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Research Article: The Role of Evidence-Based Design in Enhancing Architectural Design Process of Healthcare Buildings: A Case Study of General Hospitals in Sulaimani City

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Abstract

This study investigates the role of Evidence-Based Design (EBD) principles in decision-making and enhancement of the healthcare architectural design process. The investigation includes correlations between participants' prioritization of hospital design aspects such as circulation, accessibility, wayfinding, visibility, and privacy and their professional background, experience, and considerations in EBD. The research utilizes a mixed method in a systematic, multi-phased approach for data collection. This includes qualitative phone interviews, structured questionnaires, and interviews to gather subjective insights from architects working in three offices in Sulaimani City. Furthermore, the research incorporates case studies and spatial analysis using DepthMapX to obtain objective insights. The discrepancy between subjective perspectives and objective analysis prompts a deeper exploration of the practical implementation of evidence-based design (EBD) in healthcare architecture. The findings emphasize the importance of collaborative decision-making, the influence of online resources, and the preference for certain design aspects in inpatient unit layouts. These results shed light on areas of strength and potential improvement in healthcare facility design. Despite limited awareness of Evidence-Based Design (EBD), participants were willing to integrate evidence-based approaches in future projects, highlighting the need for increased awareness and formal evaluation criteria. The findings of this study contribute to a better understanding of the complex relationship between Evidence-Based Design (EBD) principles and decision-making processes in healthcare architectural design. Through combining subjective viewpoints and objective spatial analysis, the study provides a nuanced understanding of the EBD's role in shaping architectural design decisions and healthcare outcomes. These insights will help improve future healthcare architectural designs.

1. Introduction:

Healthcare architecture is a specialized field that demands careful consideration of design principles to create environments conducive to healing and well-being. Traditionally, architects heavily relied on intuition and past experiences to guide their design decisions [1] [2] [3] [4]. However, Evidence-based Design (EBD) stands at the forefront of revolutionizing healthcare architecture, prioritizing well-being through evidence-driven decision-making [5]. Evidence-based design (EBD) is formally characterized as "the process of basing decisions about the built environment on credible research to achieve the best possible outcomes" by the Center for Health Design (CHD) [6] and the work of D. Kirk Hamilton who outlines four levels of application for consideration by design professionals [7]. The CHD's website further specifies that an evidence-based design process involves an informed designer and client making decisions based on the best available information from research and project evaluations [6]. Unlike conventional building design, healthcare facilities demand a holistic approach, considering the intricate web of care delivery, patient flows, staff efficiency, and user types [8]. Navigating the complexities of healthcare architecture necessitates a profound understanding of the entire healthcare ecosystem [9]. Ten principles were established for better application of the EBD approach in the healthcare sector, emphasizing problem-solving, multidisciplinary approaches, a patient-centered focus, financial considerations, broad participation, quantitative criteria, strategic partnerships, simulation and testing, a lifecycle perspective, and effective communication [10]. In exploring EBD principles in healthcare architecture, the discussion delves into critical elements of layout configuration, impacting functionality, circulation, and aesthetics [11]. Layouts, represented through floor plans and configurations, shape the sequential experiences of occupants [12]. The complexity of spatial relationships within healthcare architecture is evident in nursing unit typologies, such as 'radial,' 'double-corridor,' and 'H-shaped,' as well as the placement of nursing stations, centralized or decentralized [13].

In pursuing the enhancement of healthcare architecture, evidence-based design (EBD) emerges as a preeminent approach, surpassing traditional methodologies [14][15]. This emphasis on evidence-driven decision-making empowers designers to prioritize well-being in healthcare, drawing support from diverse studies and organizational data [11]. Within the specialized domain of healthcare architecture, the design process unfolds as a multifaceted endeavour involving pre-planning, programming, schematic design, detailed design, and construction document production making [5]. Often led by architects, the traditional hospital design process encounters distinct challenges throughout each stage [13] [16]. Here, the integration of EBD proves invaluable, ensuring spaces are thoughtfully designed and conducive to well-being. This integration becomes crucial in addressing the dynamic challenges and complexities of the healthcare field [17], aligning with the quadruple aims of enhancing patient experience, improving population health, reducing costs, and enhancing staff work life [18] [19]. As the focus shifts towards integrating EBD into healthcare architecture, a systematic eight-step process unfolds, encompassing project scope definition, literature reviews, evidence gathering, stakeholder engagement, simulation, evidence-driven design concepts, post-occupancy evaluations, and ongoing learning [6].

The EBD's pivotal role in integrating research evidence into the design process is to enhance the built environment's influence on hospital occupants and organizational outcomes [16]. The crucial factors, such as lighting, noise control, and spatial layout, consistently demonstrate their significance in shaping patient well-being, comfort, and recovery. This involves incorporating natural features, ergonomic considerations, and accessibility features to promote patient engagement and empowerment. Integrating research evidence into design decisions emerges as a potent strategy, promising improved occupant outcomes and enhanced organizational efficiency and effectiveness in healthcare settings [19].

Moving beyond a comprehensive examination of healthcare facility design elements, the discussion naturally pivots to utilizing advanced tools, driven by the inherent challenges of describing and quantifying layouts [20][21]. In this pursuit, sophisticated tools, with Space Syntax at the forefront, become essential for nuanced analysis. Furthermore, the application of Space Syntax has further propelled the integration of EBD in healthcare architecture. Space Syntax offers a sophisticated method for analyzing spatial layouts and optimizing design interventions to enhance user experience and facility efficiency Its dual functionality enables quantitative data extraction and qualitative graphical analysis, ensuring a rigorous examination rooted in the internal structure of plans [22][12]. This emphasis on spatial configurations and nursing unit spatial flow through variables like visibility, accessibility, wayfinding, circulation, and privacy exemplifies a comprehensive approach to evidence-based design. This involves a meticulous examination of crucial design aspects, systematically deconstructing spatial qualities of these design aspects into measurable components and mapping to corresponding DepthmapX tool attributes, aligning with the core concepts of ‘ease of movement’ and ‘line of sight’ of

Evidence-Based Design (EBD), facilitating a deep dive into inherent spatial features [23].
Transitioning to the intricacies of healthcare facility design, the focus shifts to the configuration of inpatient units and their relation. This research examines vital elements such as visibility, accessibility, wayfinding, circulation, and privacy. These elements, derived from various research areas, form a cohesive framework guiding evidence-based design principles in healthcare settings. The significance of these design aspects in healthcare design is paramount and has been studied by many researchers [20][24].

1.2 Variables of Interest:

Transitioning to the intricacies of healthcare facility design, the focus shifts to the configuration of inpatient units and their relation [25]. This research examines vital elements such as visibility, accessibility, wayfinding, circulation, and privacy. These elements, derived from various research areas, form a cohesive framework guiding evidence-based design principles in healthcare settings. The significance of these design aspects in healthcare design is paramount and has been studied by many researchers [26][27][28][29]. These elements, informed by evidence-based design principles, contribute to creating healthcare environments prioritizing well-being, satisfaction, and positive outcomes for all occupants. [19]

Circulation:

A critical consideration in spatial planning, circulation determines the organization of a building's layout, focusing on efficient flow and strategic corridor placement. (EBD) principles and (CHD) guidelines guide circulation strategies, prioritizing direct and obstruction-free pathways to minimize bottlenecks, enhance operational efficiency, and facilitate smooth transitions. This approach improves functionality and fosters a seamless and intuitive environment, promoting a positive user experience within healthcare spaces [30] [31].

Accessibility:

In healthcare layout design, accessibility facilitates effortless movement for patients and staff, surpassing standard adherence. Rooted in architectural principles, this strategy involves meticulous planning for unobstructed pathways and swift access between crucial areas. Improved accessibility reduces patient falls, enhances satisfaction, and increases staff efficiency. (EBD) principles, particularly from (CHD) guidelines, guide the emphasis on unobstructed pathways and spatial clearance [31][32][23].

Wayfinding:

Efficient navigation within the complex hospital environment is essential for patients, visitors, and staff, emphasizing spatial orientation, decision-making, and information processing. Effective wayfinding design requires clarity, logical connections, and organized layouts, addressing individual cognition, preferences, and environmental factors. Strategies incorporate tools like space syntax analysis to gain insights into spatial layouts and architectural impacts on navigation experiences [33][34][35]

Visibility:

In healthcare facility design, visibility pertains to the extent of space visibility and the provision of visual information. It is crucial for patient safety and staff efficiency, influenced by layout configuration and space organization. Design strategies prioritize clear lines of sight, visual cues, and an inclusive environment [36][32]

Privacy: Privacy in healthcare design involves safeguarding personal space and information to ensure a patient-centered environment. Strategies include thoughtful room layout, spatial arrangements, and architectural elements that respect patient confidentiality. Design considerations extend to visual and acoustic privacy, balancing the need for patient autonomy with efficient healthcare delivery [16][37]

1.3 Research Objectives and Hypothesis:

In light of the emerging evidence-based design (EBD) as a critical paradigm in 21st-century healthcare design, significantly influencing the architectural design process and leading to modifications and new configurations in hospital architecture, this study aims to explore which distance the integrating EBD principles to the healthcare architectural design process influences decision-making and ultimately impact the healthcare architecture outcome; the design of inpatient unit layouts in healthcare facilities through a comprehensive analysis of the design aspects of the layout configuration; visibility, accessibility, wayfinding, circulation, and privacy.

