people to create more effective and meaningful designs? The answer lies in a user-centred approach. Understanding user needs and process requirements, often abstract and undefined, is crucial. Without a clear understanding of user requirements, design solutions will fail to address the intricacies of user interactions and experiences.

As societal dynamics and technological advancements evolve, so do users' needs. Rapid technological advancements and shifting societal values constantly reshape how people interact with their environments (Punitha et al., 2023, p. 1; Wells et al., 2023, p. 649). In this dynamic landscape, designers must stay attuned to these evolving needs. This constant reassessment of user requirements is the key to ensuring that designs remain relevant and practical. Designers must be proactive in creating adaptable spaces that can meet future challenges. This ongoing adaptation is not just a necessity but a strategy for maintaining the functionality and appeal of interior spaces in a rapidly changing world (Kugler, 2007, p. 144; Schütte-Lihotzky, 2014, p. 179; Nehme 2020, p. 1).

The pre-design phase, essential for setting requirements and establishing design scope, must be addressed. (Stehn, Haller and Stehn, 2010). However, many designers do not adopt a user-centred approach; instead, they focus primarily on spatial design and the constraints of existing infrastructure. This insensitivity to user needs results in designs that fall short of expectations and fail to accommodate future challenges. (Gustafsson, Hermenlin and Smas, 2018).

Clients often lack awareness of the comprehensive scope of architectural services, leading to vague project briefs and requirements (Morris, 2022). This lack of clarity hampers architects' ability to deliver designs that fully realise their capabilities and address complex programmatic and contextual needs. (Morris, 2022). Therefore, architects must consider people, place, and programme as interconnected elements and understand how these aspects inform and affect one another to create holistic and practical designs.

1.2 Hypothesis

To address the broad problems in architecture, it is essential to understand the relationship between people, place, and programme. This triad can be visualised as a Venn diagram (figure 1), where each circle represents one of the three elements: people (user experience), place (physical environment), and programme (processes, activities, functions, uses). The intersection points highlight the areas of interaction and interdependence, indicating where the design should enhance user comfort, facilitate efficient workflows, and integrate user needs comprehensively.

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Spatial designers need to consider people, place, and programme holistically and understand how these elements inform and affect each other. Space accommodates people and programme only when both needs are thoroughly understood and integrated into the design process. (Mace, 2016). In the holistic system of people-place-programme, each component is interdependent and must be combined to create functional, efficient, and user-centric designs (Liu *et al.*, 2023).

The profession of interior architecture, due to its inherent interdisciplinary nature, is uniquely positioned at the intersection of innovation. This is because it has the potential to significantly benefit from research that integrates diverse fields of study. By combining insights from technology, sociology, psychology, and design, interior architecture can drive innovation and create holistic and adaptive environments, as demonstrated by the work of Liu *et al.* (2023).

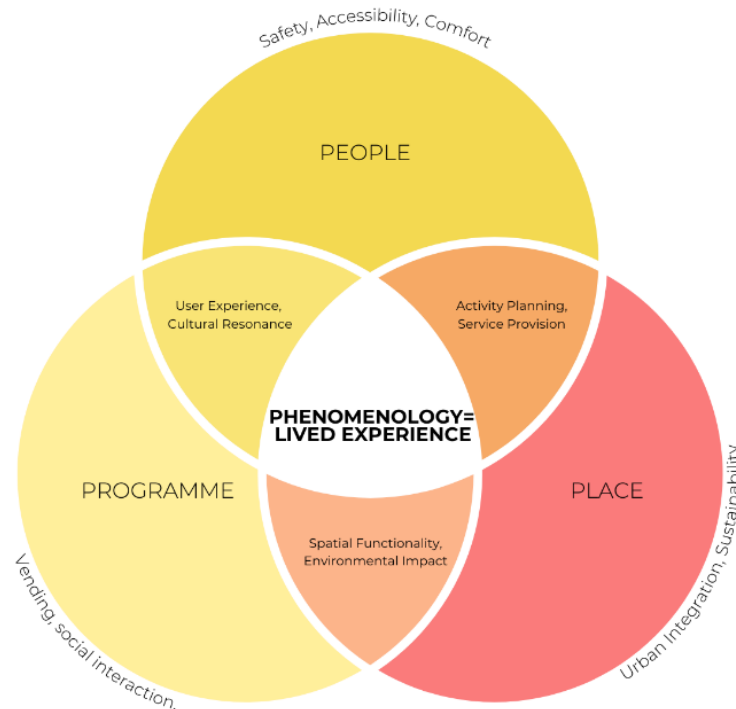


Figure 1: The Relationship between people, programme & place (Author, 2024)

With societal dynamics constantly changing and technology evolving at an unprecedented rate, the pre-design stage is increasingly important in determining how future built environments will develop (Punitha *et al.*, 2023, p. 1; Wells *et al.*, 2023, p. 649). However, traditional pre-design techniques fail to capture the specific requirements accurately and understand the complex interactions between people, place and programme (Babapour *et al.*, 2021). This underscores the need for a paradigm shift toward a more all-encompassing, integrated approach that transcends disciplinary boundaries (Liu *et al.*, 2023). By embracing interdisciplinary research, interior architecture can better address these complexities, leading to more effective and innovative design solutions that are responsive to the evolving needs of users. Spatial designers confront various possibilities and challenges in this rapidly changing environment, requiring creative solutions (Gustafsson *et al.*, 2018). Traditionally accepted design practices are being examined due to changes in societal standards and technological advancements (Babapour Chafi & Coboleda-Cordero, 2021). As a result, the significance of

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reassessing current approaches and adopting interdisciplinary frameworks that promote cooperation and innovation is becoming increasingly apparent. By escaping the confines of traditional thinking, spatial designers can steer toward more responsive and revolutionary design solutions.

1.3 Defining People, Programme, and Place

Understanding the interplay between people, programme, and place in spatial design is important for developing a holistic design approach. These three components form an interconnected system in which each influences and informs the others. By defining these elements, it can better grasp their interactions and how they contribute to the design process.

People in architectural design refer to the users of the space, encompassing their experiences, perceptions, and interactions with the environment. According to Shields (2023), individuals rely on past experiences and knowledge to process and interpret their surroundings, creating an internal reconstruction of the visual world. Lee (2022) expands on this by describing how people interact with various elements of interior space, experiencing environmental stimuli through visual and sensual factors. These interactions are not merely physical but are deeply influenced by emotions and memories, which form a spatial identity. Popov and Goza (2016) highlight people's social and spatial components, noting that activities within a space serve as a medium for interaction and relationship building. For this research, researchers define people as individuals interacting within a space whose experiences and emotions are shaped by memories and their environment's immediate physical and sensory stimuli.

In architectural terms, the **programme** is the set of criteria and requirements that guide the design process. Karp (1969) defines programming as problem-seeking, where the method identifies the needs and goals the design must address. It involves developing a statement of the problem, setting criteria, and creating hierarchies to guide design solutions. Hershberger (1985) further elaborates that architectural programming identifies values, goals, and facts about a project to articulate facility needs. The first stage in the architectural design process sets the foundation for achieving effective and meaningful architecture. Daniel and Jesper (2012) consider the programme to encompass daily routines and habits, emphasising the interaction between spatial configuration, organisational structure, and work processes. This research defines the programme as the structured set of requirements and guidelines that shape the design process, integrating functional needs, user activities, and spatial practices to create a coherent and purposeful space.

Place refers to the physical environment in which people interact and where the programme is implemented. Shields (2023) describes a place as a familiar environment where people develop internal muscle memory for interacting with it. Mace (2016) emphasises the psychological resonance of a place, where spaces influence how people feel about themselves and each other. Sime (1986) traces the concept of place back to Aristotle's 'topos', highlighting the emotional ties and sense of belonging that physical locations can evoke. This notion of place transcends physical dimensions, incorporating the experiences, behaviours, and emotions associated with a location. In this research, the place is defined as the physical and psychological environment that shapes and is shaped by human interactions, encompassing both the tangible aspects of space and the intangible experiences and emotions it evokes.

By defining people, programme, and place, researchers establish a framework for understanding their interdependence in architectural design. This holistic approach acknowledges that effective design cannot prioritise one element over the others but must consider the dynamic interactions between users, their activities, and the physical

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environment. This understanding forms the basis for creating spaces that are functional, efficient, and responsive to the needs and experiences of those who inhabit them.

1.4 Introduction to three selected disciplines for this study

In a dynamic and ever-evolving landscape, spatial designers find themselves at the forefront of a field with promise and challenge, necessitating a reevaluation of established design paradigms (Gustafsson et al., 2018). As societal norms shift and technology progresses, there is a growing imperative for interdisciplinary frameworks that foster innovation and collaboration. Spatial designers can pioneer novel and responsive design solutions by transcending traditional boundaries.

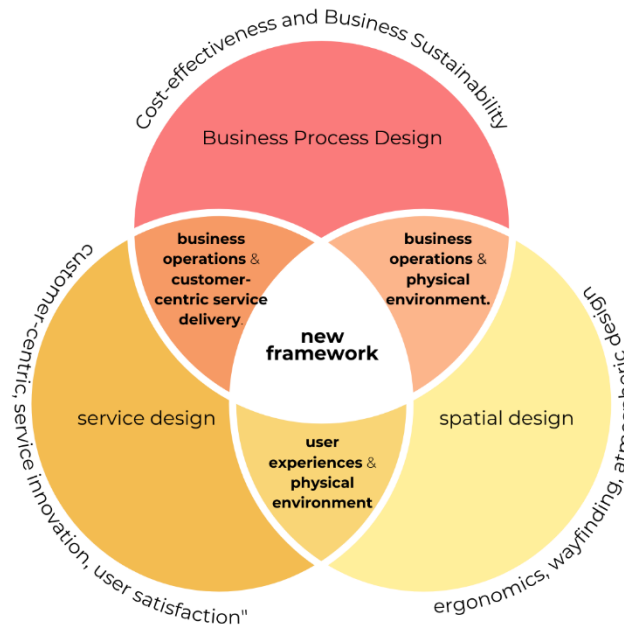


Figure 2: BPD, SD & ISD diagram (Author, 2024)

The contemporary post-pandemic milieu, marked by technological advancements and evolving socio-political dynamics, has fundamentally altered our relationship with the built environment (Punitha et al., 2023; Wells et al., 2023). This transformation has created new typologies, methodologies, and user expectations (Kugler, 2007; Schütte-Lihotzky, 2014; Nehme, 2020). However, conventional design practices often fail to address human needs, especially in healthcare, education and transportation domains. Efforts to enhance the human experience are frequently superficial, focusing primarily on spatial design, programme requirements and aesthetic surface treatment.

In contemporary architectural practice, addressing the complexities of design goes beyond conventional approaches (Dokter, Thuvander and Rahe, 2021)It

requires a deep and multifaceted understanding of the interplay between various elements, including people, programmes, and places. These elements form the foundation upon which architectural solutions are built, influencing not only the physical form but also the functionality and user experience of built environments. The role of spatial designers are crucial in creating spaces that are not just aesthetically pleasing, but also functional and efficient. (Shields, 2023). As such, architects are increasingly turning to interdisciplinary approaches that integrate diverse fields of study. Among these, Service Design (SD), Business Process Design (BPD), and Interior Spatial Design (ISD) stand out as disciplines that offer unique perspectives and methodologies to address the intricate challenges of modern architecture. By combining insights from these interdisciplinary fields, architects can optimise solutions that prioritise user needs, develop organisational processes, and create environments that foster well-being and satisfaction. Thus, understanding the roles and contributions of Service Design, Business Process Design, and Interior Spatial Design could be greatly benefit for architects seeking to navigate the complexities of contemporary architectural practice effectively.

Selecting Service Design, Business Process Design, and Interior Spatial Design is intentional and strategic. Each discipline contributes a distinct yet complementary perspective for

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addressing modern architectural challenges' multifaceted nature. Service Design focuses on creating user-centred experiences by mapping out service touchpoints and interactions, making it important for designing environments that cater to diverse user needs (Selloni & Meroni, 2023). Business Process Design provides tools for aligning spatial and service design with organisational objectives, ensuring efficiency and clarity in how spaces are used and managed (Amoozad et al., 2023). On the other hand, Interior Spatial Design integrates aesthetic and functional aspects of physical environments, bridging the gap between form and function (Thoring *et al.*, 2020). Together, these disciplines offer a holistic approach that enhances the user experience, streamlines processes, and elevates the overall quality of the built environment. By leveraging the strengths of SD, BPD, and ISD, spatial designers can create spaces that are not only visually appealing but also highly functional and responsive to the evolving needs of society.

1.5 Defining SD, BPD, & ISD

Service design is an interdisciplinary field that focuses on creating and organising services to enhance user experience and meet customer needs. According to Zurlo (2018), service design can be approached from a problem-solving perspective akin to engineering and management, and an exploratory inquiry method called "designing for service." This approach emphasises a human-centred, holistic, creative, and iterative process for crafting new service futures. Service design has evolved within design disciplines to address the complexities of behaviour, organisations, and service systems, gaining recognition in design studies and related fields such as service research, service science, and service innovation.

Musulin and Strahonja (2023) highlight that service design methods share common characteristics, including a user-centred and holistic approach that considers all customer lifecycle touchpoints. These methods also emphasise customer value co-creation, practical tools, visual techniques, and the inclusion of various stakeholders in the design process, linking organisational goals across different levels. Wang (2013) adds that service design involves planning and organising the interaction between service providers and customers, creating an environment that stimulates user imagination and participation. Unanue et al. (2021) emphasise placing the user at the centre of the design process, ensuring that services are useful, usable, and desirable from the user's perspective.

This research defines service design as an interdisciplinary and user-centred approach to creating and organising services. It integrates various stakeholders and practical tools to enhance customer experience and co-create value.

Business process design focuses on understanding and improving organisational processes to deliver maximum customer value. Trkman et al. (2015) state that any process redesign effort should start with the customer's needs, aiming to transform these requirements into actual goods and services. Business process management (BPM) consolidates disciplines that believe a process-centred approach leads to substantial improvements in performance and compliance. This approach often begins with evaluating key customers' priorities, although it sometimes overlooks the importance of perceived customer value.

Ryzhakova et al. (2019) describe the traditional business process as a sequence of actions to achieve a valuable result for the enterprise. This process approach views the organisation as a set of interconnected business processes that work together to deliver products or services. Galvin and Singer (1996) emphasise that business process design helps clarify confusing business situations by viewing organisations as webs of commitments designed to produce customer satisfaction rather than hierarchies or material systems.

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This research defines business process design as a process-centred approach that focuses on understanding, redesigning, and managing organisational processes to optimise performance, compliance, and customer satisfaction.

Spatial design, particularly in interior design and architecture, involves creating environments that enhance the experiences and well-being of their occupants. Ndovela et al. (2022) highlight the importance of interior design in promoting health, safety, and welfare. However, the field has often been perceived as serving the privileged, leading to an ethical dilemma regarding social responsibility. The concept of social innovation in interior design can bridge this gap, emphasising human-focused solutions and societal contributions.

Lee (2022) explains that interior spaces, which people interact with daily, impact their occupants by providing a communicative form that engages the body and generates emotional connections. This includes various elements such as proportions, forms, textures, light, colours, and sounds, collectively creating a holistic spatial experience. Interior spaces reflect how people use, occupy, transform, and adapt to their environments, forming spatial identities and memories (Lee, 2022).

For this research, spatial design is defined as creating and arranging interior environments that enhance user experience and well-being by considering various elements such as proportions, forms, textures, light, colours, and sounds. Additionally, spatial design is critical in accommodating various programmes, functions, activities, and uses (Karp, 1969). By integrating these elements, spatial design ensures that spaces are aesthetically pleasing and functionally practical, supporting users' diverse needs and the specific requirements of different activities (De Rosa, 2022). This holistic approach allows for creating environments that are adaptable, efficient, and conducive to the intended purposes.

1.6 Integrating Interdisciplinary Approaches for Enhanced Interior Spatial Design

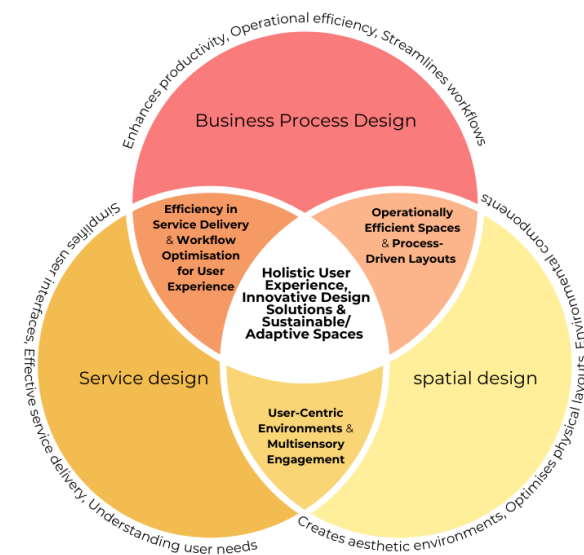


Figure 3: Intersections of BPD, SD, and ISD (Author, 2024)

The synergistic potential of integrating tools and methods from multiple fields is at the forefront of this study. Spatial Design ensures that environments are aesthetically pleasing and suitable for human activity, optimising physical layouts and environmental components (De Rosa, 2022). Service Design complements this by creating simple user interfaces across various touchpoints, driven by effective service delivery procedures and a thorough understanding of user needs (Kongelf and Camacho-Otero, 2020). Meanwhile, Business Process Design enhances productivity and operational efficiency by systematically analysing and streamlining organisational workflows (Galvin & Singer, 1996). By integrating these disciplines, designers can generate comprehensive solutions that address pragmatic requirements while improving the overall user experience, leading to innovative and meaningful design outcomes.

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With a focus on the intersection between Business Process Design (BPD), Service Design (SD), and Spatial Design (ISD), the research aims to understand how these disciplines can be integrated to enhance the programme efficiency, effectiveness, and user experience of interior architectural projects. This interdisciplinary approach acknowledges the multifaceted nature of contemporary interior architecture, where a comprehensive understanding of design procedures is paramount (Liu *et al.*, 2023). By combining the principles of BPD, SD, and ISD, spatial designers can transcend traditional design limitations and present new frameworks that improve human experiences.

To bridge these disciplines, the implementation of specific tools is crucial. Tools that document programmatic requirements, user needs and experiences (UX), and spatial qualities can be employed in both the pre-design phase and post-occupancy evaluations. During the pre-design phase, such tools help establish a foundation for a user-centric approach, ensuring that the design process aligns with user needs, programmatic requirements, and spatial considerations (Stehn, Haller and Stehn, 2010). In post-occupancy evaluations, these tools provide valuable feedback on the effectiveness of the design, highlighting areas for improvement and validating the success of the integrated approach (Aliyu *et al.*, 2016). By leveraging these tools, designers can create functionally efficient environments that are emotionally resonant and adaptable to future needs.

This research seeks to provide insights that will guide the development of a coherent framework for pre-design practice, paving the way for a new era of interior architecture that is inclusive, adaptable, and responsive to the demands of a rapidly changing world. By fostering interdisciplinary collaboration and creative thinking, this approach opens possibilities for designing spaces that effectively mediate between user experiences and operational processes, ultimately leading to more sustainable and user-centric design outcomes (Liu *et al.*, 2023).

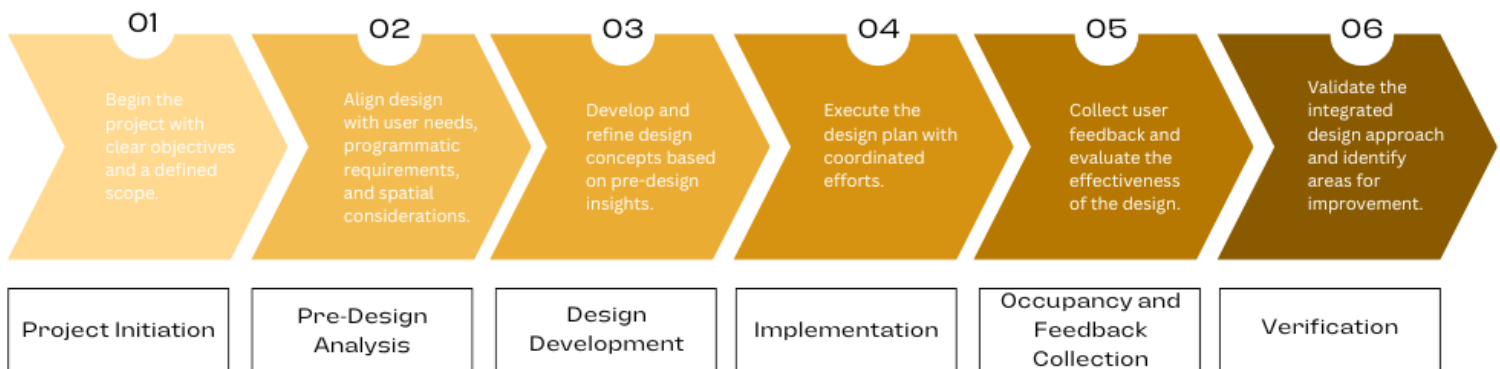


Figure 4: BPD, SD, and ISD intersect to elevate interior architectural projects (Author, 2024)

In line with the integrated framework described, the six-step flowchart (Figure 4) visually articulates how Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) intersect to support interior architectural projects, with a specific focus on the pre-design phase. This approach underscores the synergy of integrating diverse tools and methodologies from these disciplines. Designers can meticulously align projects with user needs and operational efficiencies by leveraging tools that measure processes, user experiences (UX), and spatial qualities.

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This integrated methodology enhances interior spaces' functionality and emotional appeal and supports iterative improvements through post-occupancy evaluations. Spatial Design develops physical layouts and environmental elements, ensuring spaces are aesthetically pleasing and conducive to human activity (Thoring *et al.*, 2020). Concurrently, Service Design simplifies user interactions, guided by a deep understanding of user needs and effective service delivery strategies (Selloni and Meroni, 2023)—meanwhile, Business Process Design streamlines workflows, boosting productivity and organisational effectiveness (Galvin and Singer, 1996).

By integrating these disciplines cohesively, particularly in the pre-design phase, designers can innovate and deliver design solutions that are both pragmatic and user-centric, paving the way for a future of adaptive and inclusive interior architecture.

2. Theoretical Framework

The imperative for innovation and integration is evident in the dynamic realm of interior architecture. Technological advancements and societal changes challenge traditional design principles (Chauhan, Parida, and Dhir, 2022), necessitating interdisciplinary frameworks that span academic boundaries (Liu *et al.*, 2023). The pre-design phase is crucial, laying the foundation for exceptional design by integrating programmatic procedures, spatial aspects, and user experiences, collectively known as People-Place-Programme (PPP). By navigating the complexities of pre-design practice and incorporating insights from multiple disciplines, this study aims to stimulate creativity and change, offering viewpoints and ideas that align with evolving societal demands (Stehn, Haller, and Stehn, 2010).

With the emergence of intelligent technologies and the increasing integration of digital solutions in the built environment, interior designers are tasked with reimagining traditional paradigms to create functional spaces responsive to users' changing needs (Ashour and Rashdan, 2023). This shift underscores the importance of adopting an interdisciplinary approach that integrates tools and methodologies from diverse fields, such as service design (SD), business process design (BPD), and interior spatial design (ISD), to address the multifaceted challenges inherent in modern interior architecture.

As interior architecture evolves to include new typologies like co-working spaces and smart homes, there is a pressing need to reconsider traditional frameworks (Bouncken, Aslam, and Qiu, 2020). These emerging trends highlight the need for innovative strategies to keep design practices relevant amid changing demands and technologies (Chauhan, Parida, and Dhir, 2022). Embracing interdisciplinary collaboration and leveraging innovative tools and techniques enable designers to create built environments that meet functional requirements and foster meaningful experiences, enhancing the quality of life (Liu *et al.*, 2023).

Conventional design methods often fall short due to fragmentation, failing to integrate essential elements such as programmatic requirements, spatial qualities, and user experiences (Julia-Nehme *et al.*, 2023). Current practices prioritise components over holistic integration, leading to disjointed outcomes that do not adequately address users' needs (Polaine, Løvlie, and Reason, 2018). Critically evaluating these techniques and focusing on a user-centric approach is crucial for understanding the interplay of programmatic operations, spatial characteristics, and user experiences, and proposing a more effective design strategy (Schmidt *et al.*, 2020).