The central hypothesis suggests that integrating and applying Evidence-Based Design (EBD) principles may enhance the overall design process of healthcare architecture, leading to improvements in the outcomes of hospital facility design and informing design decisions.

2. Datasets and Methods:

This study utilized a mixed-methods approach by integrating qualitative and quantitative methods, including diverse data collection techniques such as questionnaires, space syntax analysis using DepthmapX software, semi-structured interviews, and case studies of hospital projects. This concurrent approach acknowledges the multidimensional nature of the topic and enhances the validity and reliability of the findings through triangulation of data sources Merging the strengths of qualitative richness and quantitative precision, the study method provides a holistic understanding of the relationship between evidence-based design practices and the design process [38][39][40].

2.1. Quantitative approach:

The quantitative approach enables an objective exploration of the research aim and hypothesis through measurement and quantification of variables, gathering data in a numerical form for analysis, and facilitating data collection [39][40].

2.1.1. Questionnaire Survey:

The first tool is the questionnaire that gathers numerical data on aspects related to evidence-based design practices and the design process in hospital projects, aiming to yield statistically analyzable insights. The questionnaire in this study encompasses five sections. The first section addresses the participants' demographic information, such as (Age, Gender, Years of experience, and educational attainment). In the second section, participants were asked about their familiarity with EBD (familiarity with evidence-based design (EBD) principles, Implementation of EBD principles). Sections third and fourth of the questionnaire consist of questions regarding their preferred decision-making approach and the significance of factors in ensuring the success of hospital layout designs. In the final section, participants rate the importance of various factors when evaluating the impact and success of hospital projects on a scale from 1 (Least Important) to 5 (Very Important).

2.1.2. Utilization of DepthMapX Tools:

Additionally, the space syntax methodology supplements this approach by extracting numerical data from samples and case studies from the (DepthmapX 0.8) software, expanding quantitative analysis and enriching understanding of spatial relationships within the targeted area. The attributes offered by DepthmapX are categorized into global metrics and localized data, providing a comprehensive overview and detailed insights into the layout, respectively. The global metrics, including connectivity integration, angular mean depth, metric mean shortest path angle, and metric mean shortest path distance, contribute to a general assessment supported by visual graphics. On the other hand, attributes such as angular step depth, metric step shortest path angle, metric mean shortest path length, and visual step depth offer focused, localized data centered around reference points. This dual approach facilitates a broad evaluation and a detailed analysis, ensuring a thorough examination of the layout's effectiveness as assigned to the variables shown in the Table (1).[41][21][43].
The DepthmapX tools offer a comprehensive analysis of spatial attributes through graphical representations, employing a visually informative color-coded system to represent the results of its spatial analyses. Warm colors such as red, orange, and yellow signify heightened values, indicating a more robust presence or intensity of the measured characteristic. At the same time, cooler tones like blue and green denote lower values, suggesting a weaker presence. Smooth color gradients between extremes provide nuanced insights [43]. Regarding connectivity and visual integration, high values in red indicate seamless interaction and strong visual connections, whereas low values in blue suggest barriers and fragmented layouts. Regarding Angular Mean Depth and Visual Step Depth, high values in red indicate deeper engagement and complex visual routes, while low values in blue suggest simpler navigation and direct visual connections. Similarly, Metric Mean Shortest-Path Angle and Metric Step Shortest-Path Angle showcase high values in red, signifying complex paths and potential disorientation, contrasted with low

values in blue, indicating more accessible wayfinding and efficient navigation. Finally, Metric Mean Shortest-Path Distance and Metric Step Shortest-Path Length reveal high values in red, implying reduced visual accessibility and longer distances. In contrast, low values in blue suggest better accessibility and more direct navigation routes [44].

(Table1 Mapping DepthMapX Attributes to Design Aspects)

	Attribute and Description
Circulation	**Connectivity:** Measure of overall connectedness of spaces within the layout. Provides insights about the ease of movement within the space.
	Visual Integration: Assesses visual interconnectedness of spaces for overall accessibility. Quantifies visual accessibility for navigation. Reflects how easily a point can be reached visually from other points.
	Angular Mean Depth: Measures average angular distance from a point to all other points, indicating spatial integration.
	Metric Mean Shortest Path Angle (MMSPA): Measures cumulative angular deviation and straight-line distance. Higher values suggest a complex path, potential disorientation, and navigation challenges.
	Metric Mean Shortest Path Distance (MMSPD): Averages edges required to reach points. Higher values indicate reduced visual accessibility or longer distances; lower values suggest better visual accessibility or shorter distances.
Accessibility	**Metric Step Shortest-Path Angle (MSSPA):** Analyzes local path complexity for enhanced accessibility.
	Metric Step Shortest-Path Length (MSSPL): Provides insights into cumulative physical distance covered during spatial navigation.
Wayfinding	**Angular Step Depth (ASD):** Explores intricacies of visual pathways for effective wayfinding.
	Visual Step Depth (VSD): Quantifies the number of directional changes needed to reach any location, providing insights into visual complexity and the maritime experience.
Visibility	**Visual Step Depth (VSD):** Quantifies visual complexity for effective patient monitoring.
	Isovist: Provides a panoramic view, contributing to enhanced visibility.
Privacy	**Visual Integration:** Analyzes appropriate visual connections to maintain privacy.
	Isovist: Provides insights into potential privacy concerns.

2.2. Qualitative approach:

Qualitative methods involve interpretive approaches to deeply explore subjective aspects of a research topic, focusing on understanding human behavior, experiences, and perceptions [39]. This study uses qualitative methods, including open-ended interviews and detailed analysis of textual or graphical data, to provide a rich understanding of the topic. Through semi-structured and phone call interviews to understand the familiarity of EBD among a broader population and interviews with individuals involved in hospital projects, subjective experiences and detailed insights are captured. These methods uncover contextual information not easily quantified, enhancing understanding of qualitative dimensions and allowing for deeper exploration of complexities.

2.3 Population and Sampling:

This study focuses on consultancy architectural design offices in Sulaimani City that designed general hospitals with inpatient units between 2011 and 2022. From an initial pool of 124 registered architectural offices, a rigorous filtration process based on operational status yielded a target population of 57 consultancy architectural offices. All 57 identified consultancy offices in Sulaymaniyah City were surveyed via phone interviews to assess their familiarity with Evidence-Based Design (EBD), recent hospital design experiences, and willingness to participate. Following applying filtering criteria to identify relevant expertise, three offices were retained, all agreeing to participate fully, thus encompassing 100% of the population. This ensured a focused and comprehensive analysis of decision-making processes in healthcare architectural design, emphasizing recent hospital projects, specifically focusing on the inpatient unit layouts, which serve as the basis for three hospital inpatient unit case studies.

2.4 Case Studies:

This study undertook a meticulous selection process, focusing on recent hospital projects contributed by participating offices for a comprehensive analysis, explicitly emphasizing the inpatient unit. The selected inpatient unit layouts were treated as distinct cases, allowing for an in-depth examination of their unique design characteristics and architectural features Table (2).

Table 2 Key Attributes Across Three Hospital Case Studies: Inpatient Unit Characteristics

Category	**Case Study One**	**Case Study Two**	**Case Study Three**
Office Name	Office One	Office Two	Office Three
Year	2022	2022	2022
Floors	6 Floors	11 Floors	3 Floors
Status of Project	Accepted Proposal	Accepted Proposal	Accepted Proposal
Ownership	Private	Private	Private
Inpatient Unit Typology	Courtyard/U Shape	Racetrack	Linear
Nurse Station Distribution	Multi-hub – 2 Nurse Stations	Centralized – 1 Nurse Station	Multi-hub – 2 Nurse Stations
Patient Room Number	87 (83 Single Rooms, 4 VIP Rooms)	25	15
Patient Rooms Analyzed	29	14	15

Case Study One (Office One): The inpatient unit adopts a courtyard typology with mirrored layouts, creating two identical courtyards. It features a U-shaped design with a single corridor, nurse stations at four main hubs, and a distinct reception area. Patient rooms, including VIP rooms, have varying configurations. One section with the most repeated room type is being investigated for the research scope.

Case Study Two (Office Two): This case employs a racetrack typology with a centralized nurse station and corridors circulating the nurse station. There's no distinction between the nurse station and nurse reception. Patient rooms are positioned in the layout's circumference, with 4 VIP rooms. Despite uniform configurations, minimal variations arise due to design and structural features.

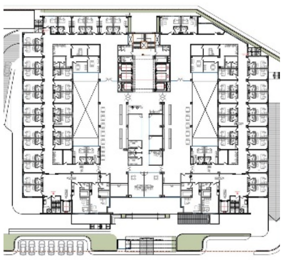
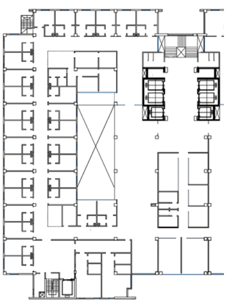
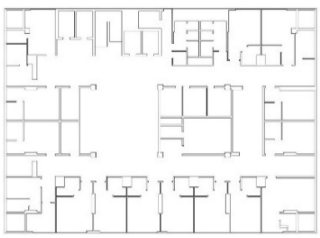
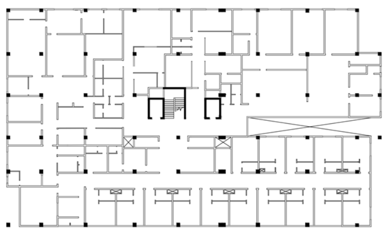
Case Study Three (Office Three): The inpatient unit follows a linear typology integrated into the overall hospital layout alongside the surgical unit and ICU. Patient rooms are arranged on either side of the corridor in a uniform configuration; minimal variations arise due to structural features.

Case studies described below; see Table (3

2.5 Data Gathering Process:

The research process unfolds in a systematic and multi-phased approach, designed to gather qualitative and quantitative data and analyze the intricate factors influencing decision-making in healthcare architectural design. In the initial phase, architects and designers in Sulaymaniyah City underwent phone interviews to evaluate

Table 3- Inpatient Unit Floor Plan of the Cases and Prepared Layout for Analysis

Case One	**Case Two**	**Case Three**
		
Plans Prepared for the DepthmapX software		
		

their familiarity with Evidence-Based Design (EBD), recent experiences in hospital design, and their willingness to participate in the research. Following the phone interviews, a meticulously crafted structured questionnaire was administered to the selected architects and designers. The next phase involved carefully selecting recent hospital projects from participating offices for in-depth case study analysis, particularly the inpatient unit. The chosen inpatient unit layouts were treated as individual cases, setting the stage for applying quantitative methodologies in the following phase. In the fourth phase of the process, an integrated approach of the Space Syntax methodology with the DepthMapX software analysis will be used to evaluate crucial design aspects in inpatient unit layouts comprehensively Figure (1). The analysis meticulously examines circulation, accessibility, wayfinding, visibility, and privacy through the software's framework, leveraging the fundamental concepts of "Flow of Movement" and "Line of Sight." This comprehensive methodology is applied to the three carefully selected inpatient unit designs produced by consultancy architectural offices in Sulaymaniyah City. AutoCAD plans are modified and rescaled for subsequent spatial structure and configuration analysis within DepthMapX. This holistic approach aims to provide a nuanced understanding of inpatient unit layouts, considering their spatial structure and configuration, ultimately informing future design decisions. During the final phase, the data generated from the previous phases was subjected to rigorous statistical analysis to identify significant relationships and patterns among the variables of interest and decision-making process and the role of EBD in the architectural design process.

2.6 Statistical Analysis:

This phase aims to identify significant relationships and patterns within the data collected from the architects of the offices and their designs, the hospital inpatient unit as case studies through questionnaires, interviews, and the DepthmapX software. To achieve this, various statistical methods will be employed using SPSS and Excel. Descriptive statistics, including means, standard deviations, and frequencies, will be calculated for all variables to provide an initial overview of the data distribution and identify potential outliers. Subsequently, various inferential analyses, including One-way ANOVA and Chi-Square Test of Independence, were conducted.

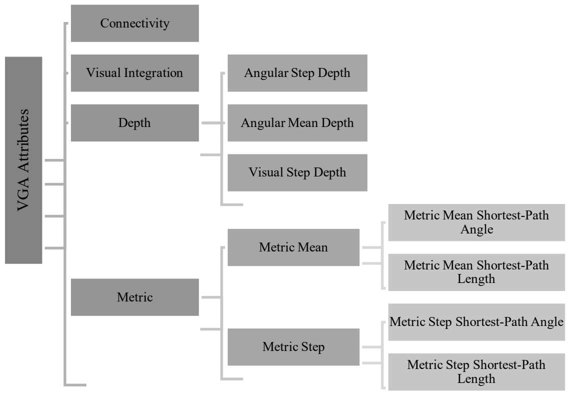


Figure 1- Utilized VGA Attributes for the Analysis of the Reference Points

3. Findings Analysis, Interpretation and Discussion:

After conducting phone surveys to identify suitable offices for further analysis, it was found that only three out of 57 offices met the criteria and expressed interest in participating.

3.1 Questionnaire Survey:

Based on the demographic data, it can be inferred that the participants of the study, who are mainly architects and designers, have diverse backgrounds. 64% of them have 6-10 years of experience. Their educational qualifications vary, with 82% holding a Bachelor's degree, 9% a Master's degree, and 9% a Doctoral degree. The participants have been actively involved in various projects, focusing on residential design (100%) and healthcare facilities (73%) Figure (2).

The (EBD) section results indicate a knowledge gap, with only one somewhat familiar respondent. Commonly employed strategies include collaborative design (73%), benchmarking (64%), and user-centered methods (55%), while formal EBD research during programming is limited (18%) Figure (3). There's a consistent focus on lighting and privacy, with variable attention to other elements like wayfinding, materials, flexibility/adaptability, and patient and family-centered design.

In the Decision-Making Section, preferences for decision-making show that the majority (72.7%) prefer team-based decision-making, and (27.3% combination) individual decision-making was not an approach by any participant Figure (4).

Regarding the influences on decision-making, online resources, especially non-academic ones, are heavily relied upon (100%) for industry updates. The evaluation of influences on architectural decision-making revealed distinct patterns. Collaborative brainstorming sessions, information from online platforms, and considerations based on feedback from project stakeholders and the physical site shared high consideration percentages at 78%, 100%, and 92%, respectively. Financial considerations received substantial attention, with 83% consideration. Conversely, factors like adherence to codes, technical feasibility, structural integrity, and a focus on energy efficiency and sustainability were less considered, each receiving 28%. These results highlight the prevalence of collaborative and stakeholder-driven inputs, underscoring their pivotal role in shaping architectural decisions Figure (5).

In the "Approaches and Considerations in Hospital Design," The assessment of crucial factors in architectural decision-making revealed varying degrees of importance, as reflected in average ratings on a scale of 1 to 10. Stakeholder Engagement and Feedback emerged as the highest-rated aspect, garnering an average score of 8.09. Other notable considerations include Space Utilization, with an average rating of 7.64, and Cost-Effectiveness at 7.73. On the lower end, Regulatory Compliance and Guidelines received a rating of 4.55, as shown in Figure (6), showing the average among all three offices. These results provide insights into the prioritization of factors, with a strong emphasis on stakeholder engagement and a balanced consideration of efficiency, space utilization, and cost-effectiveness in the decision-making process.

The mean ratings for key factors across three offices are as follows: Patient-Centered Experience ranged from 4.75 to 7; Staff Collaboration and Efficiency varied between 6.25 and 7; Space Utilization showed consistency, ranging from 7.5 to 8; Regulatory Compliance and Guidelines ranged from 4.25 to 4.75; Modern Design and Aesthetics varied between 5.75 and 6; Cost-Effectiveness showed minimal variation, ranging from 7.67 to 7.75; Stakeholder Engagement and Feedback ranged from 8 to 8. 3; and Healing Environment varied from 5.5 to 7.25. These results highlight certain factors where offices share similar perspectives and others with notable variations in their ratings Figure (6).

The next inquiry within the Approaches and Considerations in Hospital Design section is the evaluation of the design aspects of inpatient unit layout regarding visibility, accessibility, circulation, wayfinding, and visual privacy Figure (7).

In the final project assessment, criteria for hospital design success were rated as follows: Patient satisfaction and positive feedback at 4.09, efficient workflow and operational efficiency at 4.55, providing a healing environment at 3.73, effective use of space and functional layout at 4.09, integration of technology and innovative solutions at 2.82, compliance with safety and regulatory standards at 3.27, sustainability and environmental considerations at 3.18, with an overall rating of 3.18. These numerical results highlight varying degrees of emphasis on different factors, shedding light on the multifaceted nature of successful hospital projects Figure (8).

3.1.1 One-way ANOVA:

To examine whether there were significant differences in mean ratings of design aspects (visibility, accessibility, circulation, wayfinding, privacy) among the three offices, a one-way ANOVA was conducted. The results revealed no statistically significant overall difference among the offices regarding mean design aspect ratings, $F(2, 40) = 0.74$, $p = 0.513$. This suggests that, based on the available data, the perceived importance of these design aspects does not vary significantly across the three offices Table (4).

Table 4- One-way ANOVA results

Source of Variation	The sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-statistic	p-value
Between Groups	1.56	2	0.78	0.74	0.513
Within Groups	8.4	40	0.21		
Total	9.96	42			

3.1.2 Exploring Associations Between Participants' Design Aspect Ratings and Demographic Factors:

The Chi-square Test of Independence was employed to assess the relationship between different demographic factors The Chi-square Test of Independence was employed to evaluate the relationship between different demographic factors and participants' ratings of design aspects (Visibility, Accessibility, Circulation, Wayfinding, and Privacy) on a scale from 1 to 5. The following significant associations were identified: (Education Facilities: chi-square (4.78), p = 0.093), (Workplace Design: chi-square (4.950), p = 0.084), (Role in Design Process: chi-square (5.598), p = 0.061). Conversely, no significant associations were observed between design aspect ratings and Years of Experience (chi-square = 6.286, p = 0.179), Level of Education (chi-square = 3.056, p = 0.549), or Healthcare Facilities (chi-square = 3.438, p = 0.179) Table (5).