This study aims to explore the potential for synergy between methods and tools from SD, BPD, and ISD to create an integrated framework that addresses core issues in interior architecture. Understanding the complexities associated with contemporary interior architecture underscores the necessity of a paradigm shift towards integration (Dokter *et al.*, 2021). Moving past segmented methods to a comprehensive view of the built environment, designers can

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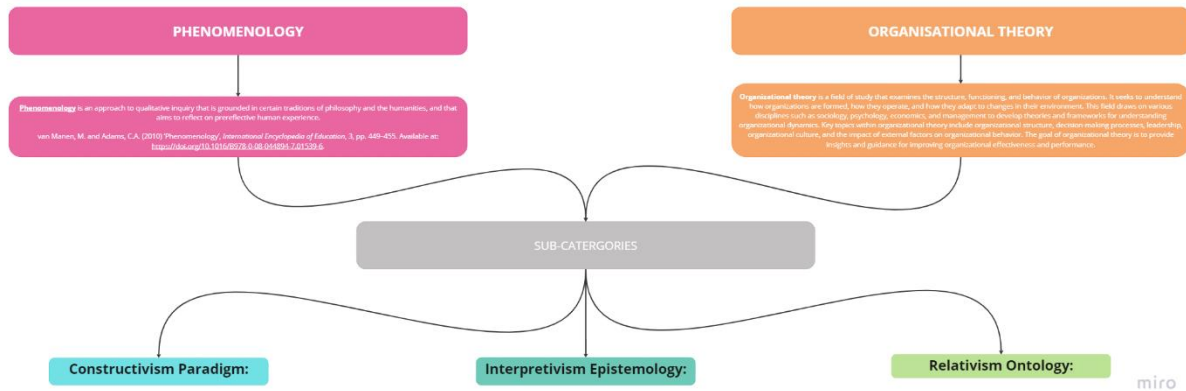


Figure 6: Theoretical Framework (Author, 2024)

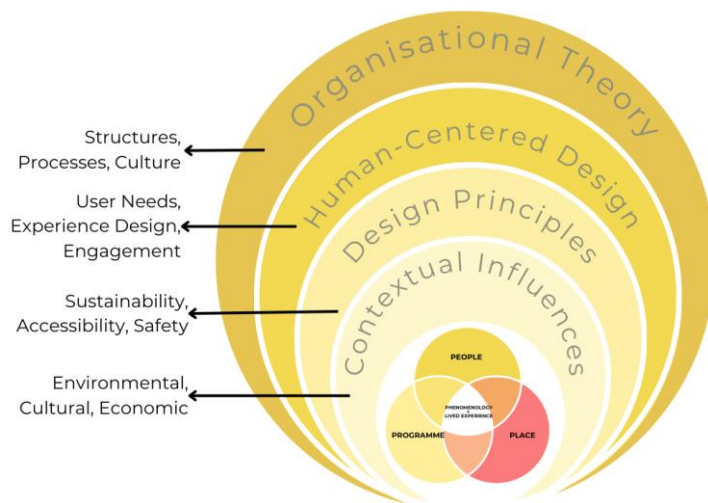


Figure 5: integration of Organisational theory and phenomenology

develop spaces that meet practical requirements and achieve meaningful resonance with inhabitants (Liu et al., 2023).

Adopting a phenomenological approach in spatial design is relevant for site-specific documentation and evaluation. This approach places lived experiences and human psychological needs at the centre of the design process, emphasising empathy and understanding (Chaitanakankul, 2023). By delving into the pre-reflective human experience, designers gain insight into users' subjective experiences, enabling them to create spaces that

meet functional requirements and resonate emotionally with occupants (Daylight Site, 2017). As Henry (2005) discussed, designers can explore how users perceive and interact with their surroundings through the lens of phenomenology, focusing on the cultural dimensions that shape these experiences. A phenomenological approach to place involves understanding the emotional and experiential connections users have with specific locations, while a phenomenological approach to programme focuses on how users' activities and routines are experienced within these spaces. This culturally sensitive approach to phenomenology allows for a more nuanced understanding of the spatial needs and preferences of users, resulting in spaces that are aesthetically pleasing, practical, intuitive, and emotionally meaningful within the context of cultural traditions and lived experiences (Henry, 2005).

In addition to phenomenology, incorporating organisational theory further enriches the understanding of design practice in interior architecture, especially within organisational settings. Organisational theory provides insights into organisations' structure, functioning, and behaviour, shedding light on how organisational dynamics intersect with spatial design considerations (Starbuck, 2003). By integrating organisational theory with phenomenology,

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designers can comprehensively understand the interplay between individual experiences, organisational contexts, and the built environment, ultimately leading to more informed and impactful design outcomes sensitive to unique cultural and organisational landscape (Starbuck, 2003; Chaitanakankul, 2023). This approach ensures that the design process is informed by universal design principles and the African context's specific cultural and organisational realities.

Incorporating philosophical perspectives such as the Constructivism Paradigm, Interpretivism Epistemology, and Relativism Ontology can enrich the understanding of design practice in interior architecture. The Constructivism Paradigm highlights how versions of the social world are constructed in discourse, shedding light on how reality is socially constructed and shapes individuals' actions and perceptions (Durrheim et al., 2006). Interpretivism Epistemology emphasises the subjective nature of knowledge, reality, and truth, suggesting that events are understood through interpretation influenced by interactions with social context (Archer, 2017). Similarly, Relativism Ontology posits the existence of multiple subjective realities constructed and interpreted through human interactions (Archer, 2017). These philosophical perspectives provide valuable insights into how individuals perceive and interpret their surroundings, enriching the understanding of People-Place-Programme (PPP) interactions in interior design.

Integrating various methods and tools from BPD, SD, and ISD is increasingly important as the boundaries of interior architecture expand. In the current landscape of interior architectural research, experts are pushing boundaries, exploring novel intersections, and challenging conventional knowledge (Young, 2021). Innovations such as parametric design principles and immersive virtual reality experiences are reshaping the fundamentals of spatial experience (Salama and Patil, 2024). However, amidst this activity, a pressing need remains for a framework that combines various lines of thinking. This investigation aims to address this need by providing an extensive framework for design practice, incorporating insights from diverse disciplines, and recognising the intricacies of the built environment and human experience.

This research aims to contribute to the ongoing discourse about the future of interior architecture. Through careful investigation and rigorous inquiry, it seeks to provide a path for a more cohesive, adaptable, and responsive approach to design in interior architecture. The dynamic nature of interior architecture necessitates continuous adaptation and innovation to address evolving societal needs and technological advancements.

Integrating philosophical perspectives such as Constructivism, Interpretivism, and Relativism adds depth to the understanding of design practice in interior architecture. These philosophical frameworks provide valuable insights into how individuals perceive and interpret their surroundings, shedding light on the subjective nature of human experience and the role of social context in shaping reality (Durrheim et al., 2006; Archer, 2017). By incorporating these perspectives into design processes, designers can better understand user needs and preferences, creating more responsive and user-centric spaces.

3. Research methodology

3.1 Research strategy/ approach

This investigation aims to develop an integrative framework for pre-design practice by exploring the synergistic potential of merging tools and methodologies from service design (SD), business process design (BPD), and spatial design (ISD). Recognising the role of the pre-design phase in establishing a foundation for human-centred design, the study emphasises the integration of programmatic requirements, spatial qualities, and user experiences.

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This paper follows a five-step research structure approach proposed by Lubbe et al. (2020) (Figure 7). This study employs step 1 to 4. The initial steps are to develop a search strategy and collect relevant data. The search strategy began with setting up an Excel spreadsheet (Figure 8) to keep track of information and processes for searching, scoping, screening, and selecting literature, data extraction, and synthesis and presentation of the results.

3.2. Step 1: Review Question

The research question aims to be accessible. It is precise, points out gaps in the body of knowledge, and promotes ILR techniques for efficient data extraction and collecting.

Research Question (RQ):

The primary research question for this study is: "Can tools from business process design, service design, and interior spatial design be combined to create a framework for evaluating user experience, programmatic requirements, and spatial qualities in the pre-design phase?"

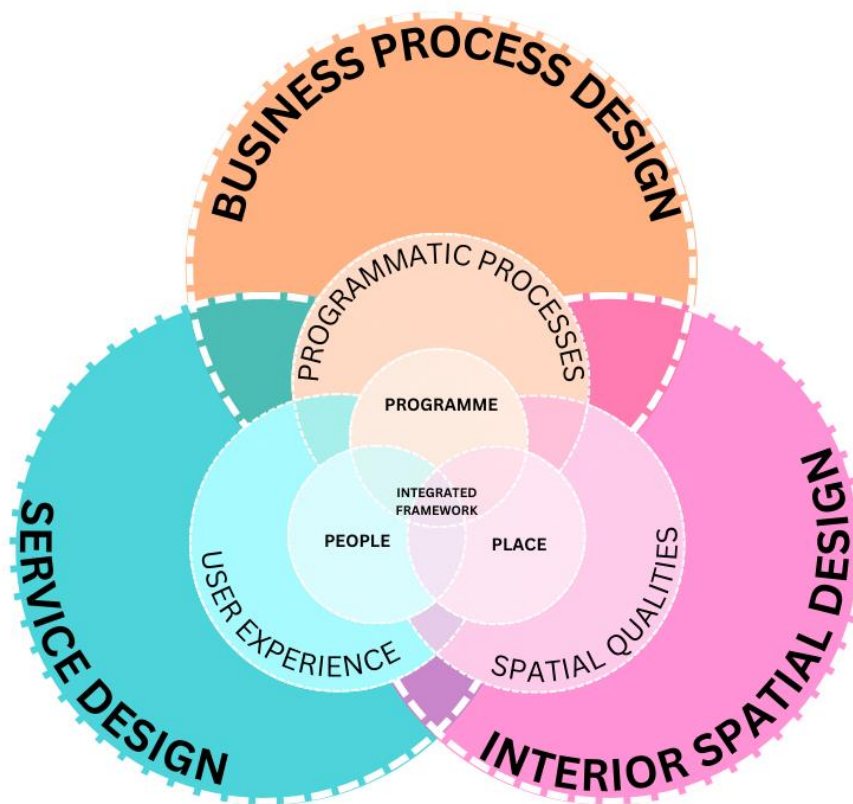


Figure 8: Research Question Visualisation (Author, 2024)

Several sub-questions complement this core inquiry to delve deeper into the complexities of interdisciplinary design integration:

- What are the BPD, SD, and ISD disciplines, and how do they relate and differ?
- What tools or methods are used in BPD, SD, and ISD, and how do they compare? What challenges and opportunities do they present?
- What are the strengths and limitations of current tools in capturing user experience, programmatic requirements, and spatial qualities?

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- How effective is the developed spatial framework in establishing and documenting user experience, people, place (physical environment), programme, and their relationships?
- What are the critical intersections among business process design, service design, and spatial design that can enhance pre-design practices in interior architecture?
- How effective are integrated tools from these design disciplines in addressing user experience, programmatic requirements, and spatial qualities?

These inquiries address viewpoints in interior spatial design, business process design, and service design. They investigate the applications, comparisons, and integrations of technologies from these fields with the pre-design stage of interior architectural projects. Furthermore, they investigate how these tools impact people, programme, and place (PPP) and their characteristics and user experience in a physical space. Moreover, the questions seek to investigate the possible creation of a novel pre-design phase model that results from the intersection of these instruments.

This review question and its sub-questions incorporate the elements of a practical review question—setting, perspective, intervention, comparison, and evaluation (SPICE), as Lubbe et al. (2020) identified. By framing the research this way, the study seeks to systematically explore and document the synergistic potential of integrating tools and methodologies from diverse design disciplines to improve interior architectural practices.

3.3 Step 2: Sampling

The literature sampling process is planned, employing a rigorous strategy to gather reliable evidence. This step is segmented into three parts: Searching, Screening, and Selecting.

3.3.1 Step 2a: Searching

The search process begins by selecting databases that will provide relevant sources addressing the research question. The chosen databases include ResearchGate, Academia, Google Scholar, Elsevier, ScienceDirect, EBSCOhost, JSTOR, MIT Library, and ProQuest. These databases were selected due to their accessibility and comprehensive collections of high-quality articles. To refine our search strategy and increase its specificity and relevance,

| NO. | NEO READ | COLLEEN READ | SEARCH ENGINE | KEYWORD 1 | KEYWORD 2 | KEYWORD 3 | KEYWORD 4 | DATE | TITLE OF ARTICLE/BOOK/JOURNAL | AUTHORS | RELEVANCY (ex "specific" tool/method/s keyword etc.) | IMPORTANCE |
|-----|----------|--------------|----------------|-----------------------------|----------------------------------|---------------------|------------------------|------|---|--|---|--|
| 1 | | | ResearchGate | business process management | workflow | design | management | 2023 | "Design Principles for Using Business Process Management Systems" | Sabaletta-Dunster, Will, Tang, Neo Hochstetler, Samira Zikar & Maxim Kuznetsov | Business process management (BPM) enables continuous improvement of business processes. Business process management systems (BPMS) serve as an entry point to BPM activities and afford firms to manage, execute, and automate business processes. (These design principles compare user management, process modeling, automation, logging, monitoring, integration, and case handling) | Offers BPM definition /service design principles /Improve BP |
| 2 | | | EBSCO host | business process management | workflow | design | | 2013 | Control Flow Pattern Recognition For BPMN Process Models. | Yeh-Chur Juan, Kuo-Yen Yuan | Business process models are implicitly composed of a set of control flow patterns, such as the Parallel Split, Synchronization, Exclusive (Choice, and Single Merge, etc.) in three-phased framework to recognize the constituent control flow patterns and their interrelationship for a Business Process Modeling Notation (BPMN) process model | Proposes procedure and method by developing a workflow pattern representation system for BPMN process models. /design phase then develops the detailed procedure and methods based on the proposed conceptual process to recognize control flow patterns for a BPMN process model. |
| 3 | | | GOOGLE SCHOLAR | flow | business process modeling | User experience | Programmatic processes | 2012 | Essential Business Process Modeling (CHAPTER 1) | Michael Hevry | Standard ways to code rigorous processes that are centerpiece of a service-oriented architecture (SOA), which defines how networks interact so that one can perform a service for the other. | Defines BPM / service architecture /methodology explored /BPM model explored |
| 4 | | | James Cook | user experience | BPM | TOOLS/METHODS | | 2021 | Human factor in business process management: modeling competencies of BPM roles | Hozab, Martin, Tufak, David, Mende, Venclov, Fedotko, Gabriel | The proposed competence model can be utilized during business process management (BPM) implementation while appointing process owners, analysts and industrial engineers and their further development. | |
| 5 | | | Proquest | business process management | user experience (or customer) | user experience | | 2015 | From business process management to customer process management | Thiemann, Peter, Mertens, Willem, Vlaemin, Silje, Gemmel, Paul. | If the purpose of this paper is to argue that in order to achieve customer centricity through business process management (BPM), companies have to obtain the profound understanding of customers' processes and when necessary change not only the interactions with but also the processes of their customers. A method is presented that allows doing this in a systematic manner. | |
| 6 | | | GOOGLE SCHOLAR | business process | innovative technology | customer experience | innovation design | 2019 | The Innovative Technology for Modeling Management Business Process of the Enterprise | Galyna Ryzhikova, Dmytro Ryzhikov, Sanyu Patrash, Tatiana Kocherzhen, Tatiana Hoshcharenko | presents recent innovative technology for modeling business processes of enterprises based on process management (includes the creation and construction of the logical methodological and analysis tool for assessing, selecting and equipping the production system of administration of an enterprise project portfolio in a single operating management system. | Proposes functional system /NO PHYSICAL ENVIRONMENT TOUCH |
| 7 | | | Proquest | BUSINESS PROCESS MANAGEMENT | CUSTOMER EXPERIENCE | TOOLS/METHODS | SERVICE DESIGN | 2019 | Business Process Analysis for Transfer Payment Transaction Case Study: An LPG Distributor Company in Bandung | Priatama, Jonathan, Akbar Adh Utama | This research aims to understand the current situation of the business process, give a solution for the business issue faced by the company, and speed up the business process. | BPM /METHODOLOGY EXPLORED /SERVICE DESIGN |
| 8 | BPD | | Science Direct | business process management | workflow | design | | 2013 | Formal workflow design analytics using data flow modeling | Sun, Sherry X, Zhao, J, Leon | Will investigate the possibility of incorporating formal analytics into workflow design thus enabling the interrelated challenge faced by business analysts when creating workflow models. (The workflow design analytics can process large construct a workflow model based on information about the relevant activities and their associated data. /workflow design from a formal and experimental effort into a more systematic and rigorous approach. | Method: Workflow model |
| 9 | | | James Cook | business process management | tools OR methods (or technology) | design | | 2021 | BPM and Socialization Tools Integrated to Improve Acquisition and Management of Information During Design and Execution of business processes: BPM-Social Tool - a proposal | Mehrab, Pablo, Marco Bazzano, Julio César Basán, Patricia | If this work proposes to base how the socialization tools can solve current problems in BPM through a theoretical analysis added to the practical development of a socialization tool integrated to a BPMS (Business Process Management System). | /Socialization tools |
| 10 | | | James Cook | user experience | BPM | TOOLS/METHODS | | 2020 | Business process management workshops : BPM 2020 international workshops, Seville, Spain, September 13-18, 2020 : revised selected papers | Leocadi, Henrik, editor, Del Rio Ortega, Aida, editor, Saez, Rosa Maria, editor | Papers from the following workshops are included: Workshop on Security and Privacy-Enhanced Business Process Management (SBP 2020) Workshop on Social and Smart Aspects of Business Process Management (SBAS 2020) | /Human aspects combined BPM |

Figure 9: Excel Search Activity log (Author, 2024)

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researchers consulted with a librarian who provided invaluable insights and taught us advanced search strategies.

Identifying keywords and search strings is important. The keywords used in the search included:

- 1) Tools: techniques, methods, models, systems, aids, instruments, devices, mechanisms, observational tables, user journey maps, archetypes, service mapping, service blueprint
- 2) Business Process Design (BPD): business process management, business process modelling
- 3) Service Design (SD): service experience design (SXD), interaction design
- 4) Spatial Design: architecture, interior design, interior architecture, interface design
- 5) Pre-design: concept, conceptual phase, planning, inception
- 6) User Experience (UX): customer experience (CX), human interface, human-centred, behavioural
- 7) Programmatic Processes: program, use, function, activity, process, operational, business process, workflow
- 8) Spatial Qualities: material, characteristics, infrastructure, built fabric, physical environment, building, architecture, dimension, place.

The review question serves as a guide to identifying key search terms for the literature review. These keywords were incorporated with Boolean operators in the chosen databases to enhance the combination of terms for more effective searches. All data collected was systematically organised in a spreadsheet detailing the database from which it was sourced, followed by the keyword combinations used, the title, and the publication date (figure 10).

| TYPE | SEARCH ENGINE | KEYWORD 1 | KEYWORD 2 | KEYWORD 3 | KEYWORD 4 | DATE | TITLE OF ARTICLE/BOOK/JOURNAL |
|------|----------------|-----------------------------|----------------------------------|-----------------|------------------------|------|--|
| BPD | ResearchGate | business process management | workflow | design | interior | 2023 | "Design Principles for Using Business Process Management Systems" Chapter in Book |
| | Ebsco host | business process management | workflow | design | | 2013 | Control Flow Pattern Recognition For BPMN Process Models. Academic Journal |
| | GOOGLE SCHOLAR | Tools | Business process modelling | User experience | Programmatic processes | 2012 | Essential Business Process Modeling (CHAPTER 1) |
| | James Cook | user experience | BPM | TOOLS/METHODS | | 2021 | Human factor in business process management: modeling competencies of BPM roles |
| | Proquest | business process management | (tools OR methods OR techniques) | user experience | | 2015 | From business process management to customi |

Figure 10: Search Strings (Author, 2024)

Inclusion and exclusion criteria were established to refine and specify the research focus (table 1). The selected literature spans various sources from the past decade (2014-2024), encompassing online articles, printed books, journals, conference papers, and peer-reviewed sources in English. It focuses on discussions related to user experience (UX), tools, methods, techniques, and their practical application in physical environments. Excluded are sources such as newspapers, honours dissertations, irrelevant topics to architecture or spatial design, discussions on BIM (Building Information Modelling), virtual reality, non-English documents, computer science, AI (Artificial Intelligence), and research not about physical environments.

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Table 1: Inclusion and exclusion criteria for search strategy

| Inclusion | Exclusion |
|--|--|
| Past ten years (2014-2024) | Newspapers |
| Online articles | Honours Dissertation |
| Printed books | Other Architecture (professions that do not directly relate to architecture or spatial design) |
| Journals | Other Design |
| Conference papers | BIM |
| Peer-reviewed sources | Virtual Reality |
| English language | Non-English |
| User Experience (UX) | Computer Science |
| Tools/methods/techniques | AI |
| Application within physical environments | Non-Physical Environment |

Step 2b: Screening

The search strategy was refined using designated keywords and specific inclusion and exclusion criteria, yielding 206 relevant and readable documents which was reduced to 89 articles. Many of these documents were subsequently excluded due to duplication, irrelevance to the topic, or not addressing the review question. The process for determining the relevancy of each document was documented using a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart (Page *et al.*, 2021) (Figure 11). Reviewing the literature, including abstracts, introductions, and conclusions, achieved a broad understanding of each text's content.

As the process continued, the selection and removal of sources from the preliminary findings were guided by the predetermined exclusion and inclusion criteria. The sources from each researcher were then consolidated, and further sorting and categorisation were conducted. Separate Excel sheets were created for pertinent articles categorised under “background” and “tools,” allowing for focused analysis within each domain. These articles generated a final source Excel sheet for in-depth data analysis. An activity log, maintained in Google Sheets (Figure 9), was used to initiate the search and keep track of the included and excluded articles.

A systematic technique was employed during the data-gathering phase to identify and select articles aligned with the research goals. The first step in this process was the creation of inclusion/exclusion criteria (Table 1) and specified search phrases to guide the search. An initial broad collection of articles was obtained, then refined through a series of iterative steps to narrow down the findings.

Articles not meeting the predefined criteria were filtered out during the iterative refining process to ensure alignment with the study objectives. This approach to data gathering facilitated the

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identification of pertinent literature, ensuring that the selected articles would provide valuable insights for the subsequent study.

The PRISMA flowchart (Figure 11) was important in this process. It visually represented the selection process, illustrating the number of articles identified, screened, deemed eligible, and ultimately included in the final analysis. This diagram provided a clear and transparent method for tracking the flow of information through the different review phases, detailing the reasons for exclusions, and ensuring the reliability and reproducibility of the selection process.

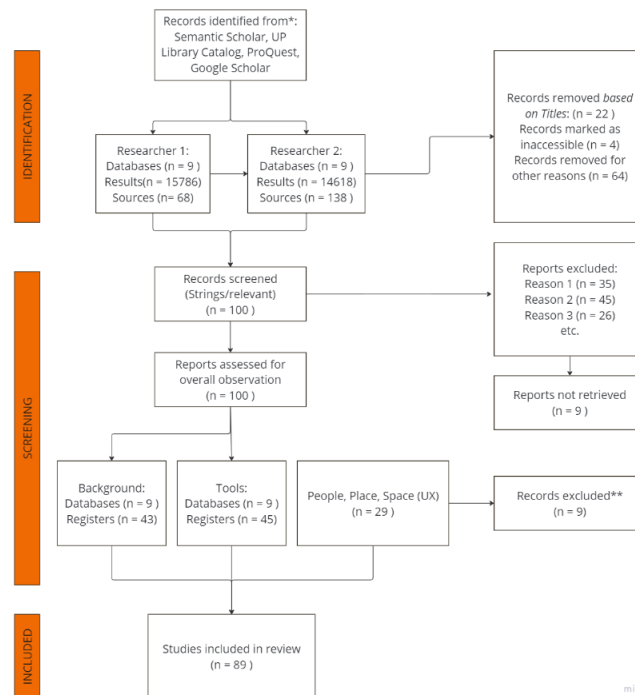


Figure 11: PRISMA Diagram (Author, 2024)

Step 2c: Selection

After the screening process, the selection of 89 full-text documents completes the sampling. The full texts of the identified relevant articles are obtained and reviewed in-depth. This final step ensures that all selected articles provide comprehensive and valuable insights that align with the research objectives and contribute significantly to the study. The final sample for analysis, consisting of 89 papers relevant to the research aims, was carefully selected using this iterative procedure. The thorough approach to literature sampling and selection ensures the credibility and validity of the integrative literature review, laying a foundation for subsequent analysis and findings.

3.4 Step 3: Data Collection Critical Appraisal

An essential step in the process is conducting a thorough critical appraisal (CA) to evaluate the quality and relevance of the documents. This step ensures that the evidence collected is solid and dependable for the study. For this ILR, researchers utilised a structured "Note-Taking Template for Journal Articles" (refer to Appendix 1) alongside an Excel spreadsheet for detailed analysis, which acts as an activity log (figure 9). This template serves several purposes: identifying articles with misleading titles unrelated to BPD, SD, ISD, and PPP

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concepts, removing duplicates, and eliminating articles that are inaccessible or unavailable online.

Critical Appraisal Tools and Process

Researchers employed the "Note-Taking Template for Journal Articles" (Appendix 1), which includes the following critical appraisal questions (The Interprofessional Health Sciences Library, n.d.):

- How are ideas organised/how does the authors organise ideas?
- What methods have they used to study the problem?
- What theories have been used to explain, predict, or understand their research?
- What sources have they cited to support their conclusions?

These questions facilitated an evaluation of the quality and relevance of the selected articles. Each article was assessed for its methodological robustness, theoretical grounding, and validity of conclusions based on the cited sources.

Implementation of Critical Appraisal and Selection Process

- **Title Relevance:** Articles were first screened to ensure their titles accurately reflected the content related to BPD, SD, ISD, and PPP. Misleading or unrelated titles were excluded.
- **Duplicate Check:** Duplicate articles were identified and removed to ensure each document in the sample was unique.
- **Accessibility:** Articles were checked for accessibility and availability online. Inaccessible or unavailable articles were excluded.
- **Methodological Quality:** Using the Note-Taking Template for Journal Articles, each article was evaluated based on how it organised its ideas, the methods it used to study the problem, the theories it employed, and the sources it cited.
- **Content Relevance:** The articles were further assessed to determine whether they addressed user experience, programmatic requirements, and spatial qualities.