Table 5- Chi-Square Test of Independence Results Between Participants' Design Aspect Ratings and Demographic Factors

Demographic Factor	Design Aspect Ratings (p-value)	Significant Association
Education Facilities	chi-square (4.78), p = 0.093	Yes
Workplace Design	chi-square (4.950), p = 0.084	Yes
Role in Design Process	chi-square (5.598), p = 0.061	Yes
Years of Experience	chi-square (6.286), p = 0.179	No
Level of Education	chi-square (3.056), p = 0.549	No
Healthcare Facilities	chi-square (3.438), p = 0.179	No

3.2 DepthmapX Software Data and Graphical Results:

- **Circulation:**

This analysis explores five crucial attributes: Connectivity, Visual Integration, Angular Mean Depth, Shortest-Path Angle, and Shortest-Path Distance. The goal is to evaluate three distinct layouts' spatial dynamics and potential user experience. Notably, all five attributes in each case demonstrate average values closer to their respective minimums, indicating a layout that tends toward specific distinct characteristics. However, the results reveal variations among the attributes of the layouts in different cases. It is essential to note that while they are referred to for better understanding, the primary focus of this study is not the direct comparison of these layouts Table (6).

After analyzing the circulation attributes of the three cases, we noticed different spatial dynamics in each layout, with distinct strengths and weaknesses. Case Two balances efficiency and engagement, but Cases One and Three present challenges such as fragmentation and limited connectivity. Although circulation can be efficient in some instances, there are significant opportunities for improvement across the sampled population.

- **Accessibility:**

Accessibility, crucial for user navigation, is evaluated through Metric Step Shortest-Path Angle (MSSPA) and Metric Step Shortest-Path Length (MSSPL). These metrics provide insights into local path complexity and cumulative physical distance, offering a concise overview of navigational ease within the layout.

Despite the varying degrees of efficiency observed across the three cases, it is evident that achieving optimal accessibility in healthcare environments remains a multifaceted endeavor. While Case Two demonstrates higher efficiency with generally lower angles and shorter, more direct routes, Cases One and Three highlight complexities and potential hurdles. These findings underscore the importance of tailored interventions to address the diverse needs of users and optimize accessibility within healthcare settings, numerical results showon in Table (9).

- **Wayfinding:**

Wayfinding effectiveness is assessed using Angular Step Depth (ASD) and Visual Step Depth (VSD) shown in Table (8). These metrics quantify visual pathway intricacies and directional changes required for navigation, providing succinct insights into wayfinding efficiency. In this analysis, priority is given to the reference points rather than the patient rooms due to their critical role in guiding wayfinding within the healthcare facility. Highlighting key reference points such as the Entry, Nurse Reception, Corridor, and Nurse Station serve as pivotal navigation landmarks, providing essential orientation cues for patients and staff

The analysis of various cases indicates a mixed result regarding wayfinding. While some areas have efficient paths, others need improvement. Despite the Corridor being easy to navigate with its straightforward paths and clear visibility, the overall analysis raises concern about hard wayfinding being the dominant theme across cases. Entry areas and many Nurse Stations have intricate layouts, complex movement paths, and obscured views, as indicated by high Angular Step Depth (ASD) and Visual Step Depth (VSD) values. This lack of clarity in crucial zones like entry points and patient care areas calls for targeted interventions such as improved signage, layout adjustments, and strategic visual cues to enhance spatial awareness and optimize wayfinding for both patients and staff. Such interventions will ultimately lead to a more efficient and stress-free healthcare experience.

- **Visibility:**

The analysis of Isovist exposes the visibility dynamics crucial for the interaction between nurses and patients, and spatial management across three different cases. In Case One, there seem to be some communication and supervision obstacles in the Entry and Nurse Reception areas, with an overall average visibility score of 18.4%. However, the average visibility from Nurse Stations and Corridor viewpoints is higher at 28.5%. In Case Two, the visibility levels are more balanced, with an average score of 55.4% and visibility of 61.8% from Nurse Stations and Corridor viewpoints. In Case Three, although the visibility score is moderate at 41.2%, the visibility from Nurse Stations and Corridor viewpoints is relatively higher at 63.9%. These findings highlight the significance of optimizing spatial design, as shown in Table (10). The analysis of Visual Step Depth further reveals spatial complexities, with Case One exhibiting higher values (Entry: 5.21, Nurse Reception: 4.90), Case Two demonstrating lower values (Entry: 2.43, Nurse Reception: 2.64), while Case Three falls in between (Entry: 4, Nurse Reception: 3.87). These findings emphasize the need for further investigation and potential design enhancements Table (8).

The analysis reveals that each case has its challenges and strengths, highlighting the crucial role of spatial design in improving visibility. It is essential to enhance oversight from Nurse Stations' and Corridor's viewpoints to improve patient care and staff efficiency. Although the average visibility from these viewpoints is above 60% across cases, individual areas present a mixed picture, indicating the need for improvement. The entry and certain Nurse Reception areas tend to hinder communication and supervision due to obscured views or complex layouts, leading to lower visibility scores. Case Two shows a moderate overall visibility score of 55.4%, while Case One presents the most challenges with an average score of 18.4%. The Visual Step Depth analysis reinforces these findings, highlighting intricate pathways and navigation difficulties, particularly in Case One. Implementing strategic design interventions to optimize visibility, especially around entry points and patient care areas, is necessary to enhance communication, supervision, and overall patient care efficiency. As a result, the theme of uneven visibility across cases needs to be emphasized.

- **Privacy:**

The inpatient unit's privacy assessment is done using Visual Integration and Isovist metrics. These metrics evaluate the visual connections and potential privacy concerns within the layout, providing concise insights into privacy maintenance and spatial design considerations. The study prioritizes safeguarding patient room privacy using the Isovist property and line of sight concepts. The privacy assessment analyzes reference points and identifies additional points based on visual and numerical values extracted from the Visual Integration attribute to pinpoint areas prone to privacy breaches. Using a line-of-

sight concept, the evaluation assesses privacy levels in patient rooms on a scale, with 1 indicating complete visual privacy, 0 indicating no visual privacy, and 0.5 implying potential privacy concerns. This process determines the percentage of maintained privacy, providing a comprehensive understanding.
The analysis of privacy metrics across all cases indicates that privacy within the inpatient unit layouts has been efficiently achieved, with values exceeding the 85% threshold. The findings show that each case demonstrates varying privacy levels, with overall percentages ranging from 79.6% to 93% Table (10). The emphasis on spatial design, particularly Isovist analysis and line-of-sight concepts, has effectively safeguarded patient room privacy. The high privacy percentages demonstrate the success of the layout designs in mitigating potential privacy breaches and ensuring patient confidentiality. This indicates a successful implementation of privacy-enhancing strategies within the inpatient unit layouts, ultimately contributing to a conducive environment for patient care and well-being.

Finally, the analysis conducted by DepthMapX on the designed layouts provides a detailed view of how healthcare architectural decisions should prioritize design aspects. The results indicate that privacy is an important aspect, with patient rooms consistently exhibiting high visual privacy. This is in line with the designers' commitment to prioritizing and successfully achieving enhanced privacy within the inpatient unit, as demonstrated by the high average rating for privacy obtained from the questionnaires. The congruence between the software results and questionnaire responses highlights the strength of the empirical findings and their resonance with industry professionals' perspectives. However, a discrepancy arises in the attention given to visibility, where the questionnaire responses suggest a higher emphasis than the software outcomes indicate. This prompts reflection on the design process and potential areas where human intuition may differ from software-generated insights. Voicing this out, adherence to many evidence-based design strategies could achieve more desirable results for healthcare outcomes, such as the evidence of "Direct and visual sightline from corridors/decentralized nursing station to see patients head (Harvey & Pati, 2012; Pati, Cason, Harvey, & Evans, 2010; Seo, Choi, & Zimring, 2011)" from the CHD Tools. The principles of Evidence-Based Design (EBD) suggest a balanced approach. However, regarding decision-making processes, the data shows a singular focus on privacy. This could mean that other important considerations, such as circulation and accessibility, are being overlooked. The software outcomes also suggest a lack of prioritization for these critical aspects, which can lead to operational obstacles and challenges in wayfinding. These findings highlight the need for further integrating EBD strategies into healthcare design to ensure a comprehensive and balanced approach.

4. Conclusion:

The study focuses on the relationship between Evidence-Based Design (EBD) principles, decision-making processes, and healthcare outcomes in architectural design. To explore how architects and designers approach design decisions and prioritize vital aspects such as circulation, accessibility, wayfinding, visibility, and privacy, a mixed methodology has used qualitative interviews, structured questionnaires, case studies, and spatial analysis using DepthMapX. The study revealed a significant need for more awareness of EBD principles among the surveyed architects, highlighting a crucial knowledge gap within the architectural community in the study region. However, despite this initial lack of awareness, a prevailing preference for collaborative decision-making has been identified, emphasizing the influence of financial considerations. This suggests that architects may unknowingly integrate EBD principles into their decision-making processes.
The results obtained from DepthMapX provide significant insights into the decision-making patterns in healthcare architectural design. These results showcase a strong emphasis on privacy while highlighting potential gaps in realizing EBD (Evidence-Based Design) principles. These findings contribute to the ongoing discourse on enhancing evidence-driven designs in healthcare architecture. Statistical tests, including One-way ANOVA and Chi-Square, indicate that perceptions among architectural offices are generally harmonized and associated with

demographic factors. The study emphasizes the dynamic nature of decision-making processes involved in EBD principles that enhance the architectural design process. Cultural factors impact decision-making regarding the layout of hospital inpatient units. The preferences and priorities in hospital design are shaped by cultural considerations, which explains the focus on privacy in the results. This cultural aspect makes it more complex to implement EBD principles, indicating the requirement for a more refined approach that considers cultural factors during the design process.