Presentation of the Findings and Discussion

After conducting a thorough review and analysis following Lubbe's methodology, the initial findings are presented and discussed in Table 5: Tools & Models from Interdisciplinary Topics (BPD, SD, ISD). This table categorises various tools identified through the integration of business process design (BPD), service design (SD), and spatial design (ISD). For example, one tool identified is the "Service Blueprint," which originates from service design methodologies but proves adaptable to spatial design contexts through its focus on user interactions and journey mapping within physical environments. This categorisation not only consolidates relevant tools but also underscores their applicability across interdisciplinary domains, supporting the evaluation of user experience, programmatic requirements, and spatial qualities during the pre-design phase.

These findings are structured in alignment with Lubbe's five-step approach, ensuring a systematic exploration from initial sampling through to critical appraisal. The tables and figures in the results section (4.1 Presentation of Initial Findings) serve as a visual representation of the synthesised data, facilitating a comprehensive understanding of the tools and methodologies pertinent to this study's research question.

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Example of initial tools and methods

Table 2: Example of Tools & models from interdisciplinary topics (BPD, SD, ISD)

| Business Process Design | Service Design | Interior Spatial Design |
|-------------------------|-------------------|-------------------------|
| 5 Diamond method | Double Diamond | Double Diamond |
| Service Blueprint | Service blueprint | Service Blueprint |

Selection Criteria for Tools

Specific criteria guided the selection of tools to ensure a focused and relevant analysis. Initially, a larger sample of tools based on Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) was selected. The criteria for this initial selection were based on three main aspects:

- User Experience (UX): Tools that provide insights into user interactions and experiences within physical spaces (Ediae, Abeng and Egbudom, 2022).
- Programmatic requirements: Tools that offer methodologies for analysing and optimising processes within design environments (Karp, 1969).
- Spatial Qualities: Tools that assess physical and environmental attributes of designed spaces (De Rosa, 2022).

Researchers further refined the selection from this larger sample based on whether the tools had a spatial quality component. This additional criterion was important to ensure that the tools could effectively evaluate spatial design aspects, which is a core focus of the study.

Selection Process for Tools and Models

1. Applicability to the Physical Environment:
 - i) Criteria: The tool must address spatial qualities, helping to create or evaluate physical spaces that enhance user experience.
 - ii) Evaluation: Tools integrating spatial design principles were prioritised, ensuring they could effectively contribute to the pre-design phase.
- 2) Capacity to Facilitate the Design Process:
 - i) Criteria: The tool must improve the design process, making it more efficient.
 - ii) Evaluation: Tools were assessed for their ability to map out processes, facilitate collaboration, and provide insights during the design phase.
- 3) Potential to Enhance User Experience:
 - i) Criteria: The tool must improve user interaction with the designed space, service, or product.

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- ii) Evaluation: Emphasis was placed on tools that offer insights into user needs, behaviours, and satisfaction, ensuring the final design meets these criteria.


| | |
|--|--|
| Title of Article: Assessing Spatial User Experience for Design Guidelines: A Comparative Study of Outpatient Waiting Rooms With Conventional Versus Modern Features | Publication: Health Environments Research & Design Journal (Sage) |
| Author(s): Begona Julia-Nehme , So-Yeon Yoon , Patricia Cumsille , and Eugenio Rodriguez | Date: 2013 (accessed 26/02/2024) |
| Background What was the context for this research? What has been studied or determined already? | Built environments are relevant in patients' evaluation of overall healthcare service. For outpatients, waiting frequently consumes the largest amount of time (studies were done to decrease this time but that was not successful, so other methods are needed to be explored); thus, waiting room interior design has great potential to enhance their experience. In recent decades an evidence-based design approach was used to improve healthcare environments "the process of basing decisions about the built environment on credible research to achieve the best possible outcomes." |
| Methods & Nature of this Study What was the objective? How did the author(s) collect data? When and where did the research take place? | Identify waiting room design features that are most appreciated by outpatients and their companions in conventional and modern waiting rooms. Evaluate if end users evaluate the environment differently from experts and in what aspects. Provide evidence-based design guidelines that orient designers and healthcare managers. Methods: This study compares perceptions of two types of waiting rooms—conventional and modern—based on the spatial user experience (SUE) model. In the first stage of the study, we compared user evaluations of conventional waiting rooms (n = 14/137) and modern waiting rooms (n = 14/426) with respect to the eight SUE model dimensions using multigroup structural equation modeling. In the second stage, an expert ergonomist and two professional interior designers assessed both types of waiting rooms |
|  | |
| Results What highlights emerged? Were there any surprises? | modern waiting rooms were perceived to be significantly better in all SUE dimensions. We also found experts' evaluations were overall consistent with users' perceptions. Discrepancies were only found in temperature perception, signage evaluation, and spatial appreciation. |
| Data What is most striking about the tables, graphs, illustrations? Why did the author(s) include them? | Fig 1* shows Spatial user experience model structure and main definitions, basically highlighting how ergonomic dimensions such as spatial cognition, physical compatibility, emotional reaction etc. influences user experience which results in behavioral responses (definitions are on the figure) |
| Conclusions What did the author(s) learn overall | Participants valued modern style waiting room features such as good quality signage, use of armchairs and sofas, a controlled environment, and decoration. We suggest involving end users in the design process to respond to their needs and |
| Next Steps What is implied or proposed for future study? | In future studies they should use larger sample groups as it became limiting (they had a small sample group), future studies assuring demographic and background equivalence could support our results. It is important that designers and managers consider all six dimensions that influence the user experience in the SUE model in order to define the characteristics of healthcare waiting rooms: spatial cognition, physical compatibility, environmental compatibility, spatial appreciation, emotional reaction, and proximity. |
| Significance Why does this research matter? | The research underscores the crucial role of waiting room design in shaping patients' overall healthcare experience, particularly in outpatient visits where waiting is a significant aspect. It introduces evidence-based design guidelines, providing practical tools for designers and healthcare managers to enhance patient satisfaction. Through a comparative analysis of conventional and modern waiting rooms, the study reveals that modern waiting rooms are perceived as significantly better in Spatial User Experience (SUE) dimensions, indicating the positive impact of specific design elements on user satisfaction. The alignment between expert evaluations and user perceptions supports the involvement of experts in the evaluation process, despite some noted discrepancies in aspects like temperature perception, signage evaluation, and spatial appreciation. The study concludes by emphasizing the importance of incorporating end users in the design process, promoting a patient-centered approach that caters to the needs and preferences of individuals using the space. |
| My Thoughts & Questions 1. How are they organising their ideas 2. What methods have they used to study the problem? 3. What theories have been used to explain, predict, or understand their research? 4. what sources have they cited to support their conclusions | The article emphasizes the importance of a patient-centric approach in healthcare design, particularly in waiting rooms. Modern design elements are shown to positively impact user experience, aligning with the trend towards patient-centered care. The consistency between user and expert evaluations highlights the valuable role of professionals in ergonomics and interior design. Specific design elements, such as quality signage and comfortable seating, are identified as key factors in enhancing waiting room aesthetics and functionality. What are the reasons for user vs. expert discrepancies in temperature perception, signage, and spatial appreciation, and how can these differences be addressed in the design process? Does the research explore the long-term impact of improved waiting room design on patient satisfaction, treatment adherence, or overall healthcare outcomes? How does the study account for cultural or regional variations in user preferences, and what are the implications for the generalizability of proposed design guidelines? Does the article discuss the potential cost implications of incorporating user-preferred features into healthcare facility designs, and how can designers balance these preferences with budgetary constraints? Does the research provide insights into how user preferences for waiting room design might evolve over time, and how can healthcare facilities adapt to changing design trends? |

Figure 12: example of Critical Appraisal implemented in one of the articles (Author, 2024)

Criteria for Measurement

- Usability (Programme): The tool should effectively and efficiently meet user needs.
- Accessibility (Place): The tool should ensure the design is accessible to all users.
- Experience (People): The tool should clarify and enhance user interactions with the space.

Based on these selection criteria, an initial set of tools was identified. These tools were further evaluated to determine their suitability for the integrated framework. This process ensured that only the most relevant and practical tools were selected, focusing on those with solid spatial qualities and the potential to enhance UX significantly in the pre-design phase.

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Evaluation and Scoring System

A scoring system was employed to rate each tool based on its UX, programme, and spatial design performance. The tools were rated on a scale from 1 to 10, with higher scores indicating better performance in the respective criteria.

Explanation of Scoring System

- 1-3: Low relevance or effectiveness
- 4-6: Moderate relevance or effectiveness
- 7-9: High relevance or effectiveness
- 10: Exceptional relevance or effectiveness

Each tool was rated based on its ability to enhance user experience (UX), optimise or improve design processes, meet programmatic requirements, and applicability in spatial design contexts. The ratings reflect an assessment of how well each tool meets these criteria, ensuring the selection of tools that will significantly contribute to the integrated framework and enhance user experience during the pre-design phase.

Table 3: Evaluation Criteria

| Criteria | Description |
|---------------------------------------|---|
| UX (User Experience) | Evaluates the tool's potential to enhance user experience through interactions within the designed space. |
| Programmatic requirements (processes) | Assesses the effectiveness and efficiency of the tool in managing and enhancing design processes. |
| Spatial Design | Determines the tool's suitability for application within physical environments and spatial design contexts. |

Example of Selection Criteria Table

To illustrate the methodology used in selecting the tools, researchers developed a scoring system to rate each tool based on the above criteria: user experience, programmatic requirements, and spatial design. The table below demonstrates this evaluation process:

Table 4: Example of Selection Criteria Table

| Tool/Method | Description | Discipline | UX (1-10) | Programmatic req. (1-10) | Spatial Design (1-10) | Total Score |
|-------------|-------------|------------|-----------|--------------------------|-----------------------|-------------|
| Tool 1 | - | BPD | 7 | 9 | 6 | 22 |
| Tool 2 | - | BPD/SD | 8 | 8 | 7 | 23 |

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3.5 Step 4: Data Analysis

3.5.1 Step 4a: Data Extraction

The final selected tools undergo a critical appraisal, which involves creating detailed summary documents for each. These summaries include methodologies, findings, focus areas, conclusions, and relevance to the topic, providing a thorough overview of each tool's critical aspects. This data extraction process is crucial for identifying the tools and user experiences relevant to Business Process Design (BPD), Service Design (SD), Interior Spatial Design (ISD), and the People-Place-Programme (PPP) approach.

Each tool is expanded to demonstrate its relevance to the research, focusing on its application and effectiveness in the pre-design phase. To systematically evaluate and compare the tools, researchers will rate them based on three main criteria: user experience (UX), programmatic requirements (processes), and Spatial Design. This rating system allows us to determine the most effective tools for integration into the integrated framework.

Data Extraction Process:

1. Tool Identification: Each selected document is reviewed to identify the specific tools and methodologies it discusses.
2. Summary Creation: Detailed summaries are created for each tool, highlighting methodologies, key findings, and relevance to BPD, SD, ISD, and PPP.
3. Relevance Assessment: Each tool's relevance is assessed based on its ability to enhance UX, develop programmatic requirements, and contribute to spatial design.
4. Rating System: Tools are rated on a scale based on their effectiveness in UX, programmatic requirements, and spatial design.

This detailed expansion ensures a comprehensive understanding of each tool's potential contribution to the integrated framework.

3.5.2 Step 4b: Synthesis

In this step, the synthesised data from the selected articles is organised into a cohesive framework. This involves identifying common themes, tools, and methodologies that can be integrated into a new model for the pre-design phase. The synthesis transitions from thematic exploration to practical application, where the framework is tested and refined.

The criteria for synthesis include evaluating the tools' descriptions, strengths, weaknesses, and opportunities. This is done using a discussion table, summarising these aspects and determining whether each tool should be incorporated into the integrated framework.

Analysis Process:

1. Thematic Analysis: Identify common themes and methodologies across the selected documents (Braun & Clarke, 2012).
2. Discussion Table Creation: Develop a table summarising the tools, their descriptions, strengths, weaknesses, and opportunities (SWOT analysis).
3. Tool Evaluation: Evaluate each tool based on the SWOT analysis to determine its suitability for the integrated framework.
4. Framework Development: Integrate the selected tools into a new model for the pre-design phase, ensuring it addresses UX, programmatic requirements, and spatial design.

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Example of Analysis Table:

Table 5: Example of Analysis of tools that overlap within BPD, SD & ISD

| Tool | Reference | Description | Strengths | Weaknesses | Opportunities | Outcome |
|---------------|-----------|--|---|--------------------------------|---|---------------------------------|
| Tool A | - | Describes how to enhance business processes. | Increases efficiency, easy to implement | Limited to BPD, lacks UX focus | Can be combined with UX tools for better outcomes | Include in framework |
| Tool B | - | Enhances user experience through spatial design. | Strong UX impact, improves spatial quality | High implementation cost | Potential for high ROI in spatial design projects | Do not include in the framework |
| Tool C | - | Integrates service design with spatial planning. | The holistic approach covers multiple aspects | Complex to integrate | Streamlines design process improves user satisfaction | Include in framework |

3.6 Ethical considerations

Ethical considerations were integral to the research process, ensuring integrity, transparency, and respect for intellectual property rights. All materials used in this research were properly referenced and credited, acknowledging the original authors' contributions and upholding academic integrity. Additionally, measures were taken to ensure the privacy and anonymity of individuals and organisations mentioned in the material.

The study exclusively utilised published research in the public domain, eliminating the need for formal ethical clearance. Throughout the data processing and reporting phases, care was taken to protect the privacy of research participants and stakeholders. Identifiable information was anonymised where appropriate, and sensitive material disclosed in the literature was handled cautiously. Potential conflicts of interest were transparently disclosed and managed according to ethical standards governing such conflicts. The study's primary objective was to maintain integrity and ensure the well-being of all individuals involved in the research process by adhering to ethical standards.

To enhance clarity and ensure a logical structure, Grammarly was used to assist with sentence formation and language clarity. Grammarly also aided in understanding complex subjects discussed in the literature reviewed, such as phenomenology and integrating methods and tools from various design fields, which are discussed further in the research. This approach ensured that the research objectives were comprehensively addressed through a well-articulated research process and analysis. It is important to note that while Grammarly assisted in refining the language and structure, the report's content was thoroughly reviewed and edited to maintain academic rigour and professionalism.

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4. Results

At this stage, researchers evaluated the initial literature review and analysis findings. The objective was to systematically present these findings, relating them to the research questions that formed the primary goals. Researchers arranged the data according to those standards to thoroughly assess the main concepts, topics, and patterns found in the literature.

The main goal was to extract the tools and methods used in these articles. Using critical appraisal instruments, researchers examined selected articles to extract information regarding their methods. It had the opportunity to create a comprehensive list of multiple strategies that could potentially guide the design proposal through this process.

Researchers then started a selective process to decide which tools and methods needed additional investigation. Their potential for enhancing the user experience and relevance to the study aims guided the selection process. Aligning these approaches with the three main components of the PPP diagram—people, place, and programme—was important to this study.

Each approach was evaluated based on its capacity to prioritise user wants and preferences (People) (Yadav, 2016), handle spatial qualities and environmental issues (Place) (Gustafsson *et al.*, and be in line with project objectives and functional requirements (Programme)(Wood, 2019). By incorporating these factors into the assessment procedure, researchers aimed to better understand the spatial design process and its influence on user experience.

The integration of phenomenology, which prioritises lived experiences and subjective impressions in design, was at the centre of the review process (Chaitanakankul, 2023). Phenomenology, which emphasises lived experiences and subjective impressions in design, was central to our review process (Chaitanakankul, 2023). Researchers reviewed articles that detailed user experiences in various spatial environments, extracting qualitative data that highlighted personal and emotional interactions with these spaces. For instance, articles describing how users feel within certain architectural settings were closely examined to understand the subjective impact of design choices.

Organisational theory was also integrated simultaneously, highlighting the structural dynamics that occur in organisations and how they affect spatial design (Starbuck, 2003). Simultaneously, organisational theory was integrated to highlight the structural dynamics within organisations and their influence on spatial design (Starbuck, 2003). This involved reviewing literature that discussed how organisational structures and processes dictate the spatial requirements and design of physical environments. For example, studies explaining how the layout of office spaces can enhance or hinder organisational efficiency were analysed to understand the interplay between spatial design and organisational goals.

The method combined organisational theory and phenomenology to build environments that complement organisational goals. This synthesis allows us to apply an integrated strategy to interior architecture and create settings promoting business performance and human well-being.

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4.1 Presentation of Initial Findings

Table 6: Tools & models from interdisciplinary topics (BPD, SD, ISD)

| Business Process Design | Service Design | Interior Spatial Design |
|-------------------------|---------------------------------|--------------------------------------|
| 5 Diamond method | Double Diamond | Double Diamond |
| Service Blueprint | Service blueprint | Service Blueprint |
| Value Chain | Customer journey map | Customer journey map |
| BPMN | System mapping | Spatial Service System Map |
| | Spatial service system map | Spatial Walk-Throughs |
| | Spatial walkthroughs | Card Sorting |
| | Card sorting | Behavioural Observation Mapping |
| | Behavioural observation mapping | Photographic traces |
| | Photographic traces | User experience evaluation framework |
| | Personas | Sensory Slider |
| | Archetypes | SUE Model |
| | Service ecosystem | AEIOU |
| | User states & contexts. | Graphic documentation |
| | Service experience layers | Process/Space/ Mapping |
| | Jobs to be done | Flow Analysis |
| | Prototyping | Workflow Optimisation |
| | Sd-x-bm framework | Site Analysis |
| | Servicescape method | |
| | Service Master Planning process | |

4.2 Selection Criteria for Tools and Models

The selection criteria for tools and models were designed to identify the most effective methods for enhancing user experience (UX) during the pre-design phase. This assessment focused on three key aspects: the tool's applicability within the physical environment, its capacity to

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facilitate the design process, and its potential to enhance UX through interactions with the service, product, or design. The evaluation underscored the importance of considering UX within the built architectural environment by prioritising these criteria.

Specific criteria were established to effectively measure UX, including usability (programme), accessibility (place), and usefulness (people). The usability of the tool used to assess UX should be effective, efficient, and meet user needs (Ediae et al., 2022). Based on these selection criteria, the tools were sifted through, focusing on their spatial qualities and relevance to the research objectives.

The table below outlines various tools and methods from interdisciplinary fields such as Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) and evaluates them based on their relevance to user experience (UX), programmatic requirements, and spatial design. Each tool is given a description and a score for its applicability in these areas. The total score reflects the overall suitability of the tool for integrative design processes. For example, the "Customer Journey Map," scoring 26, highlights its comprehensive utility in visualising user interactions across different environments and touchpoints, demonstrating high relevance to UX, programmatic requirements, and spatial design. This scoring aids in identifying the most effective tools for creating well-rounded design solutions.

Table 7: Selection Criteria

| Tool | Description | Discipline | UX | Programmatic req. | Spatial Design | Total score |
|--------------------------|--|-------------------------|----|-------------------|----------------|-------------|
| 5 Diamond Method | Integrates ideation and prototyping phases with a focus on spatial elements. | Business Process Design | 7 | 8 | 8 | 23 |
| Service Blueprint | Maps out service processes and customer journeys, including spatial touchpoints. | Business Process Design | 8 | 7 | 9 | 24 |
| Value Chain | Analyses processes, including spatial aspects, for improving user experience. | Business Process Design | 6 | 6 | 7 | 19 |
| BPMN | Business Process Modelling Notation details spatial flow and interactions. | Business Process Design | 5 | 7 | 6 | 18 |

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| | | | | | | |
|--|--|---------------------|---|---|---|----|
| Double Diamond | Methodology that involves divergent and convergent thinking phases. | Service Design | 8 | 9 | 7 | 24 |
| Customer Journey Map | Visualises the customer's journey across various environments and touchpoints. | Service Design, ISD | 9 | 8 | 9 | 26 |
| System Mapping | Visualises systems and processes, including spatial touchpoints. | Service Design | 7 | 7 | 8 | 22 |
| Spatial Service System Map | Focuses on the spatial distribution of services and interactions. | Service Design | 8 | 8 | 9 | 25 |
| Spatial Walk-Throughs | Physical assessment and design of spatial environments. | Service Design, ISD | 7 | 6 | 8 | 21 |
| Card Sorting | Organises information or elements within a physical space. | Service Design | 6 | 5 | 6 | 17 |
| Behavioural Observation Mapping | Observe interactions within a physical space. | Service Design, ISD | 8 | 7 | 8 | 23 |
| Photographic Traces | Documents physical spaces and user interactions within them. | Service Design, ISD | 7 | 6 | 7 | 20 |
| Personas | Represents user archetypes based on research and observations. | Service Design | 6 | 5 | 6 | 17 |

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| | | | | | | |
|-----------------------------------|--|----------------|---|---|---|----|
| Archetypes | Defines fundamental human characteristics or personas. | Service Design | 5 | 4 | 5 | 14 |
| Service Ecosystem | Maps out relationships and interactions within a service environment. | Service Design | 7 | 7 | 8 | 22 |
| User States & Contexts | Considers various states and contexts where users interact with a service or product. | Service Design | 8 | 8 | 7 | 23 |
| Service Experience Layers | Layers of experience within service delivery, including spatial elements. | Service Design | 7 | 7 | 8 | 22 |
| Jobs to Be Done | It focuses on understanding the job or task a user is trying to accomplish within a context. | Service Design | 6 | 6 | 7 | 19 |
| Prototyping | Builds and tests early models or versions of a product or service. | Service Design | 8 | 9 | 8 | 25 |
| SD-X-BM Framework | Integrates service design with business modelling to enhance service experiences. | Service Design | 7 | 8 | 7 | 22 |
| Servicescape Method | Focuses on the physical environment of service processes, including layout and ambience. | Service Design | 8 | 7 | 9 | 4 |

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| | | | | | | |
|--|---|-----------------------------|---|---|---|----|
| Sensory Slider | Evaluates sensory experiences within a space, including spatial elements. | Interior Spatial Design | 7 | 6 | 8 | 21 |
| SUE Model | Addresses spatial and user experience elements within design processes. | Interior Spatial Design, SD | 9 | 8 | 9 | 26 |
| AEIOU | Framework that includes activities, environments, interactions, objects, and users. | Interior Spatial Design, SD | 6 | 5 | 7 | 18 |
| Graphic Documentation | Includes visual representations of spatial layouts and designs. | Interior Spatial Design | 6 | 6 | 6 | 18 |
| Process/Space/Mapping | It involves mapping out physical spaces and processes within them. | Interior Spatial Design | 7 | 7 | 8 | 22 |
| Flow Analysis | Examines spatial flow and movement patterns within a space. | Interior Spatial Design | 8 | 7 | 8 | 23 |
| Workflow Optimisation | Develops physical layouts and interactions to enhance workflow. | Interior Spatial Design | 7 | 6 | 7 | 20 |
| Service Master Planning process | Strategic framework for envisioning and orchestrating holistic service experiences | Service Design | 8 | 9 | 8 | 25 |

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| | | | | | | |
|----------------------|--|-------------------------|---|---|---|----|
| Site Analysis | Assesses the physical characteristics and suitability of a site for design purposes. | Interior Spatial Design | 6 | 5 | 6 | 17 |
|----------------------|--|-------------------------|---|---|---|----|

4.3 Ideal Methods for Enhancing User Experience in BPD, SD, & ISD

Selecting the ideal methods for Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) is essential for achieving project objectives, meeting user needs, and ensuring the success of the design process. Each discipline benefits from specific methodologies that enhance its unique aspects.

In Business Process Design (BPD), methodologies like the Value Chain method enable comprehensive analysis of activity sequences, aiding in identifying optimisation opportunities (Pratama & Adhi Utama, 2019). BPMN (Business Process Model and Notation) is a standardised graphical representation that enhances stakeholder communication and understanding (Amoozad et al., 2023). Process Mapping and Workflow Optimisation are crucial for pinpointing inefficiencies (Galvin and Singer, 1996) and streamlining operations, while the 5-Diamond Method supports exploratory business process management by identifying improvement opportunities (Grisold et al., 2021).

For Service Design (SD), the Double Diamond framework stands out for its structured approach, emphasising divergent and convergent thinking stages critical for innovative service solutions (van Geetson & Wilkinson, 2021). The Service Blueprint visualises service delivery processes and customer-service provider interactions, facilitating the design of seamless service experiences (Trkman et al., 2015). The Customer Journey Map is essential for mapping the customer experience journey and identifying touchpoints for service enhancement (Zhang & Pan, 2021). Prototyping enables rapid testing and iteration of service concepts, ensuring the final design effectively meets user needs (Dokter *et al.*, 2023).

In Interior Spatial Design (ISD), methodologies like the Double Diamond framework provide a systematic approach to exploring design solutions that align with user needs. The adapted Service Blueprint visualises spatial service delivery processes, identifying opportunities to enhance user experiences within physical environments (van Geetson & Wilkinson, 2021). The Spatial Service System Map maps interactions between users and spatial elements, guiding the design of user-centric environments (Babapour Chafi & Cobaleda-Cordero, 2021). The User Experience Evaluation Framework assesses user experiences within physical spaces, informing design decisions to develop user satisfaction and comfort (Dong & Liu, 2017).

These methods are chosen for their effectiveness in addressing the unique challenges and goals of BPD, SD, and ISD projects. Adapting and customising these methodologies according to specific project requirements and user contexts ensures their successful application in enhancing user experience across different design disciplines.