Although architects may only sometimes be aware of the importance of Evidence-Based Design (EBD), a recent study has provided valuable insights into their decision-making processes regarding inpatient unit layouts. This research has highlighted some areas of strength and potential enhancements in the architectural design process. It also emphasizes the need for greater awareness of EBD and the benefits of integrating evidence-based practices in shaping successful architectural outcomes. Architects can enhance healthcare outcomes by considering cultural factors more nuancedly. Combining subjective viewpoints with objective spatial analysis enriches our understanding of architects' decisions. Overall, this study contributes to the discussion on the role of EBD in healthcare architectural design and provides a foundation for future advancements and improvements.

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دور التصميم المستند على الأدلة في تعزيز عملية التصميم المعماري للمباني الصحية: دراسة حالة للمستشفيات العامة في مدينة السليمانية

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المستخلص

هذه الدراسة تحقق دور مبادئ التصميم المستند على الادلة (EBD)في صنع القرار وتعزيز عملية تصميم العمارة الصحية .كما ان هذا التحقيق يشتمل التحقيق على الارتباطات بين أولويات المشاركين لمجالات تصميم المستشفى مثل التداول وإمكانية الوصول وتوجيه المسار والرؤية والخصوصية وخلفية عملهم وخبرتهم واعتباراتهم في التصميم المستند إلى ألادلة، منهجية البحث تكمن فى استخدام طريقة مختلطة في مقاربة منهجية متعددة المراحل لجمع البيانات منها ذلك المقابالات الهاتفية النوعية واالستبيانات الهيكلية والمقابالات لجمع رؤية ذاتية من المهندسين المعماريين الذين يعملون في ثلاثة مكاتب بمدينة السليمانية. علاوة على ذلك ، يدمج البحث دراسات حالة وتحليل مكاني باستخدام DepthMapX للحصول على رؤية موضوعية. يدفع التباين بين وجهات النظر الذاتية والتحليل الموضوعي إلى استكشاف أعمق للتطبيق العملي للتصميم المستند على الادلة (EBD) في العمارة الصحية.ان نتائج هذا البحث تؤكد على أهمية اتخاذ القرار التعاوني وتأثير الموارد اإللكترونية وتفضيل جوانب تصميم معينة في تخطيط وحدات المرضى الداخليين. تلقي هذه النتائج الضوء على مجاالت القوة والتحسين المحتمل في تصميم مرافق الرعاية الصحية. على الرغم من الوعي المحدود بالتصميم المستند على الادلة(EBD) ، كان المشاركون على استعداد لدمج النهج المستندة على الادلة في المشاريع المستقبلية ، مما يبرز الحاجة إلى زيادة الوعي ومعايير التقييم الرسمية، وتساهم نتائج هذه الدراسة في فهم أفضل للعلاقة المعقدة بين مبادئ التصميم المستند على الادلة(EBD) وعملية صنع القرار في تصميم العمارة الصحية. ومن خلال الجمع بين وجهات النظر الذاتية والتحليل المكاني الموضوعي ، تتوفر لهذة الدراسة فهما دقيقًا لدور EBD في تشكيل قرارات التصميم المعماري ونتائج الرعاية الصحية. و ستساعد هذه التطورات فى تحسين تصميمات العمارة الصحية

الكلمات المفتاحية:

التصميم المبني على الأدلة;(EBD) عمارة الصحية ; تخطيط وحدات المرضى المقيمين; اتخاذ القرار المعماري ;التحليل المكاني ; Space Syntax; DepthMapX

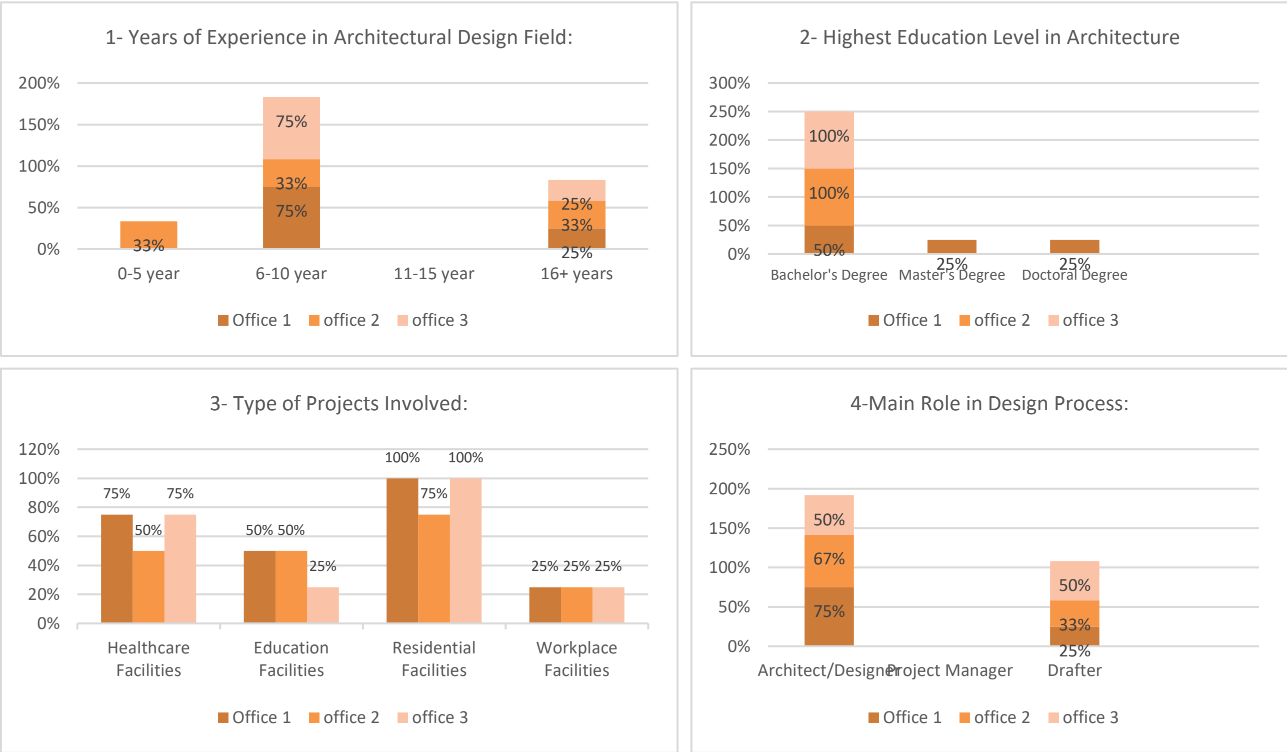


Figure 2-Questionnaire Demographic Results

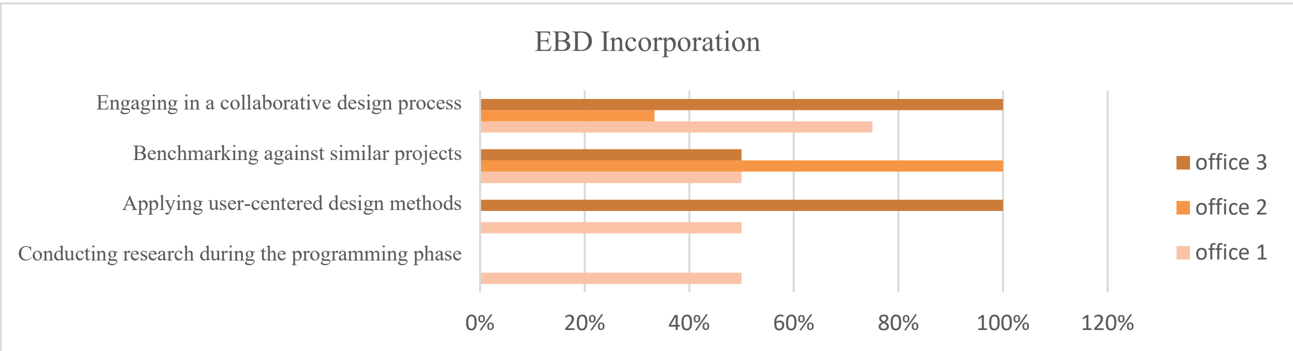


Figure 3- EBD Incorporation Rating among Offices.