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Table 8: Selected Tools and Methods for Enhancing User Experience, Programmatic Efficiency, and Spatial Design

| Tool/Method | Description | Discipline | UX | Programme | Spatial Design |
|--|---|------------|--------|-----------|----------------|
| Service Blueprint | Maps out service processes, focusing on customer journey and spatial touchpoints. | BPD, SD | High | High | High |
| Business Process Modelling Notation | Details spatial flow and interactions, ensuring efficient process management and enhancement of UX. | BPD | Low | High | Medium |
| 5 Diamond Method | Integrates ideation and prototyping phases, considering spatial elements. | BPD | High | High | Medium |
| Value Chain | Analyses processes and can include spatial aspects for improving UX. | BPD | Medium | Medium | Medium |
| Double Diamond | Covers the ideation and prototyping phases, integrating spatial aspects. | SD | High | High | Medium |
| Customer Journey Map | Maps customer experience across various environments | SD, ISD | High | Medium | High |

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| | | | | | |
|---|---|---------------------|--------|--------|--------|
| | and physical spaces. | | | | |
| Spatial Service System Map | Focuses on the spatial distribution of services. | SD | High | Medium | High |
| User States & Contexts | Considers various states and contexts where users interact with a service or product. | Service Design | High | High | Medium |
| Spatial Walk-Throughs | Involves physical assessment and design of spatial environments. | ISD | High | Medium | High |
| User Experience Evaluation Framework | Evaluates user interactions and experiences within a space. | ISD | High | Medium | High |
| SUE Model | Addresses spatial and user experience elements. | ISD | High | Medium | High |
| Behavioural Observation Mapping | Observe interactions within a physical space. | Service Design, ISD | High | Medium | High |
| Jobs to be Done | It focuses on understanding customer needs and motivations for a service or product. | SD | High | High | Medium |
| Control Flow Patterns | Analyses the control flow in processes, including | BPD | Medium | High | Medium |

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| | | | | | |
|--|---|-----------------------------|--------|--------|--------|
| | spatial layouts and user paths. | | | | |
| Service Master Planning process | Strategic framework for envisioning and orchestrating holistic service experiences | Service Design | High | High | Medium |
| AEIOU Observational Framework | Framework that includes activities, environments, interactions, objects, and users. | Interior Spatial Design, SD | Medium | Medium | High |

4.3.1 Explanation of Selection

- Service Blueprint (BPD and SD) and Double Diamond are included due to their comprehensive approach to mapping service processes and design phases.
- Customer Journey Map and Spatial Service System Map are critical for understanding user interactions across various environments, enhancing UX.
- BPMN and Workflow Optimisation are chosen for their strong emphasis on process efficiency and spatial flow.
- Spatial walk-throughs, User Experience Evaluation Framework, and SUE Model are selected for their direct involvement in spatial assessment and user experience evaluation.
- Photographic Traces and Servicescape Method provide valuable insights into the physical environment and its impact on user experience.

These tools collectively cover the aspects of business process design, service design, and interior spatial design mentioned above, ensuring a balanced approach to enhancing user experience, optimising processes, and effectively addressing spatial design needs.

4.4 Analysis of selected tools

In this section, researchers outline the methods and tools commonly used in interior spatial design (ISD), service design (SD), and business process design (BPD), as determined by the integrative literature review and data analysis. The investigation examines various tools and methods.

4.4.1 Business Process Design

Business process design (BPD) focuses on strategically structuring and optimising organisational workflows and operations to enhance efficiency, effectiveness, and overall performance. The primary goal of BPD is to streamline processes, reduce waste, and improve the alignment of various business activities with the overarching organisational goals. Organisations can significantly improve productivity, customer satisfaction, and competitive advantage by carefully analysing and redesigning business processes.

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Although BPD does not primarily focus on interior spatial design, The principles and tools used in Business Process Design (BPD) can significantly inform spatial planning and design, especially regarding program accommodation. BPD emphasises efficiency and effective resource use, which translates into optimising space to support organisational needs. Tools like Service Blueprinting and BPMN (Business Process Modeling Notation) can map out activity flows, ensuring layouts support seamless operations and minimise wasted space. This approach enhances workflow, productivity, and user experience, aligning physical areas with the operational goals of the organisation. The following tools have been identified for BPD:

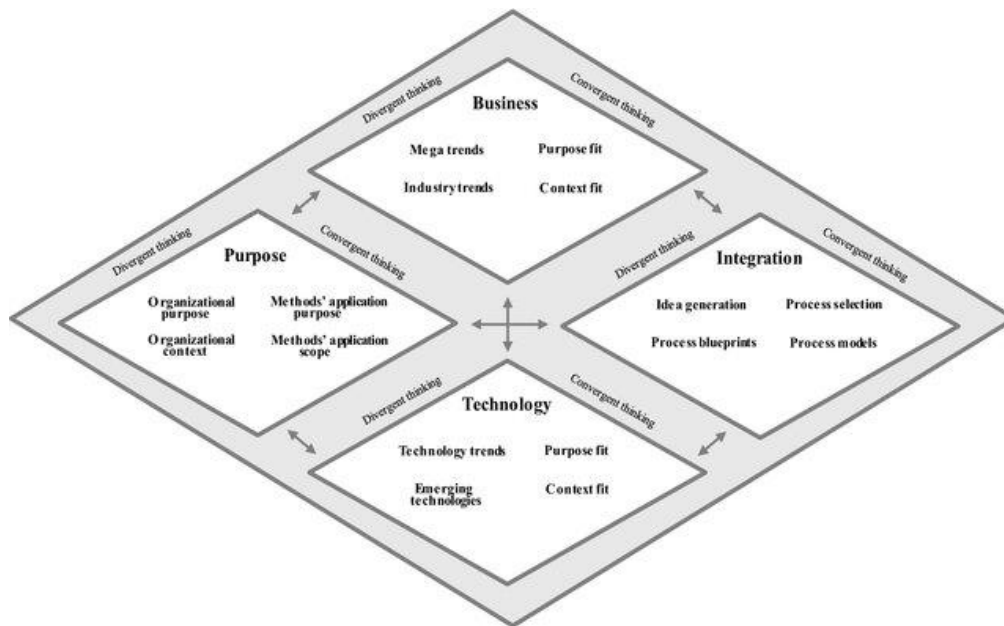


Figure 13: The Five Diamond Method which provides a systematic framework for exploring and optimising business processes, allowing organisations to identify inefficiencies, redundancies, and areas for improvement methodically (Grisold, 2021)

As Grisold et al. (2021) described in their study "The Five Diamond Method for Explorative Business Process Management," the **Five Diamond Method** stands out as a prominent approach among business process methodologies. This method provides a systematic framework for exploring and optimising business processes, allowing organisations to identify inefficiencies, redundancies, and areas for improvement methodically. Integrating ideation and prototyping phases, the Five Diamond Method ensures that design solutions are innovative and practical. This approach helps businesses explore and refine various design options based on feedback and process considerations, leading to more effective and efficient workflows. The method's structured exploration aids in aligning business processes with strategic goals, fostering innovation, and enhancing overall organisational performance (Grisold, 2021).

The Five Diamond Method operates through five key elements: Arenas, Differentiators, Vehicles, Staging, and Economic Logic (Grisold, 2021). These elements guide companies in making strategic decisions. Arenas determines where the business will compete, Differentiators focus on what sets the business apart, Vehicles identify how the strategy will be executed, Staging outlines the sequence and timing of actions, and Economic Logic defines how the business will generate returns. This approach ensures a comprehensive integration of people, place, and programme (PPP). It prioritises user needs and experiences (people), considers spatial elements for productivity and experience (place), and aligns business

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processes with organisational goals (programme). This strategy optimises workflows and enhances organisational performance (Grisold, 2021).

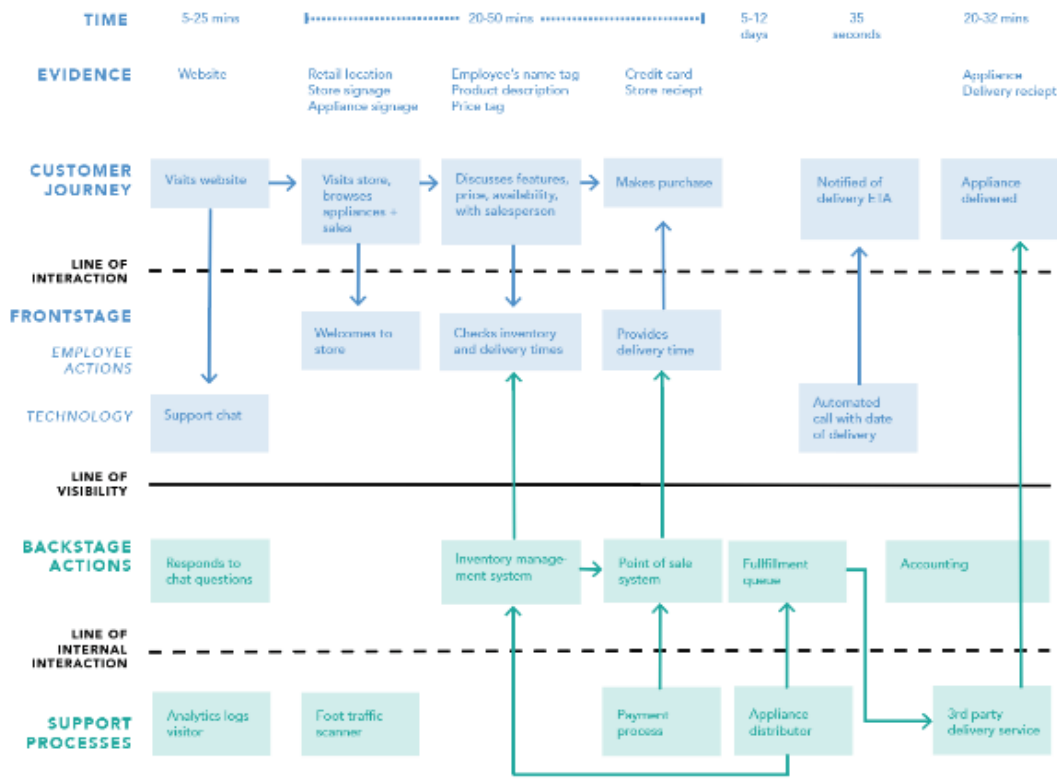


Figure 14: Service Blue printing which maps out service processes by focusing on customer journeys and interaction points, providing critical insights into service delivery mechanisms (Gibbons, 2017)

Service Blueprinting is another important tool for understanding and visualising service processes, as Trkman et al. (2015) detailed in their work "From Business Process Management to Customer Process Management." This tool maps out service processes by focusing on customer journeys and interaction points, providing critical insights into service delivery mechanisms. By outlining the various touchpoints, interactions, and dependencies within a service environment, Service Blueprinting helps identify opportunities for service innovation and improvement. It ensures that each touchpoint is designed to enhance the overall user experience, making it a valuable tool for businesses aiming to improve their service processes (Trkman et al., 2015).

Service blueprinting in interior architecture maps user interactions with the space, detailing touchpoints and processes. For instance, in a hospital, it can outline the patient journey from check-in to discharge, helping designers improve efficiency and user experience. This approach ensures more intuitive and functional environments that support seamless service delivery.

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Service Blueprinting creates a detailed visual representation of the service process, from the customer's initial interaction to the outcome. This includes front-stage activities (customer interactions), back-stage activities (support processes), and physical evidence (tangible elements the customer interacts with). Doing so highlights areas where the service may fail and identifies opportunities for enhancing customer satisfaction and loyalty (Gibbons, 2017). Service Blueprinting is particularly relevant to PPP's 'people' and 'programme' aspects. It focuses on improving user experience (people) by ensuring each interaction is efficient and satisfying (programme). Additionally, it aligns service processes (programme) to deliver consistent and high-quality service, ultimately fostering customer satisfaction and loyalty (people).

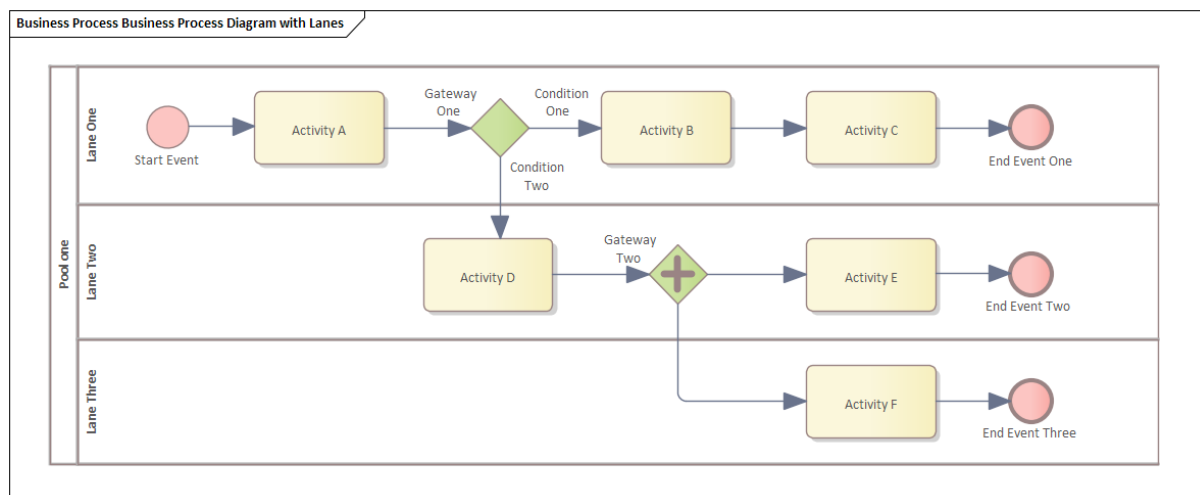


Figure 15: Business Process Model and Notation (showing Control Flow Patterns) (Amoozad Mahdiraji et al., 2023)

Business Process Modelling Notation (BPMN) offers a standardised framework for expressing and evaluating business processes, as highlighted in "Business Process Transformation in Financial Market" by Amoozad Mahdiraji et al. (2023). BPMN is a graphical representation of business processes within a workflow, providing a clear and consistent method for documenting complex processes. This tool facilitates cooperation and communication between stakeholders and departments by creating process documentation that is interoperable and easily understood (Amoozad Mahdiraji et al., 2023). BPMN is beneficial for designing intricate processes involving multiple stakeholders and activities, ensuring efficient process management and enhanced user experience.

BPMN can be used in interior architecture to diagram the flow of activities and interactions within a space. This helps identify inefficiencies and optimise layouts. For instance, in a manufacturing facility, BPMN can map out workflows to ensure machinery and workstations are placed for maximum efficiency. By visualising these processes, designers can create spaces that enhance productivity, streamline operations, and improve overall functionality.

BPMN works by using a set of standardised symbols and notations to create detailed diagrams of business processes. These diagrams map out the sequence of activities, decision points, and interactions between various elements within a process. By visualising the entire workflow, BPMN helps identify bottlenecks, inefficiencies, and areas for improvement (Amoozad Mahdiraji et al., 2023). It is particularly relevant to the 'programme' aspect of PPP, as it ensures

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that processes are simplified and aligned with organisational objectives. While it primarily focuses on the 'programme' by optimising workflows and enhancing operational efficiency, BPMN also indirectly impacts 'people' by improving communication and collaboration among stakeholders, leading to better user experiences.

As explored in Juan and Yuan's (2013) study "Control Flow Pattern Recognition for BPMN Process Models," **Control Flow Patterns** focus on analysing and optimising the control flow within business processes. These patterns help identify and eliminate bottlenecks, ensuring smooth and efficient operations. By recognising and addressing control flow issues, businesses can enhance process efficiency and effectiveness, ensuring tasks are executed logically and efficiently (Juan & Yuan, 2013).

Control Flow Patterns are closely related to BPMN (Business Process Model and Notation), which provides a standardised graphical representation of business processes. BPMN's clear visual notation aids in identifying inefficiencies and bottlenecks within complex workflows (Amoozad Mahdiraji et al., 2023). Integrating Control Flow Patterns into BPMN models enhances the ability to streamline operations, reduce delays, and improve overall process efficiency (Amoozad Mahdiraji et al., 2023).

Porter's Value Chain Analysis Model

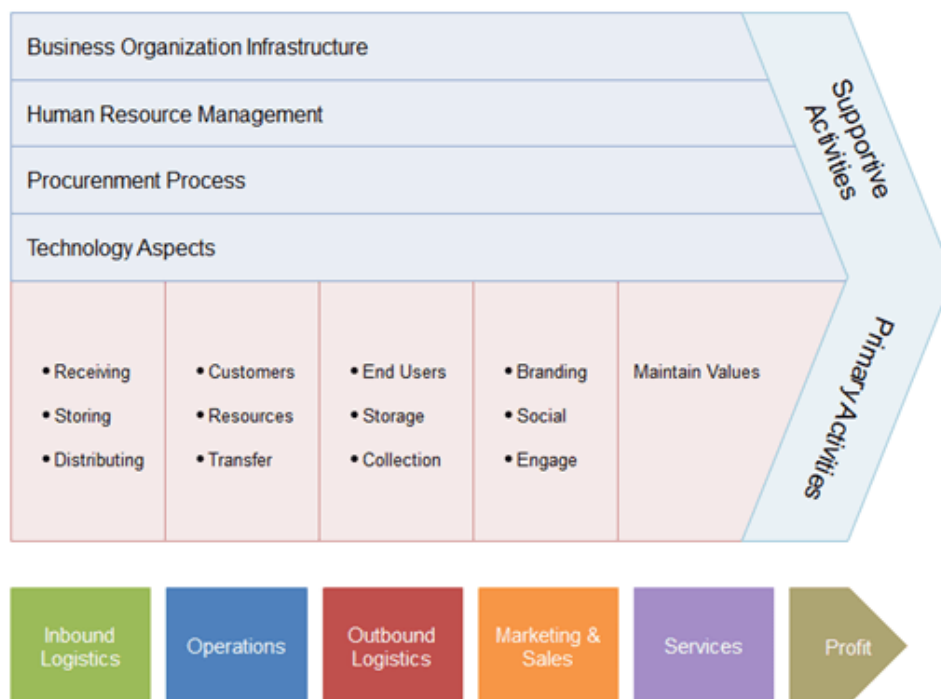


Figure 16: Customer value chain analysis which analyses the sequence of activities a business undertakes to deliver a product or service to the customer (Amoozad Mahdiraji et al., 2023)

The **Customer Value Chain**, discussed in Pratama and Adhi Utama's (2019) article "Business Process Analysis for Transfer Payment Transaction Case Study: An LPG Distributor Company in Bandung," is a tool that analyses the sequence of activities a business undertakes to deliver a product or service to the customer. This tool can include spatial aspects when examining physical distribution channels or service delivery points, providing a comprehensive view of

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the entire process. By understanding the value chain, designers can identify opportunities to enhance processes for better service delivery (Pratama & Adhi Utama, 2019). This tool is directly relevant to the 'programme' aspect of PPP by ensuring that each process is aligned with the organisation's strategic goals. Additionally, it impacts 'place' by examining the spatial elements involved in the distribution and service delivery, ensuring these physical aspects are developed for efficiency.

The Customer Value Chain can be used in interior architecture to analyse and enhance the sequence of activities that add value to the user experience within a space. By mapping out each step from entry to exit, designers can identify critical touchpoints and areas for improvement. For example, in a retail store, the value chain can help optimise the layout for better product placement, streamline checkout processes, and enhance customer service areas. This approach ensures that every aspect of the space contributes to a positive and efficient user experience, ultimately increasing satisfaction and engagement.

The Customer Value Chain Analysis (CVCA) model is beneficial for analysing the flow of information among stakeholders in the value chain, highlighting areas for improvement and enhancing overall efficiency (Pratama & Adhi Utama, 2019). It works by mapping out each step in the process, from raw material acquisition to final product delivery, and assessing the value added at each stage.

4.4.2 Service Design

Service design is an interdisciplinary approach that seeks to improve and innovate services by focusing on the user experience and interactions throughout the service process. It combines elements of various disciplines, including design thinking, business strategy, and user research, to create holistic and user-centred service solutions. Service design aims to ensure that services are efficient, effective, and enjoyable from the customer's perspective while also being viable and sustainable for the service provider.

In the context of pre-design phases in interior architecture, service design tools and methods are crucial for understanding and enhancing how users interact with and experience different service environments. These tools help map out the entire service journey, identify pain points, and uncover opportunities for improvement. By focusing on user needs and behaviours, service design ensures that the resulting environments are not only functional but also engaging and satisfying for users:

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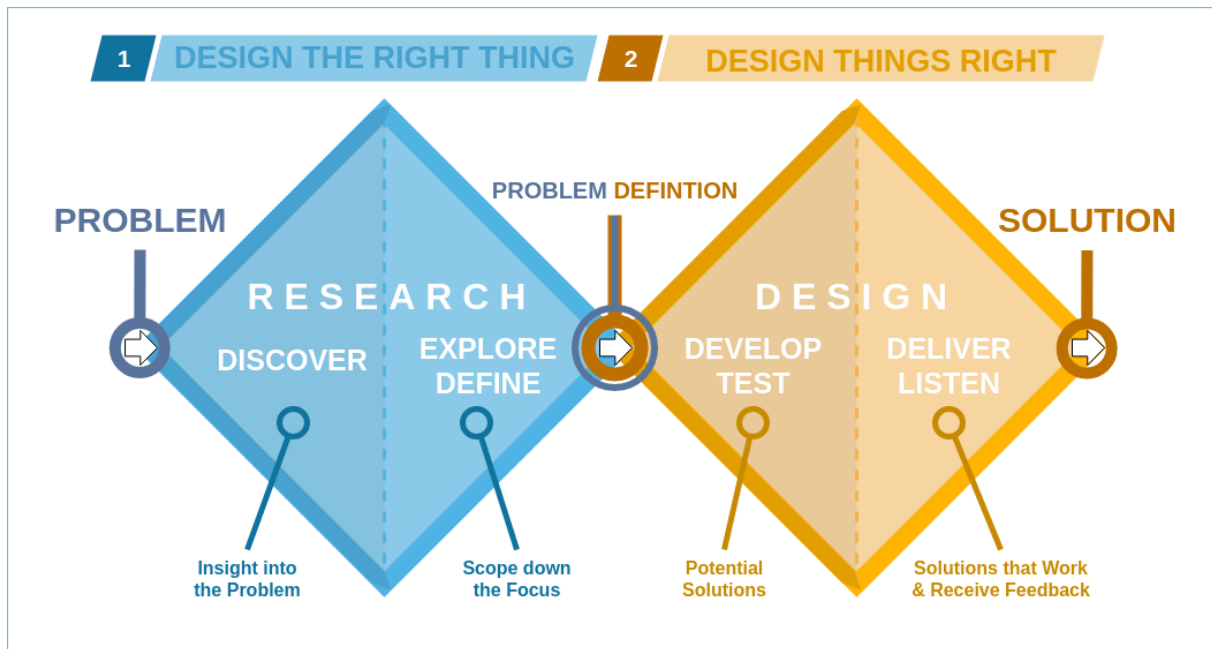


Figure 17: Double Diamond model which shows Discover, Define, Develop, and Deliver which guide practitioners through a systematic approach to divergent and convergent thinking (van Geetson & Wilkinson, 2021)

The **Double Diamond model**, introduced by the British Design Council, is a structured framework designed to enhance ideation and problem-solving in service design. It consists of four distinct phases: Discover, Define, Develop, and Deliver (van Geetson & Wilkinson, 2021), which guide practitioners through a systematic approach to divergent and convergent thinking. This process allows for exploring diverse ideas and concepts, facilitating the identification of optimal solutions.

The model's relevance spans people, place, and programme. It prioritises user-centric design by developing service concepts based on deep insights into user needs and preferences (people). Additionally, the Double Diamond method integrates spatial considerations throughout its phases, emphasising the importance of the physical environment in shaping service delivery (place). By encouraging creativity and innovation, the model supports the development of service solutions that are efficient and responsive to spatial requirements and programmatic goals (programme) (van Geetson & Wilkinson, 2021).

As discussed by van Geetson and Wilkinson (2021) in the article "Design Culture (of Resilience)," the Double Diamond model fosters a culture of resilience and adaptability within design practices, contributing to the creation of robust service offerings that effectively meet contemporary challenges.

The Double Diamond model can be applied in interior architecture to guide the design process through four phases: Discover, Define, Develop, and Deliver. In the Discover phase, designers gather insights about user needs and spatial requirements. The Define phase focuses on synthesising these insights into clear design goals. During the Develop phase, various design concepts are explored and refined. Finally, the Deliver phase involves detailed planning and implementation. This structured approach ensures a thorough exploration of ideas and solutions, leading to well-rounded, user-centered interior spaces.

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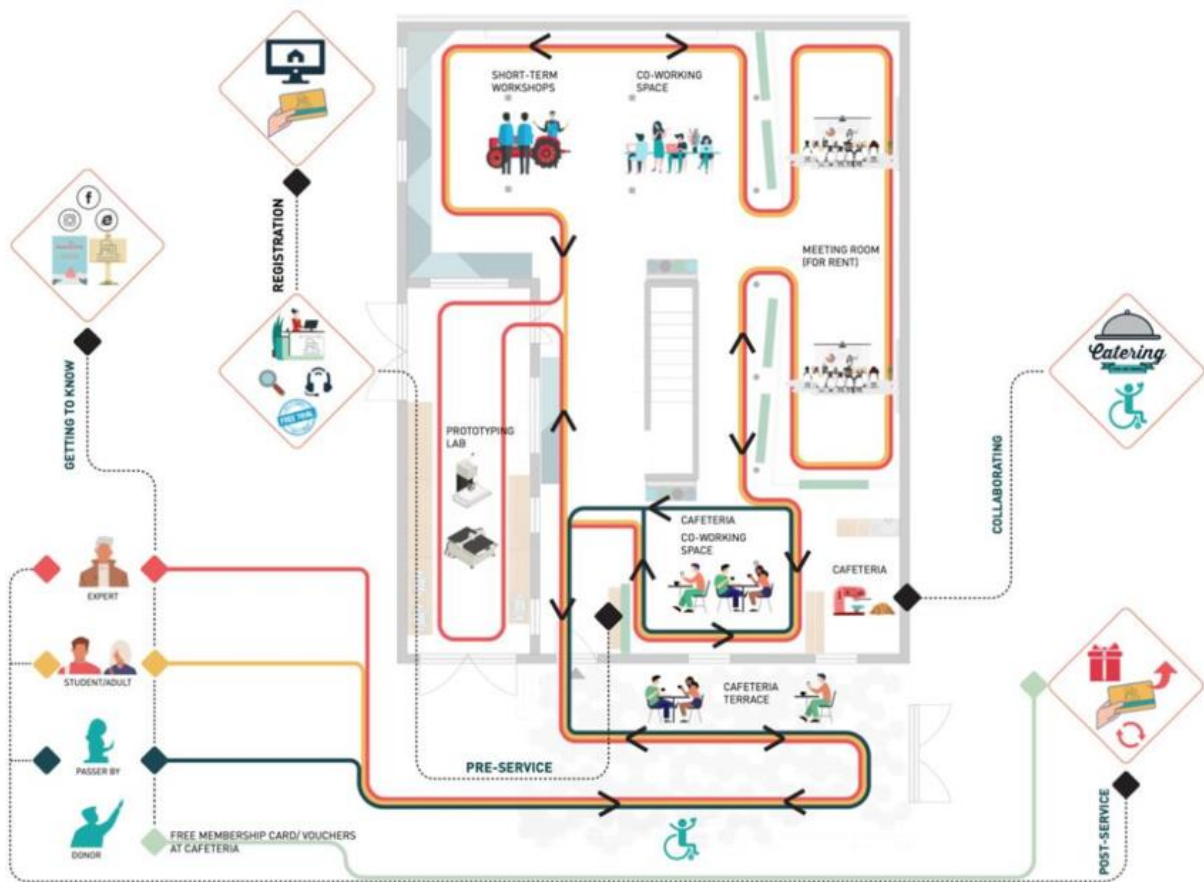


Figure 18: Spatial Service System Map showing holistic perspective on how people engage with different locations, aiding designers in optimising spatial layouts and configurations to enhance service delivery (Babapou Chafi & Cobaleda-Cordero, 2021)

The **Spatial Service System Map** analyses and visualises the spatial distribution of services and user interactions within physical environments. This tool offers a holistic perspective on how people engage with different locations, aiding designers in optimising spatial layouts and configurations to enhance service delivery. Babapour Chafi and Cobaleda-Cordero (2021) demonstrate in their study "Methods for Eliciting User Experience Insights in Workplace Studies" how this approach maps out circulation patterns, interaction zones, and spatial arrangements to improve overall user experience.

The Spatial Service System Map addresses all three aspects regarding its relevance to PPP. Firstly, it focuses on people by understanding how users interact with physical spaces, ensuring that designs are user-centric and promote positive experiences. Secondly, concerning place, it emphasises the physical environment and its impact on service delivery, guiding designers in creating functional and enhanced spatial configurations. Lastly, regarding the programme, this method helps align spatial layouts with service goals and operational processes, improving efficiency and effectiveness (Babapour Chafi & Cobaleda-Cordero, 2021).

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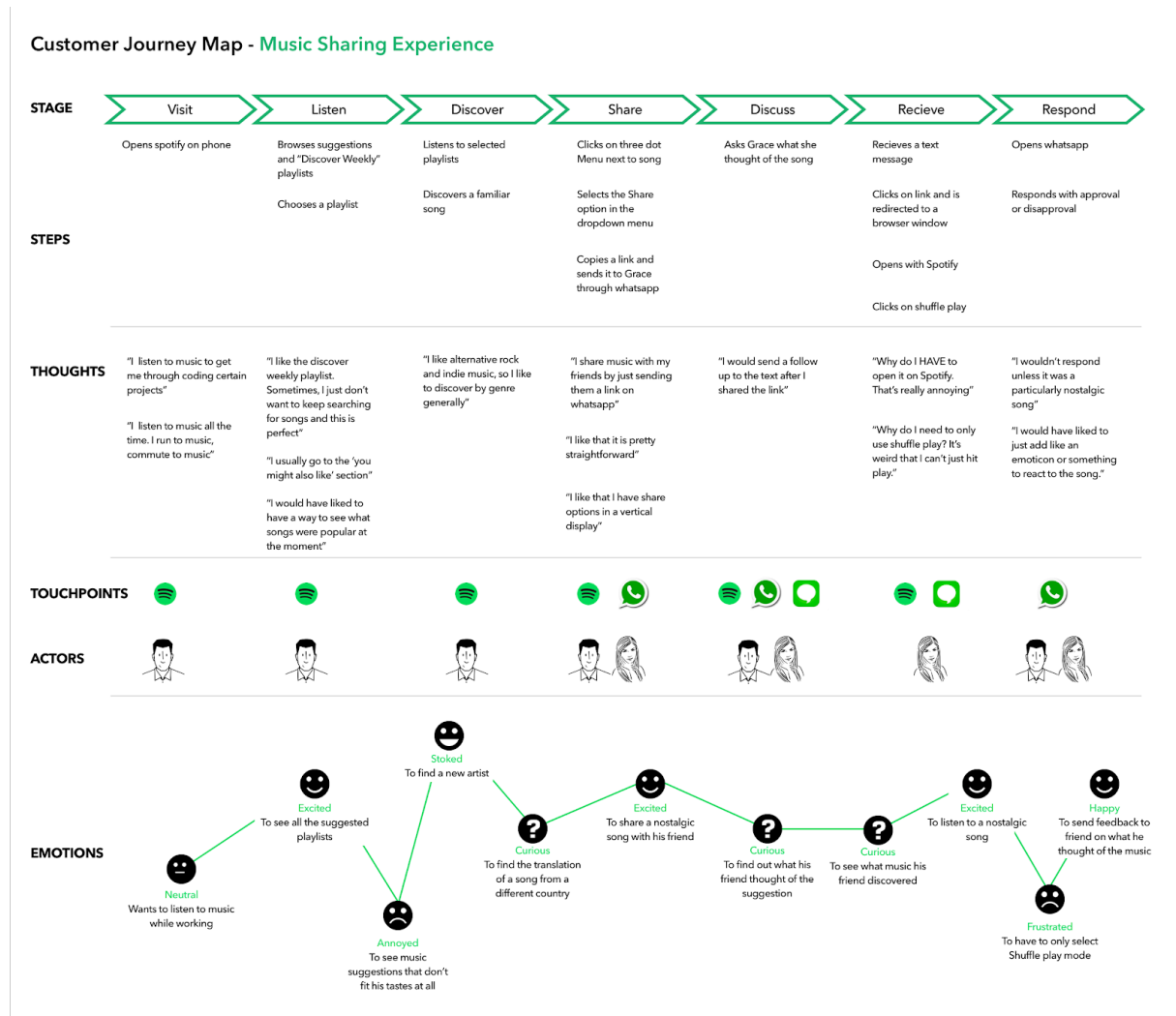


Figure 19: Customer/User Journey which provides detailed insights into user behaviours, demands, and challenges throughout their interaction with a service (Mann, 2022)

Customer Journey Mapping is a important tool in service design that provides detailed insights into user behaviours, demands, and challenges throughout their interaction with a service. This method involves mapping the entire customer experience across various environments and physical spaces, from initial contact to service delivery. By visualising the customer's journey, designers can identify pain points and opportunities for improvement. Zhang and Pan's (2021) research "Design of Sustainable Senior-Friendly Community Transportation Services" highlights how Customer Journey Mapping can help ensure that services are user-centric, intuitive, and seamless. This tool is instrumental in creating service experiences that resonate with users and meet their expectations effectively.

Regarding its relevance to PPP (people, place, and programme), Customer Journey Mapping directly influences each aspect. It focuses on people by understanding their behaviours and needs, ensuring that services are adjusted to enhance user satisfaction and engagement. Moreover, the programme Customer Journey Mapping aligns service delivery with user expectations and operational goals, facilitating efficient and effective service design and implementation (Zhang & Pan, 2021).

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Customer Journey Mapping in interior architecture can be used to visualise and analyse the experiences of users as they interact with a space. By mapping out the customer journey, designers can identify key touchpoints, pain points, and areas for improvement. For example, in a hotel, journey mapping can highlight the entire guest experience from check-in to check-out, ensuring smooth transitions between spaces and enhancing comfort and convenience. This approach helps create environments that are more intuitive, efficient, and satisfying for users.

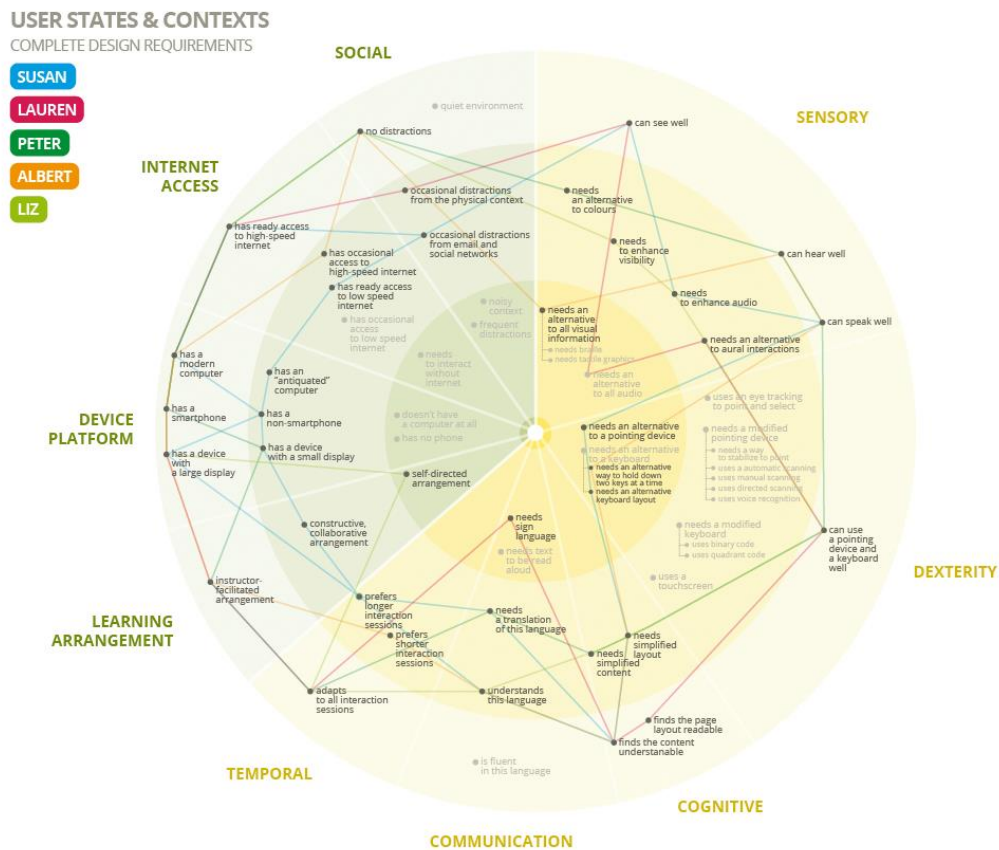


Figure 20: User States & Contexts showing the complete design requirements visualising different scenarios and conditions (OCAD University, n.d)

User States & Contexts is a powerful conceptual tool designed to model the diverse states and contexts in which users interact with a service or product. This method is instrumental in helping designers comprehend how users' needs and behaviours evolve across different scenarios and over time. By mapping out these varying states and contexts, designers can develop service solutions that are not only more inclusive and adaptable but also deeply connected to the user base.

The tool categorises and visualises the different scenarios and conditions under which users engage with a service or product. This approach enables designers to identify patterns and commonalities in user needs, facilitating the creation of designs that effectively accommodate typical and exceptional user experiences. For example, the Inclusive Design Guide from the

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Inclusive Design Research Centre at OCAD University (n.d.) emphasises how this tool can uncover insights into diverse user requirements, ensuring that services are not just accessible but also pertinent to a broad spectrum of users. This underscores the importance of our work in making services relevant and accessible to all.

User States & Contexts can be used in interior architecture to understand and design for various conditions under which users interact with a space. By considering different user states—such as relaxed, hurried, or focused—and the contexts in which these states occur, designers can create adaptable and responsive environments. For example, in a library, areas can be designed to accommodate both quiet study and casual reading, ensuring that the space meets diverse user needs. This approach leads to more versatile and user-friendly interiors that enhance overall satisfaction and usability.

Regarding its relevance to PPP (people, place, and programme), User States & Contexts directly addresses people by focusing on understanding and accommodating diverse user needs and behaviours. It contributes to place by considering how different environments and contexts influence user interactions and experiences with the service. Moreover, regarding the programme, this tool ensures that service designs are flexible and responsive, aligning with varying user states and contexts to enhance overall usability and satisfaction.

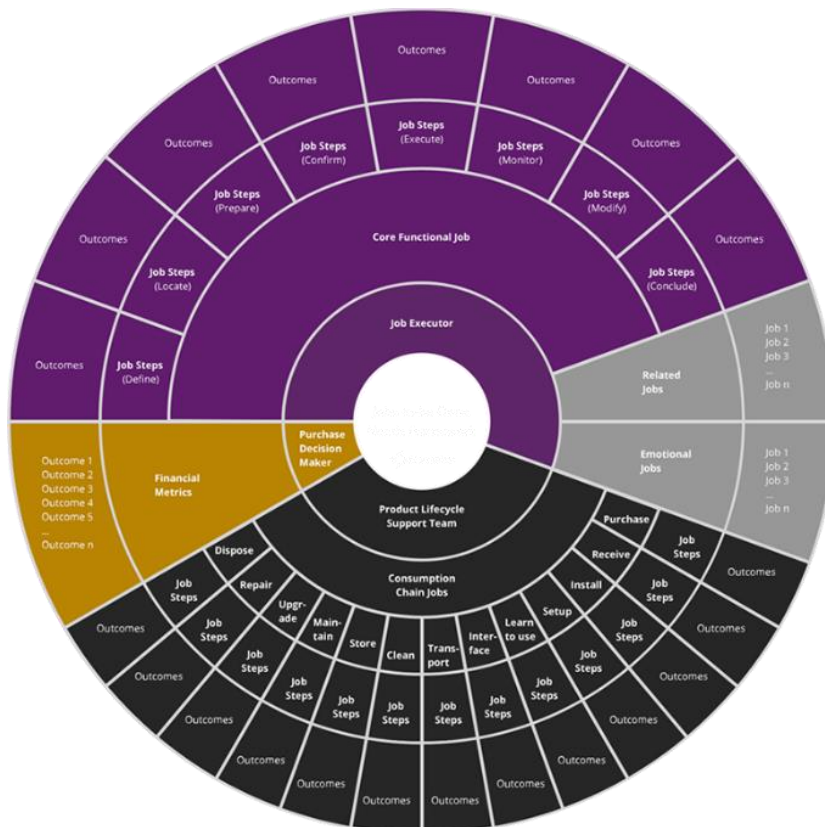


Figure 21: Jobs to be Done showing the job steps as well as the outcomes

The **Jobs to be Done (JTBD)** framework is a strategic tool that illuminates the specific goals and motivations that influence customers when they engage with a service or product (Ulwick, 2017). This approach gives designers deep insights into the fundamental tasks or 'jobs' users aim to accomplish, revealing the underlying reasons behind their choices. By focusing on these

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user objectives, the JTBD framework acts as a guiding light, steering design efforts towards developing products and services that precisely meet customer needs and expectations.

The JTBD framework involves thorough research to identify the core tasks and motivations driving customer behaviours. Designers utilise this understanding to customise service offerings and product features that closely align with what customers seek to achieve. Ulwick (2017) underscores the significance of understanding what users desire and the rationale behind their preferences, enabling businesses to craft solutions that resonate profoundly with their target audience.

Regarding PPP, the JTBD framework directly addresses the people aspect by focusing on understanding customer motivations and objectives. It contributes to the programme by ensuring that services and products are designed around specific user needs and tasks, enhancing usability and relevance. Furthermore, concerning place, this tool ensures that the service environment and interactions are enhanced to support users in efficiently accomplishing their desired tasks. The JTBD framework's adaptability is a key strength, allowing it to shape user-centric designs that foster customer satisfaction and loyalty, instilling confidence in designers.

The Jobs to be Done (JTBD) framework can be used in interior architecture to focus on the specific tasks and goals that users aim to accomplish within a space. By understanding these "jobs," designers can create environments tailored to support and enhance these activities. For example, in an office, the JTBD framework can help design spaces that facilitate collaboration, concentration, and relaxation, ensuring that each area effectively supports the tasks employees need to perform. This approach leads to more functional and purpose-driven interior designs that better meet user needs.

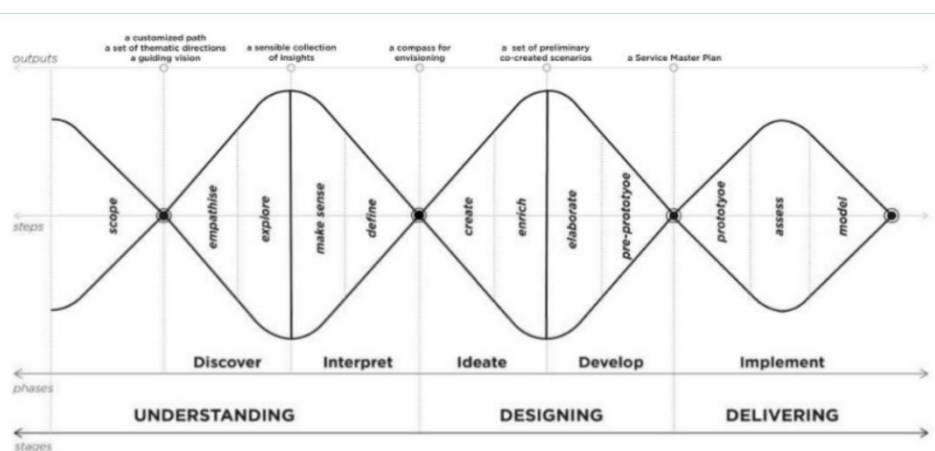


Figure 22: Service Master Planning process showing the design process (Selloni & Meroni, 2023)

Finally, the **Service Master Planning process**, as elucidated in "Exploring Service Design as a Commoning Approach: The Engaging Strategy of the Service Master Planning," emerges as a strategic framework for envisioning and orchestrating holistic service experiences. (Selloni and Meroni, 2023). By integrating these methodologies, designers can craft immersive and user-centric interior environments that resonate with diverse user needs and preferences.

The Service Master Planning process is primarily used to strategise holistic service experiences. Designers use this approach to envision and plan interior environments, seamlessly coordinating user interactions and spatial configurations. By leveraging user

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research and design principles insights, practitioners ensure that spaces are functional and enhance overall user satisfaction and comfort (Selloni and Meroni, 2023).

The Service Master Planning process is vital in PPP in all three aspects. Creating user-centric and accommodating settings emphasises understanding people's behaviours, preferences, and interactions within the planned environment. Coordinating service delivery with strategic objectives adds value to the programme by guaranteeing that internal environments efficiently support organisational goals (Selloni and Meroni, 2023). Furthermore, regarding place, this tool enhances visual compositions and spatial design to establish settings that promote satisfying user experiences. Therefore, interior designs that emphasise usability, functionality, and satisfaction with use are impacted by the Service Master Planning process.

4.4.4 Interior Spatial Design

Interior Spatial Design (ISD) focuses on creating functional and aesthetically pleasing environments within buildings. This discipline involves understanding how people interact with spaces and how these interactions can be enhanced through thoughtful design. ISD is not merely about decoration but involves a comprehensive understanding of spatial planning, ergonomics, lighting, acoustics, and materiality. Using various tools and methods, interior spatial designers can create spaces that meet users' needs, improve their experiences, and support the intended activities within these environments. The selected tools for ISD are evaluated based on their ability to enhance user experience, streamline the design process, and incorporate spatial design principles. These tools help designers to create effective, efficient, and enjoyable spaces, ensuring that the built environment supports its occupants' well-being and productivity:

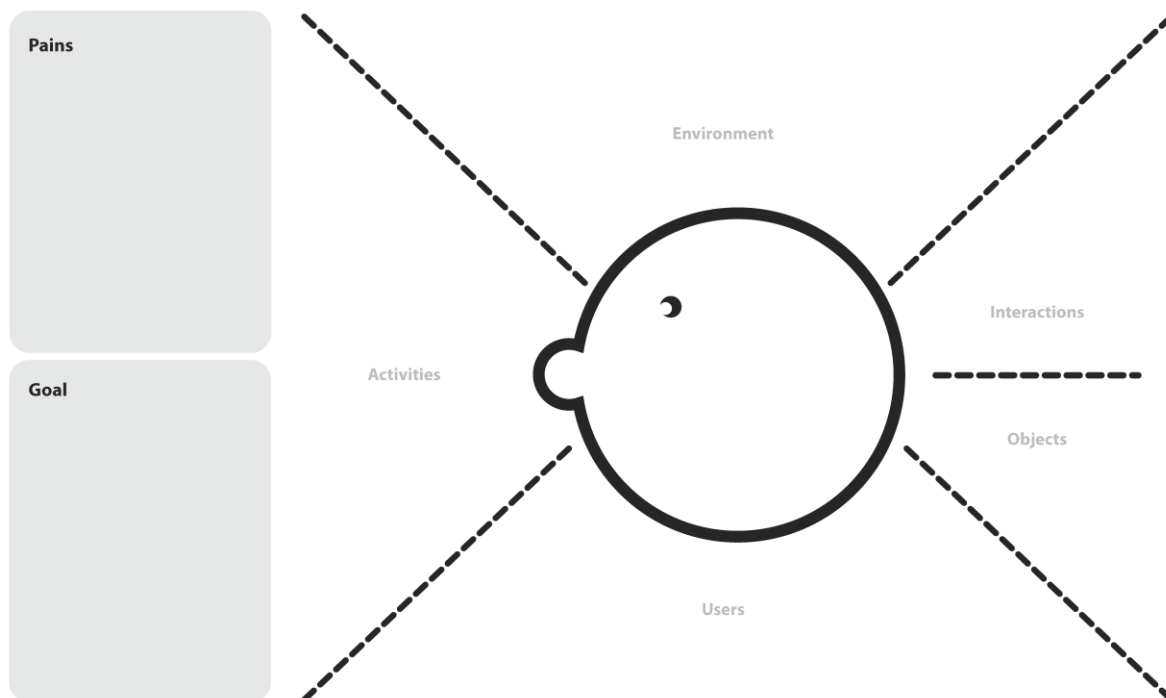


Figure 23: AEIOU Observation Framework (Fitzpatrick, 2018)

The **AEIOU (Activities, Environments, Interactions, Objects, Users) Observational Framework** is a structured method for comprehensively documenting and analysing

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interactions within physical spaces. This tool enables designers to observe and capture detailed insights into user activities, the surrounding environment, interpersonal interactions, the presence of objects, and user characteristics (Fitzpatrick, 2018). By employing the AEIOU framework, practitioners gain a nuanced understanding of how spaces are used, which informs decisions to improve functionality and enhance user experience.

The AEIOU Observational Framework involves observing and recording user behaviour and spatial dynamics. Designers conduct systematic observations to document users' activities, interactions between individuals, the layout and attributes of physical surroundings, and how users interact with objects in the environment. This methodical approach identifies patterns, preferences, and challenges within the space, as demonstrated in Darcie Fitzpatrick's study on observational frameworks (Fitzpatrick, 2018).

The AEIOU Observational Framework is valuable in interior architecture for systematically capturing and analysing various elements that influence user experiences within a space. By focusing on Activities, Environments, Interactions, Objects, and Users, designers can gain comprehensive insights into how these components interact and affect usability. For instance, in a healthcare setting, AEIOU can help observe patient activities, environmental conditions, staff interactions, medical equipment placement, and patient demographics to optimise layout and enhance patient care delivery. This approach ensures that interior designs are well-informed by user behaviours and needs, leading to environments that are functional, efficient, and supportive of diverse user interactions.

Considering PPP, the AEIOU framework is necessary to understand specific settings' requirements and behaviours. It helps create user-centred environments that accommodate a range of interests and activities. In terms of place, this tool enhances spatial configurations to improve user interactions and functional requirements. For the programme, the AEIOU framework also ensures that planned environments accomplish their objectives by coordinating observations with strategic goals (Fitzpatrick, 2018). As a result, the AEIOU Observational Framework is important for developing settings that promote positive encounters by being functional and sensitive to user demands.