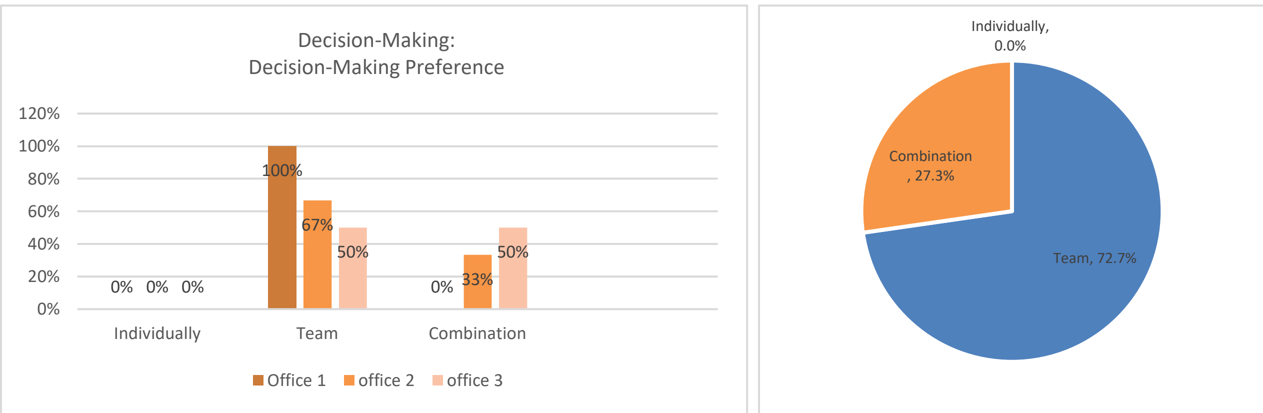


Figure 4- Decision-making section results

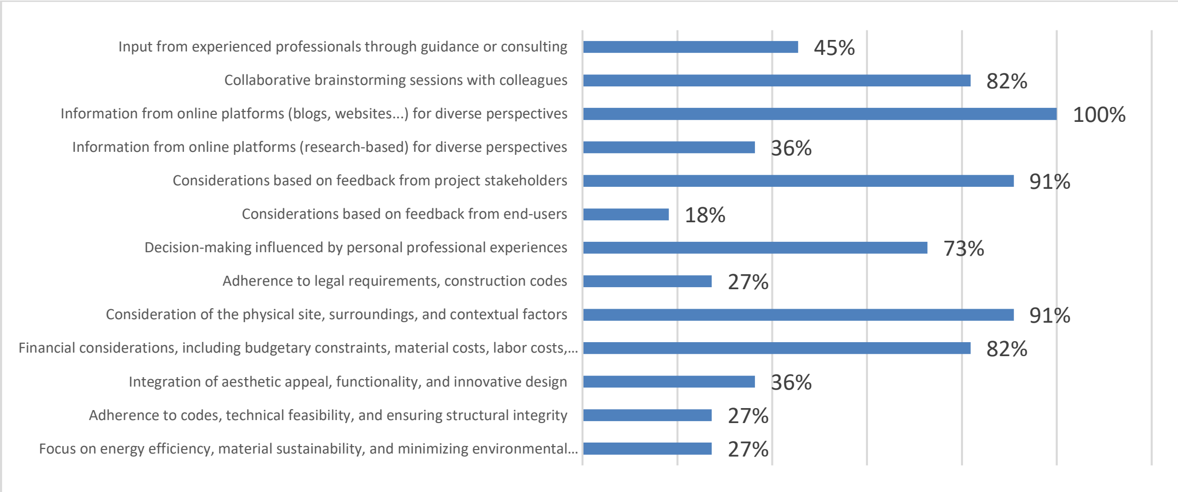
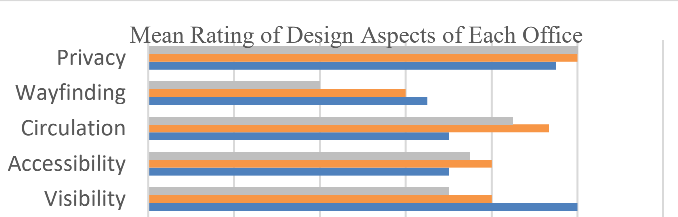


Figure 5- Overall results from the offices-influences on decision-making

Figure 6-Insight of the Offices Regarding their Ratings of Factors Influencing Hospital Layout Decisions



	Visibility	Accessibility	Circulation	Wayfinding	Privacy
Office 3	3.5	3.75	4.25	2	5
Office 2	4	4	4.67	3	5
Office 1	5	3.5	3.5	3.25	4.75

Table 6-Mean Rating of the Design Aspects

Design Aspects	**Mean Rating**	**Rating %**
Visibility	4.727	94.4%
Accessibility	3.909	78.3%
Circulation	4.273	86.1%
Wayfinding	2.909	58.3%
Privacy	4.818	96.7%

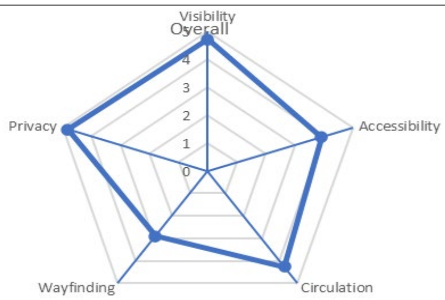


Figure 7- Mean Rating of the Design Aspects

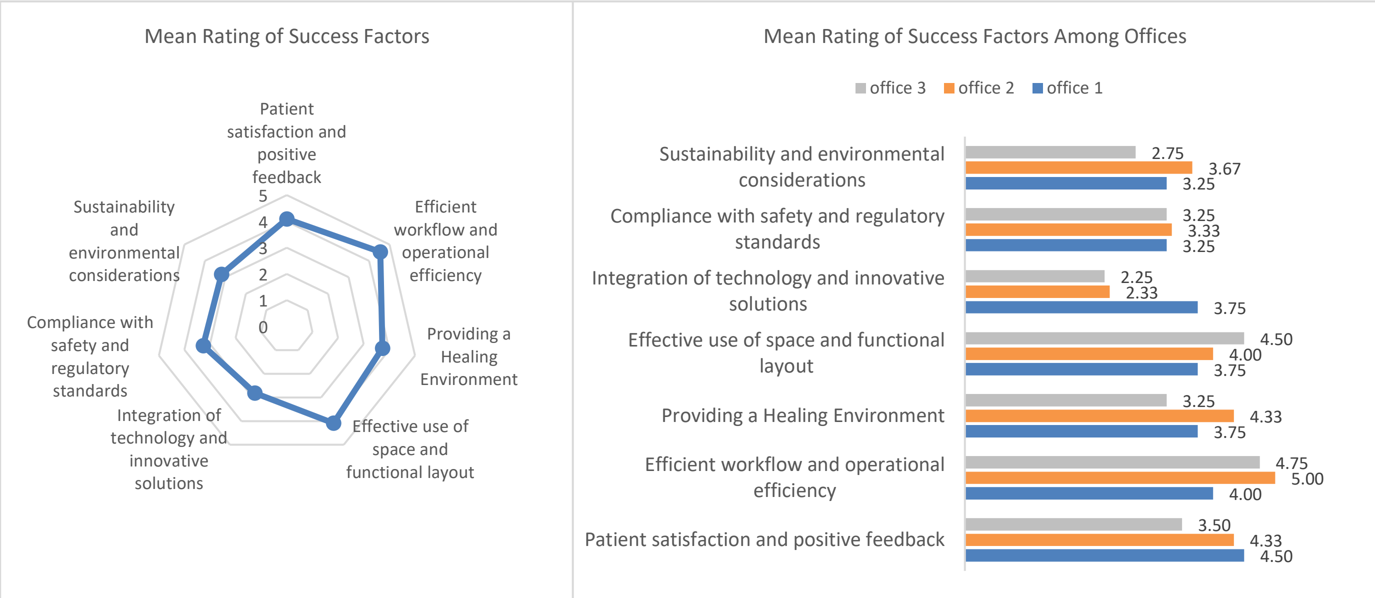


Figure 1- mean rating of success factors

Table 7 DepthMapX Software Data Results (Circulation)

	Attribute	**Min**	**Average**	**Max**	**Ave.-Min**	**Max-Ave.**
Case One	Connectivity	7	1229.4	4294	1222.4	3064.6
	Visual Integration [HH]	2.3	4.93	8.75	2.63	3.82
	Metric Mean Shortest-Path Angle	1	2.03	4.74	1.03	2.71
	Metric Mean Shortest-Path Distance	28.64	36.62	54.02	7.98	17.4
	Angular Mean Depth	0.98	1.92	4.44	0.94	2.52
Case Two	Connectivity	20	797.474	2721	777.474	1923.526
	Visual Integration [HH]	2.965	6.472	11.082	3.507	4.61
	Metric Mean Shortest-Path Angle	0.634	1.289	4.169	0.655	2.88
	Metric Mean Shortest-Path Distance	13.884	19.783	28.095	5.899	8.312
	Angular Mean Depth	0.605	1.213	3.405	0.608	2.192
Case Three	Connectivity	8.000	605.957	2227.000	597.957	1621.043
	Visual Integration [HH]	2.373	4.349	7.721	1.977	3.372
	Metric Mean Shortest-Path Angle	1.064	2.176	4.713	1.112	2.537
	Metric Mean Shortest-Path Distance	21.332	33.456	52.063	12.124	18.607
	Angular Mean Depth	0.912	1.877	4.618	0.965	2.741

Table 8 DepthMapX Software Data Results (Wayfinding)

Angular Step Depth									
	Case One			Case Two			Case Three		
R.P	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Entry	0.992	2.314	3.249	0.169	0.824	1.589	1.11	1.982	2.59
N. R	0.85	2.239	3.24	0	1.002	2.21	0.87	1.62267	2.6
Corridor	0.527	1.224	2.373	0	0.991	2.17	0.917	1.328467	1.75
N. S1	0.334	1.376	2.911	0	1.002	2.21	0.85	1.68267	2.25
N. S2	0.5	1.220	2.292						
Visual Step depth									
	Case One			Case Two			Case Three		
R.P	Minimum	Average	Maximum	Minimum	Average	Maximum	Minimum	Average	Maximum
Entry	3	5.207	6	2	2.429	3	4	4	4
N. R	3	4.897	6	1	2.643	4	3	3.867	4
Corridor	2	3.172	4	1	2.786	4	3	3	3
N. S1	2	3.586	5	1	2.643	4	3	3.867	4
N. S2	2	3.414	5						