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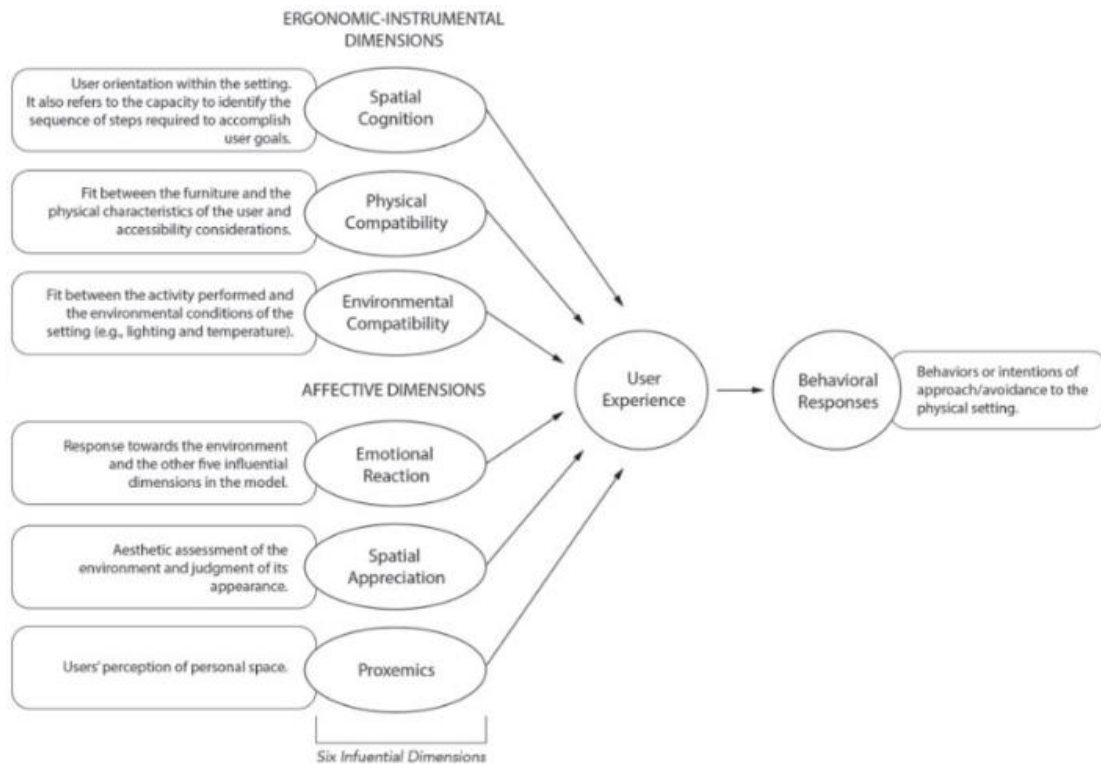


Figure 24: SUE Model (Julia-Nehme et al, 2023)

The **SUE Model (Spatial User Experience)** is a user-centred design framework prioritising simplicity, usability, and enjoyment in spatial design (Julia-Nehme et al., 2023). This model serves as a guiding principle for designers aiming to create spaces that are not only functional but also delightful to use. By focusing on simplicity, the SUE Model ensures that spatial layouts are intuitive and easy to navigate, reducing cognitive load for users. Usability is another core aspect, emphasising that spaces should facilitate tasks and activities efficiently without unnecessary complexity or barriers. Moreover, the model emphasises enjoyment, aiming to create environments that evoke positive emotions and satisfaction among users (Julia-Nehme et al., 2023).

Julia-Nehme et al. (2023) highlight the SUE Model's role in systematically assessing spatial settings based on user preferences and perceptions. It also helps designers pinpoint areas for enhancement and prioritise design changes that boost user satisfaction and well-being. By integrating insights from user experiences, the SUE Model supports the iterative refinement of spatial designs to closely align with user needs and expectations. The model creates practical, enriching, and enjoyable environments that enhance the user experience. Its emphasis on usability and enjoyment makes it particularly relevant to improving the quality of interactions within spaces (people), optimising spatial configurations and layouts (place), and ensuring that designed environments meet strategic goals effectively (programme).

The SUE Model (Spatial User Experience) is instrumental in interior architecture for evaluating and enhancing how users perceive and interact with physical spaces. By considering factors such as usability, functionality, and emotional responses, the SUE Model helps designers create environments that are not only aesthetically pleasing but also supportive of user needs and behaviours. For example, in a workplace setting, the SUE Model can assess how spatial

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layouts impact employee productivity, collaboration, and well-being. By integrating this model, designers can optimise spatial configurations, lighting, acoustics, and other elements to improve overall user satisfaction and enhance the quality of the built environment.

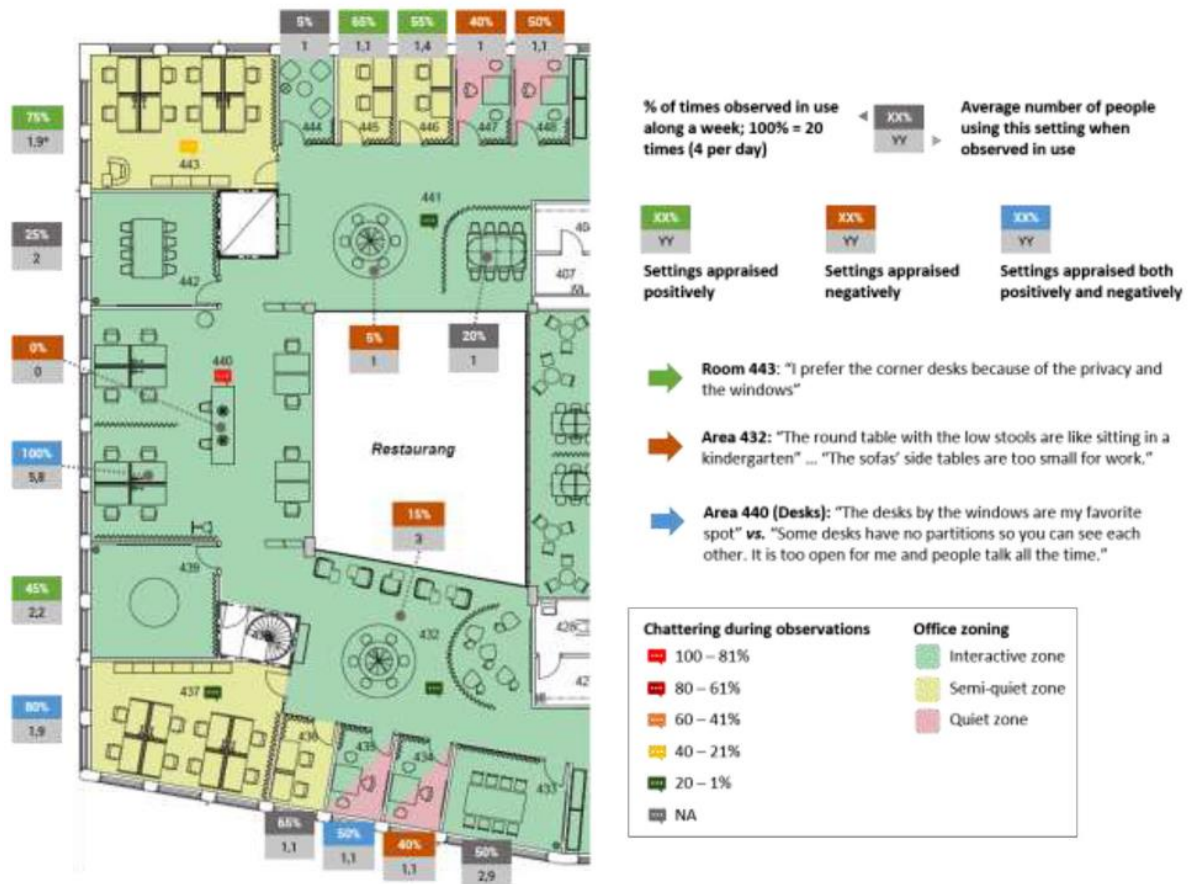


Figure 25: Spatial Walkthroughs (Cobaleda-Cordero & Chafi, 2021)

Spatial walkthroughs are a methodical approach where designers physically navigate a space to assess its functionality, spatial design, and user experience. This tool allows for a first-hand understanding of how users interact with the environment, pinpointing design flaws, inefficiencies, and opportunities for improvement (Cobaleda-Cordero & Babapour Chafi, 2021). By immersing themselves in the space, designers can evaluate aspects such as accessibility, visibility, comfort, and overall atmosphere, ensuring that the final design meets user needs and expectations effectively.

The process involves walking through the space and observing it from the perspective of users, as detailed in the study "Methods for Eliciting User Experience Insights in Workplace Studies: Spatial Walkthroughs, Experience Curve Mapping, and Card Sorting" by Cobaleda-Cordero & Babapour Chafi (2021). Participants engage by marking preferences and concerns using post-it notes or architectural drawings during office environment walkthroughs. This direct approach captures immediate user feedback and informs iterative design improvements.

Spatial walkthroughs are invaluable in interior architecture for physically assessing and evaluating the usability and functionality of designed spaces. Designers and stakeholders can walk through the space to experience firsthand how it feels, flows, and functions in real-world conditions. This process helps identify potential design flaws, ergonomic issues, and

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opportunities for improvement before finalising the design. For example, in a retail store, spatial walkthroughs allow designers to assess the effectiveness of display layouts, traffic flow patterns, and customer interaction points. By conducting these walkthroughs, designers can ensure that interior spaces are not only visually appealing but also practical and user-friendly, ultimately enhancing the overall user experience.

Spatial walkthroughs are important for enhancing the user experience (people) by directly assessing how individuals interact with spatial layouts. They contribute to optimising spatial configurations (place) by identifying areas for enhancement in accessibility, comfort, and usability. Moreover, by aligning observations with strategic objectives (programme), spatial walkthroughs ensure that design decisions are informed by user-centred insights, leading to functional environments that support user needs (Cobaleda-Cordero & Babapour Chafi, 2021).

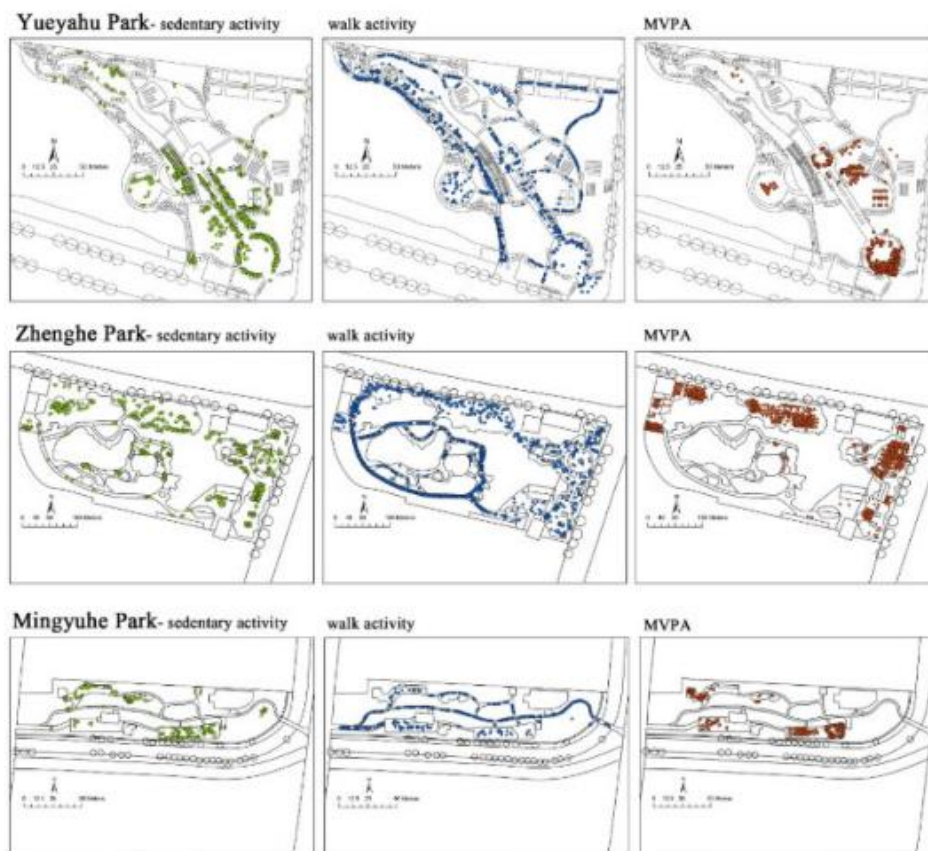


Figure 26: Behavioural Observation Mapping (O'Kelly, 2017)

Behavioural Observation Mapping is a methodical tool designers use to observe and document how people interact within a given space. This approach systematically records user behaviours and movement patterns and utilises various areas within the environment (O'Kelly et al., 2017). By capturing real-time data on user interactions, designers gain insights into how spaces are used and perceived, which informs improvements to spatial layouts and enhances overall user experience.

The process of Behavioural Observation Mapping, exemplified in O'Kelly et al. (2017) study "Can a Library Building's Design Cue New Behaviors? A Case Study," involves detailed

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observation and documentation of user behaviours across different library zones. This method enables designers to analyse patterns in user engagement, identifying opportunities to optimise spatial configurations and improve functionality. By understanding user behaviours, designers can create environments that facilitate intuitive navigation, support diverse activities, and foster positive interactions among users.

Behavioural Observation Mapping is a valuable tool in interior architecture for systematically observing and analysing user behaviours within designed spaces. By documenting how users interact with the environment—such as movement patterns, interaction with elements, and usage of amenities—designers can gain insights into spatial efficiency and user preferences. For example, in a museum, behavioural observation mapping can track visitor paths, viewing durations at exhibits, and interactions with interactive displays. This data helps optimise spatial layouts, improve exhibit placement, and enhance overall visitor experience. By leveraging behavioural observation mapping, designers can create environments that are responsive to user needs, fostering engagement and satisfaction.

Behavioural Observation Mapping directly enhances the user experience (people) by providing insights into how individuals interact with and navigate through spaces. It improves spatial layouts (place) by identifying design features that support or hinder user behaviours, thus guiding improvements that align with user needs and preferences. Furthermore, by aligning observations with strategic objectives (programme), Behavioural Observation Mapping ensures that design decisions are grounded in empirical data, leading to environments that effectively meet functional requirements and user expectations (O'Kelly et al., 2017).

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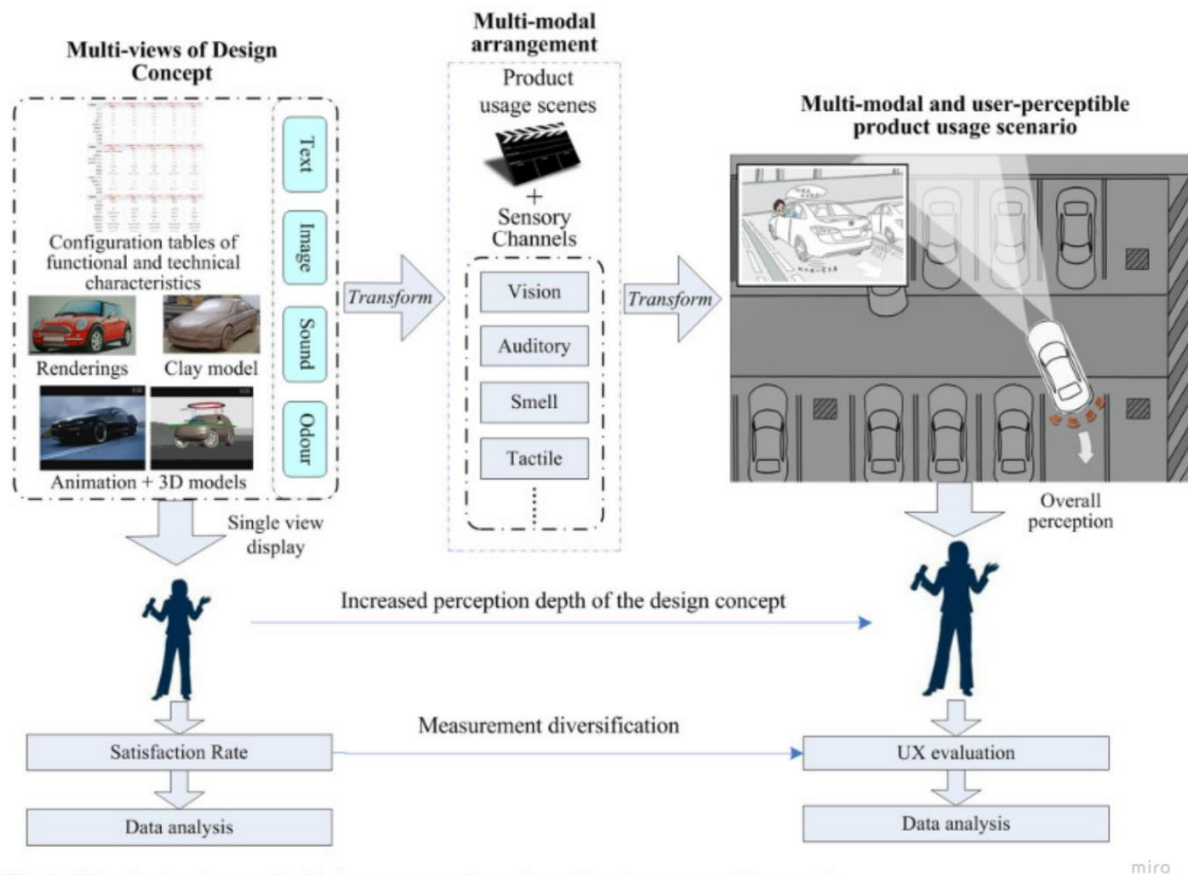


Figure 27: User Experience (UX) Evaluation Framework (Dong & Liu, 2017)

The **User Experience (UX) Evaluation Framework** is a comprehensive tool for assessing and enhancing user satisfaction and interaction with design solutions. This framework systematically evaluates various aspects such as usability, accessibility, emotional impact, and overall satisfaction to gauge the effectiveness of a design in meeting user needs (Dong & Liu, 2018). Designers can use structured evaluation methods to gather empirical data on user perceptions and behaviours, guiding iterative improvements to spatial designs.

The UX Evaluation Framework enhances the user experience (people) by ensuring design decisions are grounded in user-centric insights and preferences. It optimises spatial layouts (place) by identifying strengths and weaknesses in design implementations that affect usability and emotional engagement (Dong and Liu, 2018). Furthermore, by aligning evaluation criteria with strategic objectives (programme), the framework supports the creation of environments that not only fulfil functional requirements but also resonate with users on a deeper experiential level.

The User Experience (UX) Evaluation Framework is essential in interior architecture for systematically assessing and improving how users perceive and interact with spaces. By employing qualitative and quantitative methods, such as user surveys, interviews, and usability testing, designers can evaluate factors like comfort, usability, aesthetics, and emotional response. For instance, in an office setting, the UX Evaluation Framework can gauge employee satisfaction with workspace layouts, lighting conditions, and acoustic properties. This data-driven approach informs design decisions to optimise spatial layouts, enhance user

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comfort, and create environments that promote productivity and well-being. By integrating the UX Evaluation Framework, designers ensure that interior spaces are not only visually appealing but also functional and conducive to positive user experiences.

The research by Dong & Liu (2017), "Research on UX Evaluation Method of Design Concept under Multi-Modal Experience Scenario," illustrates the application of this framework in assessing design concepts across different modalities and user perceptual scenarios. This methodological approach ensures that spatial designs are evaluated comprehensively, addressing diverse user needs and preferences to achieve meaningful and impactful user experiences.

5. Discussion

Drawing from a comprehensive literature review and data analysis phase, the primary objective was to systematically understand these findings, anchoring them to the study's foundational challenges. With careful organisation, the aim was to present an examination of the methods, themes, and patterns found within the literature.

Critical appraisal revealed various methods contributing to the pre-design investigation environment in interior architecture. This investigation created an inventory of methods to help direct design proposals through the challenging pre-design stage.

Researchers conducted a selective procedure to determine which tools and methods required further research. This selection process was guided by criteria such as alignment with study objectives and the potential to improve user experiences. Each method was evaluated based on its effectiveness in addressing the three main elements of the PPP (people, place, and programme) diagram. This evaluation aimed to enhance our understanding of the spatial design process and its significant impact on user experiences.

The merging of organisational theory and phenomenology was necessary in the assessment process. The goal in combining these two concepts was to design spaces that appealed to users' emotions while also aligning with corporate objectives and programmatic requirements (Starbuck, 2003; Chaitanakankul, 2023). This connection facilitated the application of an integrated approach to interior architecture, creating environments that support both human well-being and business performance enhancement (Liu *et al.*, 2023). The combination of theoretical frameworks highlights the research's interdisciplinary aspect and the outlook it provides for the spatial design profession.

5.1 Identification of Key Themes and Trends

After examining the literature, a variety of key themes and trends have emerged, providing insight into significant aspects of combining Interior Spatial Design (ISD), Business Process Design (BPD), and Service Design (SD) approaches.

This research emphasises the crucial role of user-centred design methods in shaping spatial environments. By prioritising users' needs, preferences, and behaviours during the design process, designers can craft environments that appeal to them (Ediae et al., 2022). This user-centred approach promotes meaningful interactions and experiences for occupants, contributing to their well-being and satisfaction. It also improves the functionality and usability of interior spaces (Musulin & Strahonja, 2023).

The findings demonstrate the importance of iterative design approaches for efficiently adapting project objectives and user needs. Iterative design enables continuous improvement and adaptation based on customer feedback and changing project requirements (Wang, 2014).

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Designers can ensure that the final design meets project objectives and user expectations by adopting an iterative strategy, which allows for testing prototypes, iterating on concept designs, and incorporating user insights (Wang, 2014).

The research highlights that the practical integration of BPD, SD, and ISD approaches requires interdisciplinary collaboration and knowledge exchange (Schönbeck et al., 2021). Cooperation between various disciplines is necessary to fully realise the benefits of integrated design approaches, including business process and spatial design. Designers can leverage complementary skills, fill knowledge gaps, and foster innovation through interdisciplinary collaboration, resulting in more comprehensive and significant design solutions (Schönbeck et al., 2021).

This study has also revealed secondary tendencies in addition to these major themes. Creating seamless user journeys across physical and digital touchpoints is important, as is the increasing reliance on data-driven decision-making processes (Galvin and Singer, 1996; Kongelf and Camacho-Otero, 2020; Chauhan, Parida and Dhir, 2022). Moreover, sustainability and well-being are prioritised in design outcomes. These trends underscore the evolving nature of design practices and the need for a holistic, user-centric, and sustainable approach to interior architecture (Schmidt *et al.*, 2020)

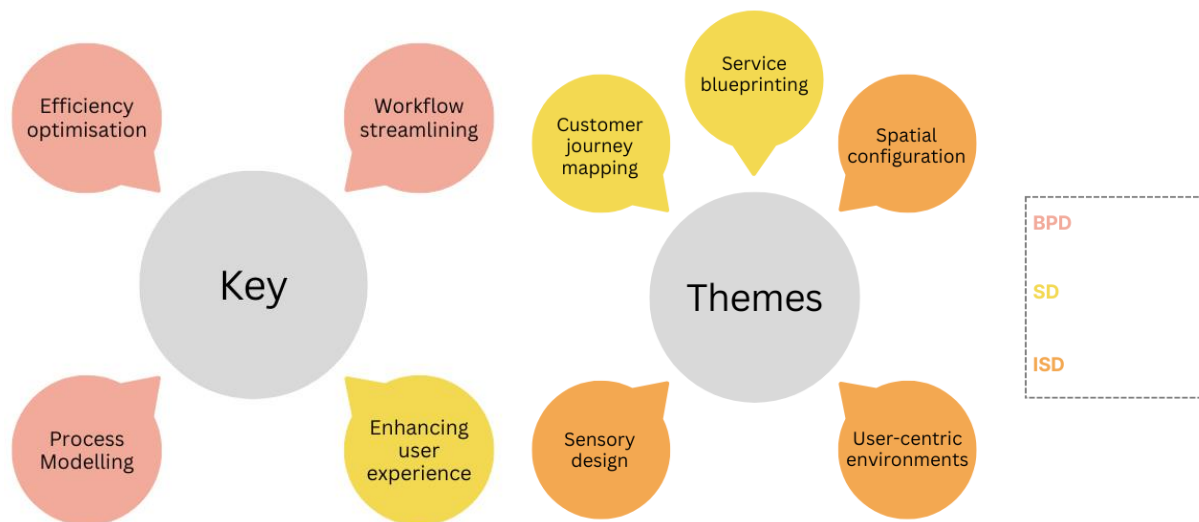


Figure 28: Key Themes with BPD, SD & ISD (Author, 2024)

5.1.1 Business Process Design (BPD)

Themes: Efficiency optimisation, workflow streamlining, process modelling.

Tools: Process mapping, business process modelling, Six Sigma, Lean methodologies.

The primary themes identified within Business Process Design (BPD) include efficiency optimisation, workflow streamlining, and process modelling (Galvin and Singer, 1996; Msomi, 2018; Amoozad Mahdiraji, Hafeez and Hajiagha, 2023). Process mapping, business process modelling, Six Sigma, and Lean methodologies are employed to refine and enhance operational procedures, ensuring maximum efficiency and effectiveness in business processes.

5.1.2 Service Design (SD)

Themes: Enhancing user experience, customer journey mapping, and service blueprinting.

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Tools: Customer journey maps, service blueprints, touchpoint analysis, and personas.

Service Design (SD) enhances user experience, customer journey mapping, and service blueprinting. The tools used in this field, such as customer journey maps, service blueprints, touchpoint analysis, and personas, help understand and improve the interactions between users and services (Lemon and Verhoef, 2016; Gibbons, 2017). By mapping out the customer journey and analysing service touchpoints, designers can identify areas for improvement and innovate to enhance overall user satisfaction and service quality.

5.1.3 Interior Spatial Design (ISD)

Themes: Spatial configuration, sensory design, user-centric environments.

Tools: Spatial analysis, sensory design tools, ergonomic assessments, spatial modelling.

Themes of spatial configuration, sensory design, and user-centric environments characterise interior spatial design (ISD). Tools such as spatial analysis, sensory design tools, ergonomic assessments, and spatial modelling are used to create spaces that are functional, aesthetically pleasing, and conducive to the well-being of occupants (De Rosa, 2022; Julia-Nehme *et al.*, 2023). These tools help designers consider spatial environments' physical and psychological impacts on users, ensuring that the design meets their needs and enhances their experience.

5.2 Identification of Overlaps in the Literature

The synthesis of literature presented in this paper underscores the inherent convergence of three distinct fields—BPD, SD, and ISD—in both theory and practice. It highlights the need for enhanced models to align various tools and concepts for expressing user experience. Analysing the reviewed literature on tools and models of BPD, SD, and ISD uncovers overlapping methodologies aimed at facilitating user experiences within products, services, or designs.

One prominent area of overlap lies in stakeholder analysis and requirements gathering, which emerged as fundamental steps in the design process across all three disciplines (Salvioni & Almici, 2020). By engaging stakeholders and understanding their needs, preferences, and challenge, designers can effectively inform the design process and tailor solutions to meet user expectations. This shared emphasis on stakeholder engagement underscores the importance of user-centric design principles in guiding design decisions (Wang *et al.*, 2019).

Similarly, prototyping and iterative design emerged as standard practices in BPD, SD, and ISD, reflecting a shared commitment to refining design solutions through continuous feedback and iteration (Dokter *et al.*, 2023). By prototyping and testing design concepts iteratively, designers can validate assumptions, uncover design flaws, and refine solutions in response to user feedback and evolving project requirements (Ediae *et al.*, 2022). This iterative approach fosters innovation and ensures the final design aligns closely with user needs and expectations.

User journey mapping and experience mapping emerged as prevalent techniques employed across BPD, SD, and ISD. These methodologies enable designers to visualise and understand user interactions with products, services, and spatial environments, facilitating seamless and intuitive user experiences and programme (Lemon & Verhoef, 2016). By mapping user journeys and experiences, designers can identify moments of satisfaction and opportunities for improvement, informing design decisions and enhancing user satisfaction (Wang, 2014).

Process mapping and workflow optimisation emerged as common strategies utilised across BPD, SD, and ISD disciplines to streamline operations and improve efficiency. By mapping out processes and workflows, designers can identify bottlenecks, redundancies, and inefficiencies, enabling them to develop methods and enhance organisational performance (Trkman *et al.*,

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2015; Yang & Qu, 2016; Wang et al., 2019). This shared focus on process optimisation reflects a collective effort to create more streamlined and practical design solutions, which relates to programmatic requirements.

3D modelling and visualisation techniques were identified as tools utilised across BPD, SD, and ISD disciplines to communicate design concepts and envision spatial environments. By leveraging these tools, designers can bring design ideas to life, enabling stakeholders to visualise and understand proposed designs more effectively (Chang & Chuang, 2021; Ediae et al., 2022; Musulin & Strahonja, 2023; Selloni & Meroni, 2023). This visual communication facilitates collaboration, decision-making, and stakeholder buy-in, ultimately driving the success of design projects.

There are clear connections, particularly in the overlap between service and interior spatial design, evident from both perspectives (Musulin & Strahonja, 2023). User response within these domains is linked to behavioural aspects, thereby shaping a unique set of values for user experience. Business process and service design utilise organised and systematic tools to communicate the essence of a service or process to all stakeholders, ensuring user involvement throughout. While interior spatial design and business process design often operate independently, there are instances of overlap, particularly regarding the user's or customer's prioritisation. The effectiveness and fulfilment of user needs determine the success of designs or projects within the architectural realm (Ediae et al., 2022), leading to a better process and structure and improving the pre-design phase within the architecture disciplines.

5.2.1 Overlaps in Tools Across BPD, SD, and ISD

Process Mapping (BPD) and Journey Mapping (SD)

Business Process Design (BPD): Process mapping is fundamental for visualising and analysing organisational workflows. It helps identify inefficiencies, redundancies, and areas for improvement (Galvin & Singer, 1996; Dunzer et al., 2021).

Service Design (SD): Customer journey mapping is a similar tool that visualises the customer's experience through various touchpoints with a service. It identifies pain points and opportunities for enhancing user experience (Galvin & Singer, 1996; Dunzer et al., 2021).

Interior Spatial Design (ISD): While not traditionally associated with process mapping, ISD can benefit from process mapping, such as journey mapping, by understanding how users interact with spaces. This helps identify inefficiencies and improve spatial flow and functionality. For example, in an office, journey mapping can optimise layouts for smoother movement and better accessibility. In retail, it can enhance the placement of signage and displays to improve user experience. Integrating process mapping into ISD ensures spaces are both aesthetically pleasing and highly functional, supporting intended activities effectively. (Babapour Chafi & Cobaleda-Cordero, 2021).

Overlap Discussion: Process mapping and journey mapping are essential for understanding and optimising users' interactions with their environments. In interior architecture, combining these tools can lead to designs that streamline operational workflows and enhance user experience by addressing space usage's functional and experiential aspects.

Personas and User Profiles

Service Design (SD): Personas are fictional characters created based on user research to represent users who might use a service, product, or space. They help designers understand users' needs, goals, and behaviours (Chang & Chuang, 2021; Musulin & Strahonja, 2023).

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Business Process Design (BPD): Although not as commonly used as in SD, personas can also be helpful in BPD in understanding the different roles within an organisation and how they interact with various processes (Hrabal, 2020).

Interior Spatial Design (ISD): Personas can inform ISD by providing insights into the users who will occupy or interact with the space, ensuring that the design caters to their specific needs and preferences (Julia-Nehme et al., 2023).

Overlap Discussion: Using personas across BPD, SD, and ISD underscores the importance of a user-centred approach. By integrating personas into the design process, designers can create more tailored and effective environments that meet their users' diverse needs.

Prototyping and Iterative Design

Service Design (SD): Prototyping is a core method for testing and refining service concepts before full implementation. This iterative process involves creating low-fidelity models to explore ideas and gather user feedback (Dokter et al., 2023).

Business Process Design (BPD): In BPD, iterative design is applied through continuous improvement cycles such as those found in Lean and Six Sigma methodologies, where processes are regularly reviewed and refined based on performance data (Trkman et al., 2015).

Interior Spatial Design (ISD): Prototyping in ISD involves creating physical or digital models of spaces to test design concepts and iterate based on user feedback and functional requirements (Ashour & Rashdan, 2023).

Overlap Discussion: The iterative nature of prototyping across all three disciplines highlights the value of a flexible and responsive design process. By continuously testing and refining ideas, designers can ensure that the outcome is well-suited to users' needs and adaptable to changing requirements.

Ergonomic and Sensory Design

Interior Spatial Design (ISD): Ergonomic assessments and sensory design tools ensure that physical environments are comfortable, safe, and conducive to the activities they support (Mansha & Gargi, 2024).

Service Design (SD): Sensory design also plays a role in SD, particularly in creating environments that enhance the overall service experience by carefully considering lighting, acoustics, and other sensory elements (Selloni & Meroni, 2023).

Business Process Design (BPD): While not a primary focus, BPD can benefit from ergonomic and sensory considerations to improve the physical workspace, enhancing employee well-being and productivity (Ryzhakova et al., 2023).

Overlap Discussion: The focus on ergonomic and sensory design across these disciplines illustrates a common goal of creating environments that meet functional needs and enhance users' overall experience. This holistic approach ensures that spaces are efficient, pleasant, and supportive of user well-being.

Stakeholder Analysis and Engagement

Business Process Design (BPD): Stakeholder analysis is crucial in BPD to understand the interests, influences, and expectations of different stakeholders within an organisation. This helps align process improvements with organisational goals and stakeholder needs (Salvioni & Almici, 2020).

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Service Design (SD): In SD, stakeholder engagement is essential for co-creating service solutions. This involves actively involving stakeholders in the design process to gather insights and foster a sense of ownership and collaboration (Schönbeck et al., 2021).

Interior Spatial Design (ISD): Engaging stakeholders in ISD ensures that the design reflects the needs and preferences of those using the space. This can include clients, end-users, and other relevant parties (Mansha & Gargi, 2024).

Overlap Discussion: Stakeholder analysis and engagement are standard practices across all three disciplines, emphasising the importance of collaboration and communication in the design process. By involving stakeholders from the outset, designers can ensure that the outcome meets the needs and expectations of all parties involved.

Empathy and User Research

Business Process Design (BPD): Empathy in BPD involves understanding the experiences and needs of employees and other stakeholders involved in business processes. This can inform more humane and effective process improvements (Dunzer et al., 2021).

Service Design (SD): Empathy is a cornerstone of SD, where understanding the user's perspective is important for designing meaningful and effective services. User research methods like interviews and observations are commonly used (Braun & Clarke, 2012).

Interior Spatial Design (ISD): In ISD, empathy helps designers create spaces that truly meet the needs of their occupants. User research methods (surveys and questionnaires, spatial walkthroughs, behavioural mapping, etc.) gather insights into how people interact and feel within a space (Babapour Chafi & Cobaleda-Cordero, 2021).

Overlap Discussion: The focus on empathy and user research across these disciplines highlights the importance of understanding the human element in design. Designers can create more effective and meaningful solutions by profoundly understanding users' needs and experiences.

Visualisation Tools

Business Process Design (BPD): Visualisation tools like flowcharts, diagrams, and dashboards represent processes and performance metrics (Juan & Yuan, 2013).

Service Design (SD): In SD, tools like service blueprints, journey maps, and storyboard illustrations visualise service interactions and touchpoints (Gibbons, 2017).

Interior Spatial Design (ISD): Visualisation in ISD includes floor plans, 3D models, and virtual reality simulations to represent and test spatial designs (Dong & Liu, 2018).

Overlap Discussion: Visualisation tools are critical across BPD, SD, and ISD for communicating complex ideas clearly and facilitating better stakeholder understanding. They help conceptualise, test, and refine designs throughout the process.

The overlaps in tools and methodologies across Business Process Design, Service Design, and Interior Spatial Design underscore the interdisciplinary nature of modern design practices. These overlaps highlight the importance of a comprehensive approach that leverages the strengths of each discipline to create user-centric, efficient, and adaptive environments. By integrating standard tools such as stakeholder analysis, data-driven decision-making, systems thinking, empathy, and visualisation, designers can develop more holistic and practical solutions that address users' functional and experiential needs. This integrated approach enhances design projects' overall quality and impact and ensures they align with organisational goals and user expectations.

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5.3 Challenges and Opportunities in Integrating BPD, SD, and ISD

The integration of Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) in interior architecture projects presents a landscape filled with both challenges and opportunities. One of the primary challenges is coordinating diverse methodologies and tools across these disciplines, each with its principles, processes, and terminologies. This can create friction and communication barriers, potentially hindering interdisciplinary collaboration and leading to siloed approaches. Additionally, the hierarchical nature of traditional design processes may inadvertently impede innovative partnerships.

The varying levels of maturity and adoption of these disciplines within the field further complicate integration. BPD and SD have gained significant traction and are often well-established in organisational practices (Mahdiraji et al., 2023; Yang & Qu, 2016). In contrast, ISD is sometimes perceived as a newer, evolving discipline (Cobaleda-Cordero & Babapour Chafi, 2021). This perception can result in differences in understanding, implementation, and stakeholder buy-in, complicating the integration process.

Despite these differences, it is essential to recognise that BPD and SD can significantly benefit from ISD's insights and contributions. BPD and SD projects often neglect ISD, missing out on the potential enhancements that thoughtful spatial design can bring.

Integration of ISD can enrich BPD by creating workspaces that support efficient business processes and enhance employee well-being. Similarly, in SD, incorporating ISD can lead to service environments that are not only functional but also aesthetically pleasing and comfortable, thereby improving overall user satisfaction.

A collaborative approach where BPD, SD, and ISD work together can lead to more holistic and successful projects. Learning from each other's strengths and integrating their methodologies can foster efficient, user-friendly environments conducive to positive experiences. This interdisciplinary cooperation ensures that projects benefit from comprehensive perspectives, ultimately leading to more effective and well-rounded outcomes.

However, significant opportunities also arise from this convergence. By leveraging the complementary strengths of each discipline, designers can develop holistic solutions that address both functional and experiential dimensions. Integrating BPD methodologies like value chain analysis with SD techniques such as service blueprinting can provide profound insights into a space's operational and experiential aspects. The growing emphasis on user-centred design and experience-driven approaches also presents an opportunity for collaboration, aligning business goals, service delivery models, and spatial configurations to meet evolving user needs and preferences.

5.4 Case Studies, Best Practices, and Their Impact

The literature and data analysis highlight integrative design techniques' potential to produce more cohesive and user-centric interior architecture projects. Design teams can create functional and engaging spaces by combining BPD methodologies for streamlining operational procedures, SD strategies for improving user interactions, and ISD principles for creating spatial environments.

Shared methods and tools among BPD, SD, and ISD underscore the interconnectedness of these fields, fostering interdisciplinary innovation. Combining approaches such as process mapping, journey mapping, sensory design, and spatial analysis provides a comprehensive framework for addressing complex design challenges and maximising user experiences.

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Subjective evidence from the literature suggests the transformative potential of these integrated techniques, even though empirical evaluations of their direct impact on project outcomes and user experiences are still pending. Best practices and case studies demonstrate how integration has enhanced user satisfaction and operational effectiveness, leading to more successful design outputs. For example, a case study by Selloni and Meroni (2023) on the "Engaging Strategy of the Service Master Planning" illustrates how integrating service design and spatial design resulted in a community hub that significantly improved user engagement and satisfaction. Another case study by Babapour Chafi and Cobaleda-Cordero (2021) on workplace studies showed how spatial walkthroughs combined with service blueprinting led to more efficient and user-friendly office layouts. Systematic evaluations of their performance in actual projects and stakeholder feedback are essential to fully understanding the influence of integrated design methodologies.

5.4.1 Literature Review and Case Study Examples

Case studies illustrate the practical application of these methodologies in diverse settings, offering valuable insights into their effectiveness and impact.

For instance, in redesigning a corporate office space, the Double Diamond framework facilitated a systematic exploration of design challenges and solutions (van Geetson & Wilkinson, 2021). By iteratively defining and refining design concepts, the framework allowed designers to address both spatial layout and service delivery issues, ultimately improving employee productivity and satisfaction. Customer journey mapping complemented this approach by identifying critical touchpoints in the employee experience, leading to targeted improvements that enhanced workflow efficiency and collaborative interactions (Lemon and Verhoef, 2016).

Similarly, a retail store renovation project exemplified the integration of service blueprinting and spatial service system mapping to enhance customer engagement and sales (Gibbons, 2017). Through service blueprinting, designers mapped customer interactions and service processes, uncovering opportunities to streamline service delivery and enhance customer satisfaction. Spatial service system mapping then integrated these insights into the physical layout, strategically positioning products and service points to improve navigation and customer flow. This integrated approach enhanced the shopping experience and boosted operational efficiency, aligning with findings that emphasise the role of spatial design in influencing consumer behaviour and retail performance (Yuan, Liu and Rui, 2021).

In healthcare facility design, applying the Business Process Model and Notation (BPMN) alongside the AEIOU observational framework proved instrumental in optimising patient care processes and spatial layout (Fitzpatrick, 2018). BPMN enabled designers to visualise and streamline complex workflows, reducing inefficiencies and enhancing staff productivity. Concurrently, the AEIOU framework provided a comprehensive understanding of user activities, interactions, and environmental influences within the facility, informing decisions on spatial organisation and resource allocation. This integrated approach aligned with research highlighting the impact of healthcare environments on patient outcomes and staff satisfaction, underscoring the importance of user-centred design in healthcare settings (Msomi, 2018).

Furthermore, the design of a community library showcased the integration of the AEIOU observational framework with spatial prototyping and mood boards to create a versatile and engaging public space (Fitzpatrick, 2018). By observing user activities and preferences through the AEIOU framework, designers gained insights into how different community groups utilised the library, informing decisions on layout, furniture placement, and amenities. Spatial

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prototyping and mood boards facilitated iterative design exploration, allowing designers to test and refine spatial configurations and aesthetic elements before implementation. This holistic approach aligned with research advocating for inclusive and participatory design processes in public facilities, promoting community engagement and satisfaction (Msomi, 2018).

These case studies exemplify the transformative potential of integrating BPD, SD, and ISD methodologies in interior architecture. By synthesising insights from diverse disciplines, designers can create environments that meet functional requirements and enhance user experience and stakeholder satisfaction. The literature underscores the importance of interdisciplinary collaboration and user-centric design approaches in addressing complex design challenges, paving the way for future research and innovation in integrated design practices (Selloni & Meroni, 2023).

5.5 Implications and Practical Applications of Research Findings

The findings of this comprehensive study underscore the importance of adopting a holistic and integrated approach in interior architecture projects. By amalgamating BPD, SD, and ISD methodologies, designers can navigate the multifaceted challenges inherent in these projects, from spatial layout optimisation to service delivery enhancement. Integrating these disciplines can improve project outcomes, enrich user experiences, and increase stakeholder satisfaction, aligning design solutions with organisational goals and end-user needs.

However, several hurdles impede the integration of BPD, SD, and ISD methodologies, including organisational silos, communication breakdowns, and resistance to change. Addressing these challenges is crucial for fostering a culture of collaboration, innovation, and interdisciplinary synergy. The study's findings also catalyse future research, identifying gaps and opportunities for developing standardised frameworks, tools, and methodologies tailored to pre-design practice.

An integrated approach allows designers to comprehensively analyse project requirements, stakeholder expectations, and user demands, leading to solutions that resonate with occupants. Despite the challenges, promoting a collaborative environment and ensuring transparent communication can help design teams and stakeholders overcome obstacles and successfully implement integrated design approaches.

5.6 Analysis of tools that overlap within BPD, SD, ISD

Table 9: Analysis of tools that overlap within BPD, SD, ISD

| Tool | Reference | Description | Strengths | Weaknesses | Opportunities | Outcome |
|--|--|--|---|---|---|---|
| Service Master Planning Process | Selloni and Meroni, (2023) | Strategic approach to planning and designing services. | Strategic, comprehensive. | It can be complex and requires detailed planning. | Enhance service delivery and enhance customer satisfaction. | Not selected due to redundancy with Service Blueprint, which is more practical for integration. |
| User States & Contexts | Inclusive Design Research Centre at OCAD | They analyse the states and contexts where users interact with | Detailed user insights enhance user-centric design. | It requires extensive user research and | Improve user satisfaction and inform design decisions. | It was not selected due to redundancy with the AEIOU Observational Framework, |

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| | | | | | | |
|-----------------------------------|--|--|---|--|--|---|
| | University (n.d.) | a product or service. | | can be complex. | | which offers a broader scope. |
| Customer Journey Map | Zhang and Pan's (2021) | Visualisation of customer experiences across touchpoints with a product or service. | A comprehensive view identifies pain points. | It requires extensive data and can be time-consuming. | Enhance customer satisfaction and inform design decisions. | Selected for an integrated framework to understand user interactions and optimise user experiences in spatial and service contexts. |
| SUE Model | Julia-Nehme et al. (2023) | Spatial User Experience model to assess usability aspects. | Focused on usability, user-centered. | Limited to usability, not comprehensive. | Enhance usability and improve user satisfaction. | It was selected for its focus on enhancing usability and user satisfaction, which complements the integrative approach. |
| 5 Diamond Method | Grisold et al. (2021) | A creative problem-solving process involving five stages: Define, Discover, Design, Develop, and Deploy. | Encourages creativity in a structured approach. | It can be time-consuming and not universally applicable. | Foster innovative solutions and improve project outcomes. | It was not selected due to its overlap with Double Diamond, which is more widely accepted. |
| Double Diamond | van Geetson and Wilkinson (2021) | Problem-solving framework in design thinking involves four stages: Discover, Define, Develop, and Deliver. | Encourages creativity in a structured approach. | Linear process, not universally applicable. | Foster innovative solutions and improve project outcomes. | Selected for an integrated framework to guide the iterative design process across spatial, service, and business dimensions. |
| Spatial Service System Map | Babapour Chafi and Cobaleda-Cordero (2021) | Mapping interactions between service processes and physical | Integrates spatial and service elements. | Requires detailed mapping and may overlook nuances. | Develop spatial layout and enhance service delivery. | Selected for an integrated framework to visualise and optimise interactions |

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| | | | | | | |
|--|---------------------------------|--|--|--|---|--|
| | | environments | | | | between spatial configurations and service processes. |
| AEIOU Observational Framework | Fitzpatrick (2018) | Framework for observing, documenting, and understanding user interactions and experiences. | A comprehensive, holistic view of user interactions. | It can be time-consuming and requires skilled observers. | Improve user-centered design and inform design decisions. | It was not selected due to its redundancy with the SUE Model, which offers a more focused approach to assessing the usability and user-centred design. |
| Customer Value Chain | Pratama and Adhi Utama's (2019) | A model that describes the full range of activities needed to create a product or service. | Comprehensive, highlights value-adding activities. | It can be complex and requires detailed data. | Enhance value creation and identify efficiency improvements. | It was not selected due to its focus on business operations rather than user experience. |
| Business Process Modeling Notation (BPMN) | Amoozad Mahdiraji et al. (2023) | Standardised notation for graphical representation of business processes. | Clarity, interoperability. | A steep learning curve can be technical. | Improve process efficiency and facilitate communication. | Selected for an integrated framework for its ability to model and enhance business processes in conjunction with spatial and service design. |
| Jobs to be Done | Ulwick (2017) | Framework for understanding the jobs users hire products/services to do. | User-centred, actionable insights. | It can be abstract and requires deep user understanding. | Inform product/service development and improve user satisfaction. | It was not selected due to its focus on product/service development rather than spatial design. |
| Service Blueprint | Gibbons (2017) | Blueprinting service processes to enhance service quality and customer experience. | A holistic view, customer-focused. | It can be complex and requires detailed mapping. | Improve service efficiency and enhance customer satisfaction. | Selected for integrated framework due to its comprehensive approach to integrating |

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| | | | | | | |
|---|--|--|---|--|--|---|
| | | | | | | service and spatial aspects. |
| User Experience Evaluation Framework | Dong & Liu (2017) | Framework for evaluating user experience across different touchpoints. | Comprehensive, user-centred. | It can be complex and requires extensive data. | Improve user satisfaction and enhance user experience. | It was not selected due to its narrow focus compared to more integrative tools like Service Blueprint and Customer Journey Map. |
| Spatial Walk-Throughs | Cobaleda-Cordero & Babapour Chafi (2021) | Simulated walkthroughs of spatial environments to evaluate design. | Realistic, user-centred evaluation. | It can be time-consuming and requires detailed models. | Validate spatial designs and enhance user experience. | It was not selected due to its overlap with the Spatial Service System Map, which integrates both spatial and service aspects. |
| Behavioural Observation Mapping | Popov, L. and Goza, F. (2016) | Mapping user behaviours in specific contexts. | Detailed user insights enhance user-centric design. | It requires extensive observation and can be time-consuming. | Inform design decisions and improve user satisfaction. | It was not selected due to redundancy with the AEIOU Observational Framework, which offers broader observational insights. |

The integration of tools from Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) represents an advancement in creating comprehensive frameworks that address user experience, programmatic requirements, and spatial qualities in the pre-design phase. This synthesis harnesses the strengths of each discipline to foster holistic design solutions that enhance functionality and user satisfaction across various environments.

Firstly, the Service Blueprint stands out as a foundational tool selected for integration due to its ability to map service processes alongside physical environments, facilitating a nuanced understanding of how spatial layouts can enhance service delivery and customer interactions (Amoozad Mahdiraji et al., 2023). Complementing this, Business Process Modelling Notation (BPMN) provides a standardised approach to modelling business processes, ensuring clarity and interoperability across teams involved in both service and spatial design projects.

Customer Journey Mapping further enriches the integrated framework by visualising user experiences across touchpoints. It guides design decisions prioritising user satisfaction and seamless interactions within designed spaces (Zhang & Pan, 2021). This tool is essential in bridging the gap between service delivery strategies and spatial configurations, ensuring alignment with user expectations throughout the design process.

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Additionally, the Spatial Service System Map is important in integrating spatial and service elements by mapping interactions between service processes and physical environments (Babapour Chafi & Cobaleda-Cordero, 2021). This tool enables designers to develop spatial layouts that enhance service delivery efficiency while improving user experience within designed environments.

The SUE Model (System et al.) was selected because it focuses on assessing usability and ensuring that design solutions are user-centred and effective (Julia-Nehme et al., 2023). This model's emphasis on usability complements the broader integrated approach by enhancing user satisfaction and ensuring that designs meet practical user needs.

Although several tools were not selected for integration due to overlaps or specific focuses, each contributes distinct advantages that could be valuable in particular contexts. Tools like the AEIOU Observational Framework offer comprehensive insights into user interactions and contexts, supporting a more detailed understanding of spatial and service dynamics (Fitzpatrick, 2018). Similarly, the Double Diamond framework, known for its iterative problem-solving approach, fosters creativity and structured exploration in designing solutions that address spatial and service challenges (van Geetson & Wilkinson, 2021).

In conclusion, the synthesis of these tools exemplifies a strategic approach to integrating BPD, SD, and ISD methodologies to create robust frameworks that optimise user experiences, streamline operational processes, and enhance spatial qualities. By leveraging these integrated tools, designers can navigate complexities inherent in modern design challenges, ultimately delivering environments that harmoniously blend functionality, spatial design, and user-centricity. This approach enhances the effectiveness of design solutions and underscores the transformative potential of interdisciplinary collaboration in shaping the future of spatial and service design practices.