Table 9 DepthMapX Software Data Results (Accessibility)

Table 9- DepthMapX- the results from (MSSPA) and (MSSPL) Mapped to Accessibility Analysis

Case One

MSSPA-metric step shortest path angle

POV/room	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	Total
Minimum	1.384	0.943	0.807	0.485	0.821	0.618	0.704	0.682	0.396	0.942	1.05	0.814	0.894	0.792	0.968	0.55	0.595	0.939	0.9	1.11	0.856	1.383	0.66	0.871	1.08	0.812	1.114	1.425	1.905	0.396
Average	1.851	1.394	1.469	1.433	1.48	1.585	1.4079	1.4044	1.4302	1.9464	1.9392	2.068	1.8894	1.7406	1.8398	1.4972	1.3766	1.3708	1.1642	1.6534	1.9798	2.2568	2.2698	2.101	2.0086	2.106	2.01	2.121	2.234	1.760
Maximum	2.35	1.82	2.13	2.513	2.17	2.9	1.917	2.327	2.103	3.402	3.141	3.66	3.074	2.514	2.833	1.956	1.997	1.778	1.512	2.547	3.685	3.59	4	3.384	2.936	3.371	2.852	2.442	2.962	4

MSSPA-metric step shortest path angle

POV/room	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	Total
Minimum	23.04	18.02	15	10.33	8.46	9.95	11.03	10.89	11.99	15.78	13.58	8.97	6.99	8.83	11.07	9.65	8.6	9.93	12.27	16.24	15.09	13.4	8.66	7	8.77	10.64	8.14	12.55	17.83	6.99
Average	36.909	33.8	32.324	31.228	30.534	33.382	33.8902	32.2308	31.9	32.212	32.558	33.502	33.248	31.998	31.728	31.084	31.278	33.094	34.936	38.576	31.428	31.836	32.8398	32.856	31.458	31.032	29.914	30.69	31.82	32.562
Maximum	57.48	52.45	49.46	45.09	43.06	43.12	44.801	45.3	46.2	49.96	52	56.65	58	54.35	52.38	48.32	47.13	46.27	46.61	50.57	49.19	50.98	55.88	57.8	53.4	51.4	46.39	46.79	52.07	58

Case Two

MSSPA-metric step shortest path angle

POV/ROOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Minimum	0.708	1.914	1.06	0.476	0.578	0.594	1.524	0	0.49	0.588	0	1.17	1.235	0.694	0.78793
Average	0.9945	2.1115	1.34325	1.15775	0.92125	0.9495	1.723	0.4225	0.75675	0.92225	0.595	1.33875	1.41175	0.968	1.11541
Maximum	1.27	2.205	1.595	1.511	1.259	1.276	1.839	1.352	1.352	1.517	1.26	1.685	1.737	1.534	1.528

MSSPL-Metric Step Shortest Path Length

POV/ROOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Minimum	18.205	24.81	20.96	22.64	20.83	18.45	17	12.34	11.57	12.29	13.49	14.35	12.9	11.7	11.57
Average	19.539	26.005	23.265	24.795	23.223	20.71	19.318	14.6325	13.715	14.453	15.828	16.8875	15.375	15.36	18.793
Maximum	20.79	27.21	24.84	29.4	28.24	25.63	24.41	19.75	19.03	18.78	19.7	20.68	17.03	17.42	29.4

Case Three

MSSPA-Metric Step Shortest Path Angle

POV/ROOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Minimum	1.02	1.73	1.02	1.23	1.75	1.67	1.08	1.66	1.06	1.57	0.88	0.85	1.13	0.93	1.64	0.85
Average	1.55	2.32	1.617	1.797	2.334	2.215	1.59	2.182	1.395	1.88	1.142	1.405	4.63	1.241	2.18	1.965667
Maximum	2.01	2.77	2.06	2.25	2.77	2.57	1.91	2.55	1.88	2.44	1.49	2.01	14	1.44	2.61	14

MSSPL-Metric Step Shortest Path Length

POV/ROOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Minimum	6.34	13.28	15.16	19.75	26.56	27.06	20.1	18.14	11.42	9.69	9.54	9.39	8.19	10.15	17.6	6.34
Average	15.703	22.468	24.443	29.033	35.838	36.268	29.283	27.278	20.378	18.468	13.353	12.458	13.013	14.75	22	22.3178
Maximum	22.32	29.1	31.1	35.69	42.49	42.96	35.97	34	27.05	25.08	18.37	16.63	17.87	19.93	27.5	42.96

Table 10 DepthMapX Software Data Results (Visibility and Privacy)

Table 10- Isovist Results Regarding Visibility

Case One

	Entry	N. R	N. S	N. S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Visibility of each room/area according to all reference points %	25%	25%	13%	25%	10%	20%	20%	20%	20%	40%	20%	20%	30%	0%	20%	10%	30%	30%	10%
Visibility of each room/area according to reference points of nurse station and corridor%	0%	0%	25%	50%	17%	33%	33%	33%	33%	67%	33%	33%	50%	0%	33%	17%	50%	50%	17%

Case One

	16	17	18	19	20	21	22	23	24	25	26	27	9	28	Ave
Visibility of each room/area according to all reference points %	30%	20%	30%	0%	20%	10%	10%	20%	20%	20%	20%	20%	0%	0%	**18.4%**
Visibility of each room/area according to reference points of nurse station and corridor%	50%	33%	50%	0%	33%	17%	17%	33%	33%	33%	33%	33%	0%	0%	**28.5%**

Case Two

	Entry	N. R	N. S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Ave
Visibility of each room/area according to all reference points %	67%	100%	100%	25%	25%	25%	25%	25%	25%	25%	50%	75%	100%	100%	50%	50%	75%	**55.4%**
Visibility of each room/area according to reference points of nurse station and corridor%	50%	100%	100%	50%	50%	50%	50%	50%	50%	50%	50%	50%	100%	100%	50%	50%	50%	**61.8%**

Case Three

	Entry	N. R	N. S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Ave
Visibility of each room/area according to all reference points %	67%	67%	33%	25%	25%	25%	25%	25%	25%	25%	25%	50%	50%	50%	100%	75%	25%	25%	**41.2%**
Visibility of each room/area according to reference points of nurse station and corridor%	50%	50%	100%	50%	50%	50%	50%	50%	50%	50%	50%	100%	100%	100%	100%	50%	50%	50%	**63.9%**

Table 11- Isovist Results Regarding the Privacy Aspect

Case One

POV/ROOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Visual Privacy %	100%	78%	100%	100%	94%	67%	89%	94%	94%	94%	94%	94%	94%	94%	94%	94%	89%	67%	100%	100%	94%	94%	94%	94%	94%	94%	94%	100%	100%
Visual Privacy for the plan %	93%																												

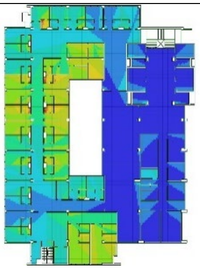
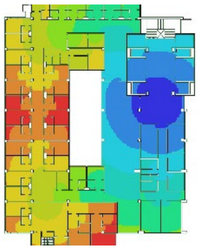
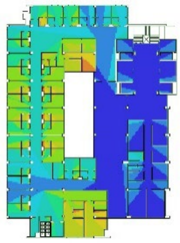
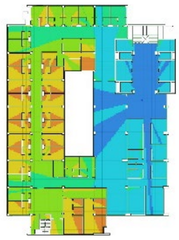
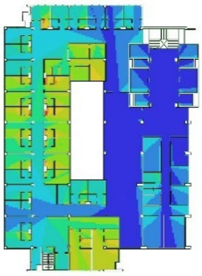
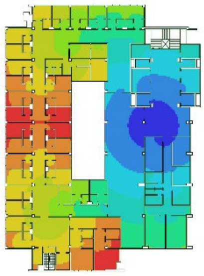
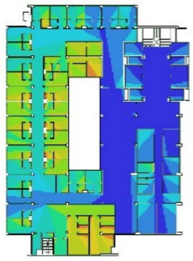
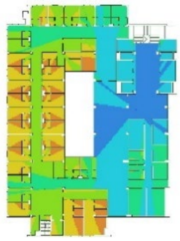
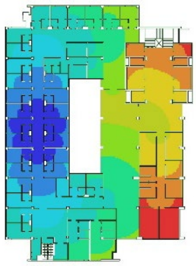
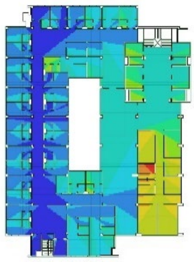
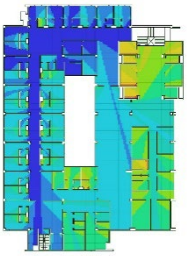
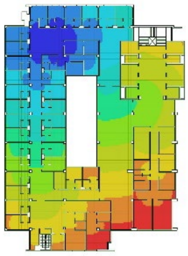
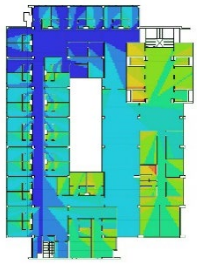
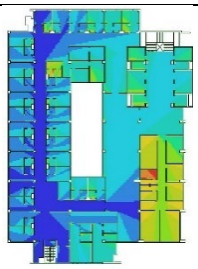
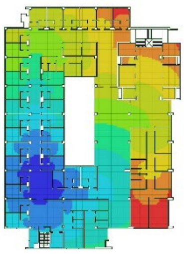
Case Two-