5.6.1 Explanation for the Selected Tools in the Integrated Framework

1. Service Blueprint: This is essential for mapping out touchpoints and interactions in service design, making it invaluable for understanding and improving user experience within physical and service environments.
2. Business Process Modelling Notation (BPMN): A standardised method for mapping business processes ensures clarity and efficiency in the pre-design phase by aligning organisational workflows with spatial and service design needs.
3. Double Diamond is a structured, iterative model emphasising problem exploration and solution creation. It is ideal for developing comprehensive design solutions that address user and organisational needs.
4. Customer Journey Map: This visualisation of the user's experience identifies pain points and opportunities for improvement, which is critical for creating seamless and intuitive user experiences.
5. Spatial Service System Map: This map integrates spatial and service interactions, helping develop physical environments and service delivery and ensuring a holistic approach to design.
6. The SUE Model (Spatial User Experience) focuses on assessing usability aspects and enhancing user satisfaction by ensuring design solutions are user-centred and effective.

5.7 Significance of Integrated Design Practices

The findings underscore the transformative potential of integrated design practices in interior architecture. By synthesising insights from Business Process Design (BPD), Service Design

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(SD), and Interior Spatial Design (ISD), designers can create environments that meet functional requirements while engaging users emotionally. This holistic approach is critical in modern interior architecture, where user experience and operational efficiency are paramount.

5.7.1 Enhancing User Experience

The significance of integrated design practices lies in their ability to enhance user experience. Literature suggests that user-centric design approaches lead to higher satisfaction and engagement. For example, Lemon and Verhoef (2016) highlight the importance of user journey mapping in understanding and improving user interactions. This study corroborates this, showing that integrating user journey mapping from SD into ISD helps designers create more intuitive and satisfying spaces.

5.7.2 Operational Efficiency

Integrating BPD methodologies like process mapping and workflow optimisation into interior design can streamline operations and enhance efficiency. Trkman et al. (2015) and Yang and Qu (2016) emphasise the benefits of process optimisation in service delivery. When applied to spatial design, the findings indicate that these methodologies improve functionality and reduce redundancies, contributing to more efficient and effective interior environments.

5.7.3 Emotional Resonance

The emotional impact of spaces on users is an important aspect of design that integrated practices can address. Mace (2016) discusses the importance of sensory design in creating emotionally resonant spaces. The study found that integrating sensory design principles from ISD into BPD and SD frameworks results in functional and emotionally engaging environments, enhancing overall user experience.

5.7.4 Limitations and Challenges of Integrated Design Practices

Despite their benefits, integrated design practices face several limitations that must be addressed to realise their full potential.

5.7.5 Organisational Barriers

One significant limitation is organisational barriers. Integrated design practices require collaboration across various disciplines, which siloed organisational structures can hinder. Schönbeck, Ansell, and Löfsjögård (2021) discuss the challenges of interdisciplinary collaboration, highlighting the need for a cultural shift towards more collaborative working environments. The findings align with this, showing that overcoming organisational silos is crucial for successful integration.

5.7.6 Resistance to Change

Resistance to change is another major limitation. Implementing integrated design practices often requires changes in established workflows and mindsets. Dokter et al. (2023) and Salvioni and Almici (2020) highlight the resistance encountered when introducing new methodologies. The study found that addressing this resistance through stakeholder engagement and iterative design processes is essential to facilitate smooth transitions and acceptance of integrated practices.

5.7.7 Confronting Challenges to Unlock Potential

Confronting these challenges is essential to unlocking the full potential of integrated design practices. Strategies to address organisational barriers and resistance to change include:

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- Promoting Interdisciplinary Collaboration: Foster a culture that values diverse perspectives and encourages knowledge-sharing across disciplines. Training programmes and workshops can help build mutual understanding and respect among team members from different backgrounds, facilitating more effective collaboration.
- Engaging Stakeholders: Involve stakeholders early and often in the design process to ensure their needs and concerns are addressed, increasing buy-in and support for integrated practices. Ediae, Abeng, and Egbudom (2022) emphasise the importance of stakeholder engagement in driving successful design outcomes.
- Iterative Design Processes: Implement iterative design processes that allow for continuous feedback and improvement, helping to address resistance and refine solutions. Iterative design, as discussed by Wang (2014), enables designers to test concepts, gather user feedback, and make necessary adjustments, ensuring the final design meets both user needs and organisational goals.

5.8 Formation and Application of the Integrated Framework

The integrated framework for interior architecture has been developed to address the need for a comprehensive and user-centric approach to tackling complex design challenges. Traditional design methodologies often concentrate on individual elements of interior spaces (referring to specific aspects or components of a space that are considered in isolation rather than as part of a holistic whole), resulting in suboptimal outcomes that may overlook the interplay between functionality, spatial design, and user experience (Aliyu et al., 2016; Ashour & Rashdan, 2023; Babapour Chafi & Cobaleda-Cordero, 2021). This framework addresses these limitations by combining methodologies and tools from three distinct yet interrelated disciplines: Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD).

5.8.1 Conceptualising the Integrated Framework

To address these challenges, an integrated framework was developed that combines the efficiency-driven methodology of Business Process Design, the aesthetic and spatial concerns of Interior Spatial Design, and the user-centric focus of Service Design. The objective was to develop a cohesive strategy that promotes operational effectiveness and stakeholder satisfaction while improving interior environments' functional and emotional elements.

- Service Design (SD): Emphasises understanding and improving the user experience. Essential tools include user journey mapping, personas, and service blueprints (Gibbons, 2017; Musulin & Strahonja, 2023; Selloni & Meroni, 2023).
- Interior Spatial Design (ISD): Focuses on the space's spatial design and sensory experience. Essential tools include sensory mapping, mood boards, and spatial prototyping (De Rosa, 2022; Ediae et al., 2022; Lee, 2022).
- Business Process Design (BPD): This field optimises processes and workflows. Essential tools include process mapping, value stream mapping, and workflow optimisation (Hrabal, 2020; Pratama & Utama, 2019; Ryzhakova et al., 2023).

5.8.2 Developing the Integrated Framework

The integrated framework was developed through a systematic process involving the following steps:

- Literature Review: To identify effective methods, user experiences, innovative tools, and best practices in the three fields, a thorough analysis of previous research and case studies was conducted (Archer, 2019; Braun & Clarke, 2012).
- Framework Synthesis: The insights from the literature review were synthesised to create a framework. The fundamental concepts of each discipline were combined to

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create a cohesive strategy that addresses the complex subject of interior architecture (Grisold et al., 2021; Gustafsson et al., 2018).

5.9 Integrated Framework for Interior Architecture

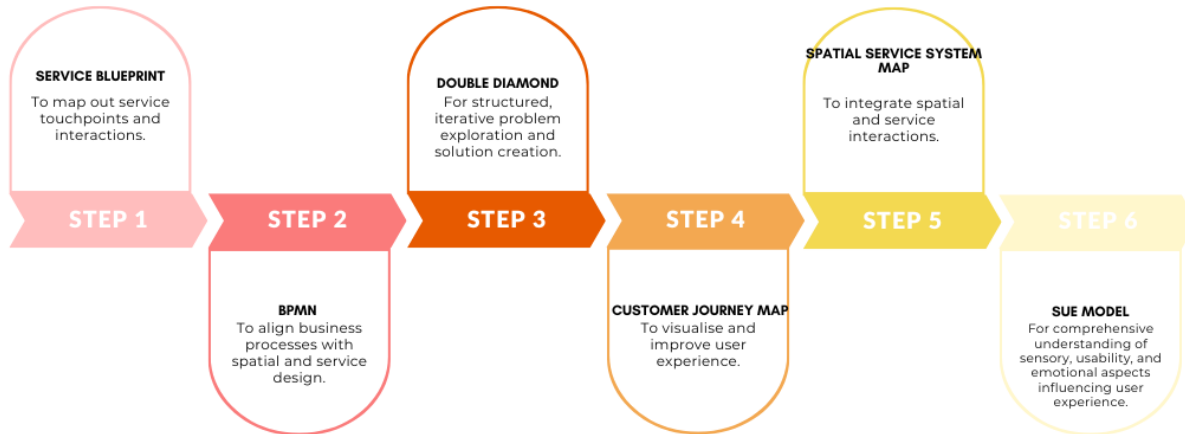


Figure 29: 6 step Integrated Framework (Author, 2024)

5.9.1 Step-by-Step Implementation

This integrated framework blends methodologies from Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) to create a comprehensive and user-centred approach to interior architecture projects. Each step utilises specific methods to enhance user experience, streamline processes, and ensure stakeholder engagement, even when direct interaction with users and stakeholders is not possible. Here is a detailed explanation of each step:

Step 1: Service Blueprint

Purpose: To map out service touchpoints and interactions.

Tools/Methods:

- Touchpoint Mapping: Identify and detail each point where users interact with the service, ensuring all critical interactions are accounted for.
- Service Blueprint Diagrams: Create visual representations outlining the user's journey through various service touchpoints, highlighting the connections and dependencies between service components.

Application: In a hotel, a service blueprint can map the entire guest experience, from booking to check-out, identifying areas for improvement such as reducing wait times at check-in or enhancing room service efficiency.

Step 2: BPMN (Business Process Model and Notation)

Purpose: To align business processes with spatial and service design.

Tools/Methods:

- Process Mapping: Visualise business processes to identify inefficiencies and areas for improvement.
- BPMN Diagrams: Use standardised graphical representations to ensure clear communication and understanding of business processes among stakeholders.

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Application: In a hospital, BPMN can help map the patient intake process, ensuring that spatial design supports efficient movement and reduces bottlenecks, improving patient flow and service delivery.

Step 3: Double Diamond

Purpose: For structured, iterative problem exploration and solution creation.

Tools/Methods:

- Divergent Thinking: Explore various potential solutions through brainstorming and research.
- Convergent Thinking: Narrow options to the most viable solutions through testing and refinement.
- Iterative Testing: Continuously test and refine ideas to ensure the final design meets user needs and expectations.

Application: In an office redesign, the Double Diamond framework guides the exploration of layout options, configuration testing with staff, and design refinements based on feedback and performance data, beginning in the pre-design phase.

Step 4: Customer Journey Map

Purpose: To visualise and improve user experience.

Tools/Methods:

- Personas: Develop detailed profiles of typical users to understand their needs, behaviours, and expectations.
- Journey Maps: Create visual representations of the user's interaction with the space over time, identifying key touchpoints and potential pain points.

Application: In a retail store, customer journey mapping in the pre-design phase helps identify opportunities to enhance the shopping experience. By analysing customer pathways and interactions, designers can enhance product placement for more straightforward navigation and strategically plan checkout areas to improve speed and convenience during the design process.

Step 5: Spatial Service System Map

Purpose: To integrate spatial and service interactions.

Tools/Methods:

- System Mapping: Create a comprehensive map that integrates spatial layout with service interactions to ensure cohesive user experiences.
- Interaction Points: Identify and optimise key interaction points within the space to enhance the user experience's functional and emotional aspects.

Application: In a museum, integrating a spatial service system map during the pre-design phase ensures that exhibition design is combined with visitor services. By strategically mapping out navigation routes and placing services like guided tours and information kiosks, designers enhance visitor flow and the overall museum experience.

Step 6: SUE Model (Spatial User Experience)

Purpose: To comprehensively understand the sensory, usability, and emotional aspects influencing user experience.

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Tools/Methods:

- **Sensory Analysis:** Assess how sensory elements (lighting, acoustics, materials) contribute to user experience.
- **Usability Testing:** Evaluate how easily users interact with the space and its features.
- **Emotional Response Assessment:** Understand how design elements evoke emotional responses and impact user satisfaction.

Application: In a public library, applying the SUE model during the pre-design phase facilitates the creation of spaces that excel in usability, sensory experience, and emotional impact. By systematically assessing how users interact with the environment (programme/ activities), how the physical space influences behaviour (place/ environment), and how different elements contribute to user satisfaction (Interactions, Objects, Users), designers can ensure that the library layout supports diverse activities effectively. This approach helps plan spaces that meet functional needs and enhance user engagement and satisfaction through thoughtful design.

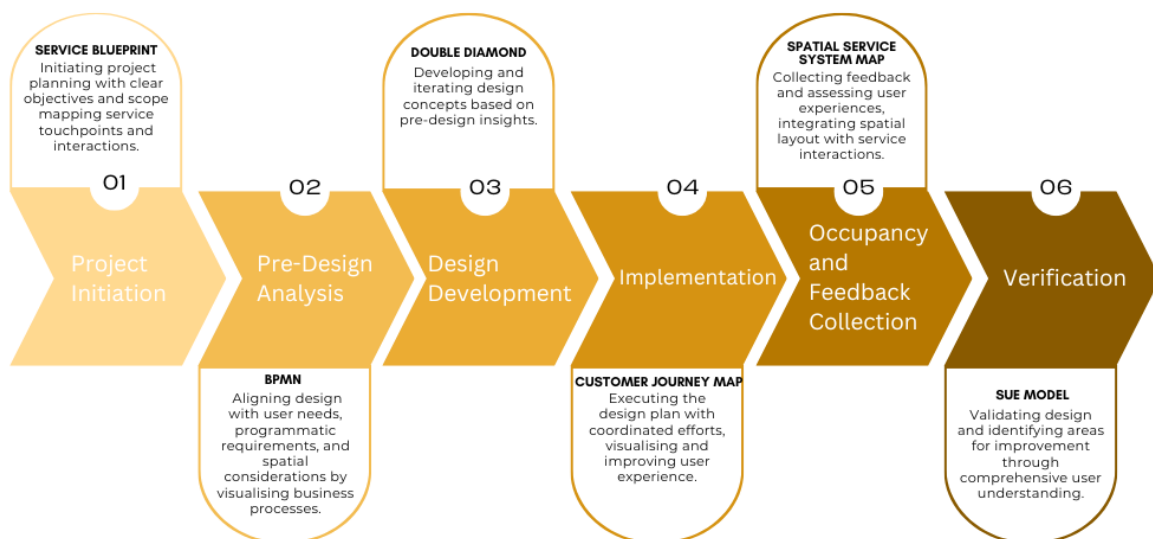


Figure 30: Combination of the project initiation to post-occupancy evaluation (fig 4) with the integrated framework (fig 28)

By integrating these methodologies, the framework supports a holistic approach to interior architecture projects, ensuring that design solutions are user-centred, operationally efficient, and aligned with stakeholder needs. This approach enhances the user experience and drives better project outcomes and stakeholder satisfaction. The integrated framework facilitates a cohesive process that addresses the complex interplay of spatial design, service delivery, and business operations, leading to more impactful and resonant design outcomes.

A visual representation has been developed to effectively communicate the integration of the research framework with the six-step flowchart for implementing integrated design tools in interior architectural design. This diagram illustrates how each step of the flowchart, from project initiation to post-occupancy evaluation, aligns with specific methodologies drawn from Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD). For instance, the Service Blueprint method supports steps like Project Initiation and mapping out service touchpoints and interactions. Pre-Design Analysis integrates BPMN (Business Process Model and Notation) to visualise business processes and align them with spatial and service design considerations. Design Development utilises the Double Diamond framework for iterative problem exploration and solution creation. Implementation incorporates tools from the

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Customer Journey Map to enhance user experiences during execution. The occupancy and Feedback Collection phase integrates Spatial Service System Maps to enhance spatial layout with service interactions. Lastly, Post-Occupancy Evaluation employs the AEIOU Observational Framework for comprehensive user understanding and design validation. This visual representation clarifies the sequential flow of design activities and highlights the approach's interdisciplinary nature, ensuring a user-centric and operationally efficient outcome in interior architectural projects.

5.10 Example Application of the Integrated Framework

Application example: Designing an Informal Food Vending Space at Menlyn Piazza

The integrated framework for designing an informal food vending space at Menlyn Piazza employs six key steps, each using specific tools to enhance user experience, streamline operations, and ensure stakeholder engagement without direct interaction, relying solely on observation:

1. **Service Blueprint:** This step maps out service touchpoints and interactions through observational data. Designers can ensure a seamless customer journey by identifying critical points such as where customers view menus, place orders, and collect food. Observations help optimise the placement of service counters and kiosks to enhance user flow and service efficiency.
2. **BPMN (Business Process Model and Notation):** BPMN aligns business processes with spatial and service design based on observed workflows. Process mapping identifies and eliminates inefficiencies in vendor operations. For example, by observing the distance food travels from preparation to delivery, designers can develop the layout to improve operational efficiency and reduce wait times.
3. **Double Diamond:** This structured, iterative process involves four phases: Discover, Define, Develop, and Deliver. Designers gather insights about user needs and operational challenges in the Discover phase through observation. The Define phase focuses on narrowing down these insights into specific design challenges. During the Develop phase, designers brainstorm and prototype multiple solutions. Finally, the best solutions are refined and implemented in the delivery phase, ensuring the design is innovative and practical.
4. **Customer Journey Map:** By creating personas and mapping their journey through the space based on observations, designers can visualise and improve user experience. Understanding how different user groups interact with the vending space helps identify opportunities for improvement, such as adding more seating areas for families or enhancing signage for better navigation and accessibility.
5. **Spatial Service System Map:** This tool integrates spatial layout with service interactions observed within the space. Mapping out how different service elements (e.g., seating, kiosks, trash bins) interact ensures a cohesive environment supporting customer convenience and operational efficiency. This ensures that the spatial design enhances the overall service experience.
6. **SUE Model (Spatial User Experience):** The SUE model assesses sensory, usability, and emotional aspects that influence user experience within spaces. By systematically evaluating sensory elements such as lighting and materials (Sensory), usability factors including ease of navigation and interaction (Usability), and emotional responses evoked by design features (Emotion), designers gain comprehensive insights. For example, understanding how lighting affects mood or how layout impacts ease of movement informs decisions on optimising spatial configurations to enhance user satisfaction, ergonomics and operational efficiency.

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By integrating these methodologies, the framework supports a holistic approach to designing the vending space at Menlyn Piazza. The process ensures the final design is user-centred, operationally efficient, and aligned with stakeholder needs. This approach enhances the user experience and drives better project outcomes and stakeholder satisfaction, creating a vibrant and functional food vending area.

5.11 Identification of potential avenues for further research

The research has laid the groundwork for exploring potential avenues and shortcomings within the integration landscape. Further investigation into these areas could pave the way for developing standardised frameworks tailored to the specific needs of interior architecture pre-design practices. Integrating business process design (BPD), service design (SD), and interior spatial design (ISD) approaches into cohesive and user-centric design solutions requires deeper inquiry (Salvioni & Almici, 2020).

To fully understand the holistic impact of integrated design techniques on project outcomes and user experiences, evaluating their performance in real-world projects and gathering stakeholder feedback is essential. Systematic evaluations can provide valuable insights into the benefits and challenges of implementing integrated approaches, thereby advancing knowledge and practice in integrated design (Ediae et al., 2022).

Future research could explore interdisciplinary collaboration and knowledge exchange avenues to enhance integrated design methods. By leveraging diverse expertise from business analysis, design, architecture, and end-user perspectives, design teams can develop comprehensive solutions that address complex challenges and opportunities more effectively (Schönbeck et al., 2021). This collaborative approach fosters alignment and consensus throughout the design process, promoting a shared understanding of project priorities and objectives.

Additionally, the iterative nature of integrated design processes and the critical role of prototyping and user testing must be delved into. By incorporating feedback from end-users and stakeholders at various design iterations, designers can validate assumptions, uncover latent needs, and refine designs to meet user expectations better (Dokter et al., 2023).

Examining case studies and best practices that demonstrate successful integration efforts can offer valuable insights into practical strategies for overcoming challenges and maximising the benefits of integrated design approaches. Analysis of real-world examples can illuminate key success factors, common pitfalls, and lessons learned, providing valuable guidance for future research and practice in integrated design (Selloni & Meroni, 2023). This ongoing exploration and documentation of integrated design experiences will contribute to the evolution and refinement of integrated design methodologies in interior architecture.

6. Conclusion

This study synthesised insights from Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) to address pre-design challenges in interior architecture. Through a thorough literature review and data analysis, the research identified critical methodologies and tools that contribute to a holistic understanding of spatial design processes, emphasising the synergy between functionality, aesthetics, and user experience. The integration of these disciplines showcased their collective potential to enhance design outcomes by aligning organisational goals with user-centric principles.

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The findings underscored the effectiveness of integrating tools such as process mapping, customer journey mapping, and spatial analysis in creating environments that develop operational efficiency while improving user satisfaction and overall experience. By leveraging these integrated methodologies, designers can navigate complexities inherent in modern interior architecture projects, ultimately delivering spaces that harmoniously blend functionality with user-centric design principles.

To thoroughly outline the body of research from a holistic perspective, this study uses the Integrative Literature Review (ILR) technique (Lubbe et al., 2020). To deepen and simplify the method, researchers like Lubbe et al. (2020) have modified the ILR process, which involves developing the research topic, choosing a sample, collecting and analysing data, and presenting conclusions. This study investigates the interdisciplinary fields of Business Process Design (BPD), Service Design (SD), and Interior Spatial Design (ISD) in the context of interior architecture using a structured five-step procedure. With careful organisation of the sampling, screening, and critical assessment procedures, this technique enables a thorough study and synthesis of intricate research fields, ensuring strong evidence and assisting in the creation of a pre-design phase framework.

This study focuses on improving the pre-design process by integrating interdisciplinary perspectives from BPD, SD, and ISD, addressing the gap between research and practice implementation within the spatial design field (De Rosa, 2022). The study aims to maximise programmatic requirements, spatial qualities, and user experience through complete framework development led by specific research questions and objectives (Girginkaya & Ergen, 2021; De Rosa, 2022). These disciplines must be integrated collectively to create environments that satisfy functional needs while establishing a connection with end users and providing a well-defined spatial framework.

The study integrates phenomenology and organisational theory from an interior architecture viewpoint to understand the impact of place and programme on user experience within architecture. It provides insightful information about physical environments' tangible and intangible effects on users (Starbuck, 2003; Chaitanakankul, 2023). Designers can develop environments that resonate with users on a more fundamental level, meeting their personal needs and social requirements and fostering a feeling of place, identity, and community by merging phenomenology and organisational theory (Starbuck, 2003). Using an interdisciplinary approach, environments are made to be emotionally and behaviourally impacting and functional, improving user satisfaction and operational efficiency in the programme and physical environments (Musulin & Strahonja, 2023; Samreen & Jha, 2024).

Six tools—Service Blueprint, BPMN, SUE Model, Double Diamond, Customer Journey Map, Service Blueprint and Value Chain—are particularly noteworthy among the tools identified for improving user experience in architectural design. These tools serve as the foundation of the proposed integrated framework. These methods meet strict requirements for enhancing user experiences in physical spaces and, when combined, offer a solid foundation for the framework's advancement. Their innovative combination defines distinct phases, arranges them chronologically, and emphasises critical elements for achieving the best possible user experiences in spatial design.

6.1 Recommendations

Building on the insights gained, several recommendations emerge to advance integrated design practices in interior architecture:

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Firstly, integrated frameworks that incorporate BPD, SD, and ISD methodologies should be developed and standardised to the benefit of all three these disciplines. These frameworks should be flexible enough to accommodate diverse project contexts and stakeholder requirements while ensuring consistency and effectiveness across different applications.

Secondly, promoting interdisciplinary collaboration among designers, architects, and stakeholders is important. Creating environments that foster knowledge-sharing and cross-disciplinary cooperation can enhance the integration of diverse perspectives, leading to more innovative and comprehensive design solutions.

Thirdly, enhancing stakeholder engagement throughout the design process is essential. By involving stakeholders early and continuously gathering feedback, designers can ensure that design solutions align closely with user needs and expectations, ultimately enhancing project success and stakeholder satisfaction.

It is recommended that empirical research are invested in to evaluate the long-term impacts and benefits of integrated design practices. Systematic evaluations can provide empirical evidence of the effectiveness of integrated approaches, informing future improvements and innovations in interior architecture.

Lastly, it is important to integrate employ design methodologies into educational curricula for future designers and architects. Comprehensive training on interdisciplinary collaboration and integrated design processes will prepare professionals to address complex challenges in interior architecture effectively and ethically.

Integrating BPD, SD, and ISD methodologies offers a promising avenue for advancing interior architecture practices. By synthesising insights from these disciplines, designers can create environments that meet functional requirements and resonate emotionally with users, fostering efficient, engaging, and enriching spaces. Continued research, collaboration, and education will be vital to realising the full potential of integrated design practices in shaping the future of interior architecture.

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Appendices

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|--|---------------------|
| Title of Article: | Publication: |
| Author(s): | Date: |
| Background What was the context for this research? What has been studied or determined already? | |
| Methods & Nature of this Study What was the objective? How did the author(s) collect data? When and where did the research take place? | |
| Results What highlights emerged? Were there any surprises? | |
| Data What is most striking about the tables, graphs, illustrations? Why did the author(s) include them? | |
| Conclusions What did the author(s) learn overall | |
| Next Steps What is implied or proposed for future study? | |
| Significance Why does this research matter? | |
| My Thoughts & Questions 1. How are they organising their ideas 2. What methods have they used to study the problem? 3. What theories have been used to explain, predict, or understand their research? 4. what sources have they cited to support their conclusions | |

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Appendix 1 critical appraisal tool: Note-Taking Template for Journal Articles (author, 2024)