POV/ROOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Privacy of each room, considering all reference points	92.9%	100%	85.7%	85.7%	85.7%	78.6%	92.9%	42.9%	64.3%	42.9%	42.9%	100%	100%	100%
privacy for plan	79.6%													

Case Three

POV/ROOM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Privacy of each room considering all reference points %	87.5%	100%	100%	100%	100%	100%	100%	100%	100%	100%	75.0%	62.5%	75.0%	75.0%	100%
overall Privacy % for plan	91.7%														

Table 11- DepthMapX Software Graphical Data Results of Attributes of the Three Cases

Case One				
Reference Point	**(MSSPA)**	**(MSSPL)**	**Angular Step Depth**	**Visual Step Depth**
Entry/ Vertical Circulation				
Nurse Reception				
Corridor				
Nurse Station (1)				
Nurse Station (2)				

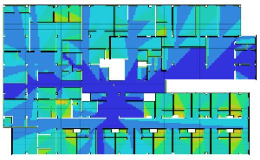
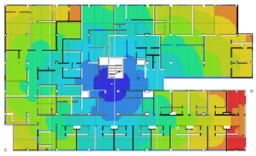
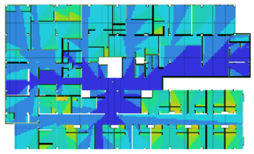
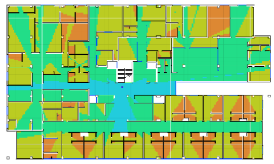
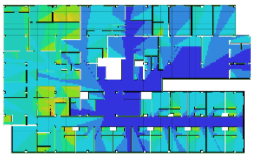
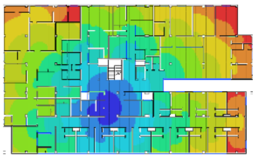
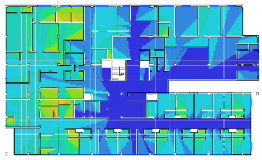
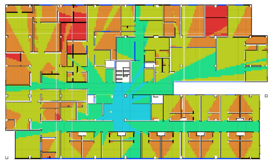
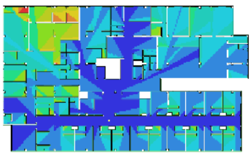
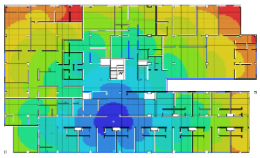
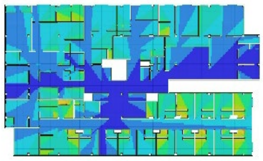
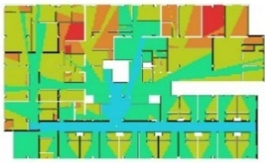
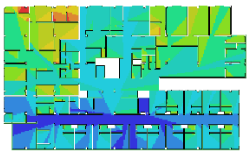
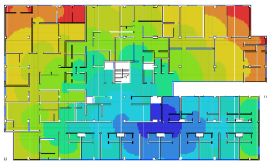
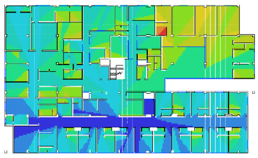
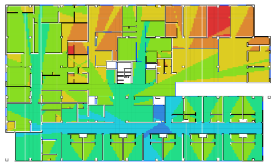
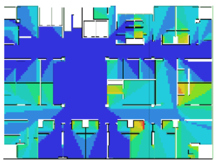
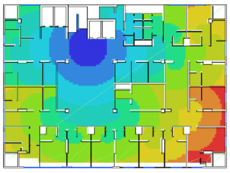
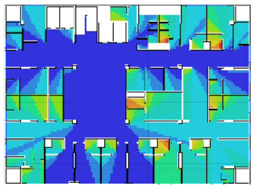
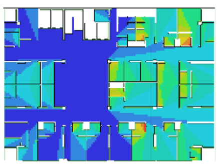
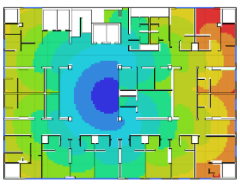
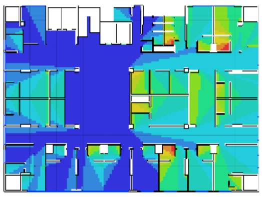
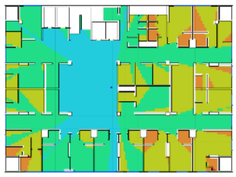
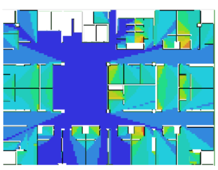
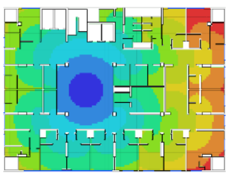
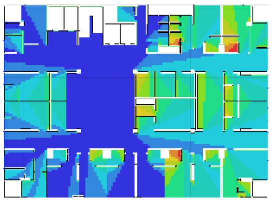
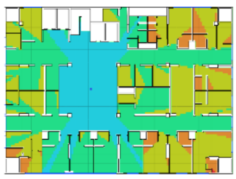
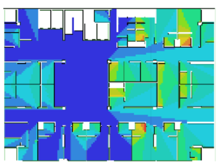
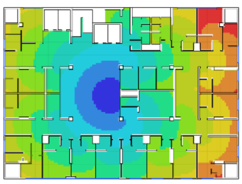
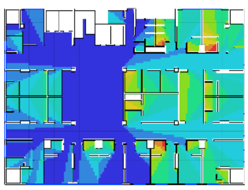
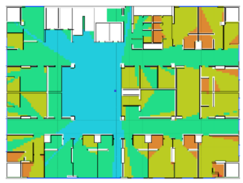
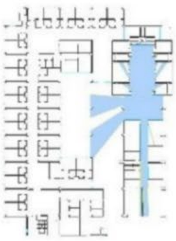
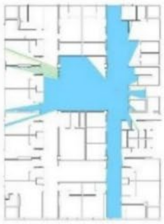
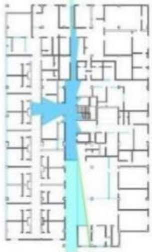
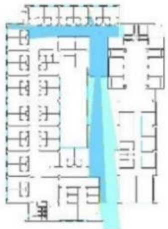
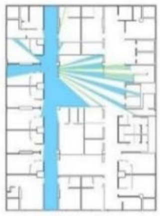
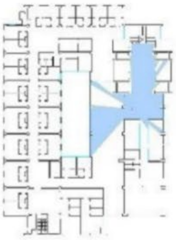
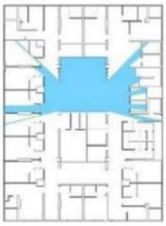
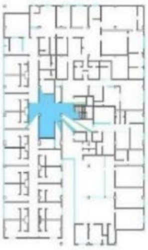
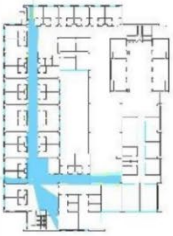
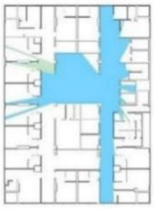
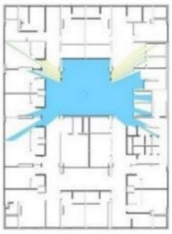
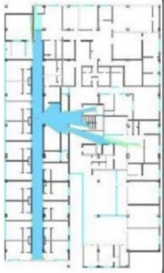
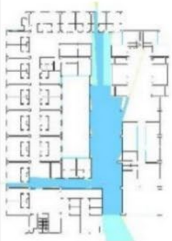
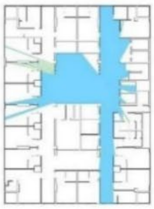
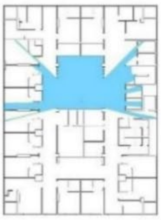
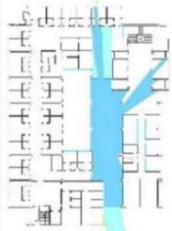
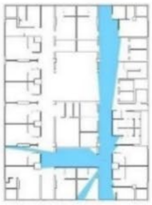
Case Two				
	(MSSPA)	(MSSPL)	Angular Step Depth	Visual Step Depth
Entry/				
Nurse Reception				
Corridor				
Nurse Station -1				
Case Three				
	(MSSPA)	(MSSPL)	Angular Step Depth	Visual Step Depth
Entry/				
Nurse Reception				
Corridor				
Nurse Station (1)				

Table 12- Isovist Results

Visbility				Privacy		
Isovist-main POV				Isovist Integration points		
POV	Case 1	Case 2	Case 3	POV	Case 1	Case 2
Entry/ Vertical Circulation				1		
Nurse Reception				2		
Corridor				3		
Nurse Station				4		
Nurse Station 2				5