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HOSPITAL REVENUE MANAGEMENT MODEL BASED ON HUMAN CENTRED DESIGN: A CASE STUDY OF A HOSPITAL IN GHANA

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Abstract
This study aims to enhance revenue mobilisation at Breman Seventh Day Adventist (SDA) Hospital, Kumasi, through Human-Centred Design principles and design thinking methodologies. The study employs innovation and user-centred systems theory, systems thinking theory, and service design theory. Employing a qualitative case study approach, the research sampled 24 stakeholders comprising finance staff, clinical personnel, and patients at the hospital. Data collection utilised structured interviews, focus group discussions, and observations. The study employs thematic analysis to examine patterns and generate insights. Findings revealed that revenue challenges stem from systemic integration gaps rather than isolated technical failures. This manifests through disconnected workflows, inadequate patient communication systems, and limited interdepartmental collaboration. The design thinking process successfully engaged stakeholders in collaborative problem-solving, generating innovative solutions that address multiple system components simultaneously. Findings validate the study's theoretical background. Key recommendations include developing patient financial education programs, implementing simplified billing systems, integrating financial counselling into clinical workflows, and enhancing mobile payment options. The research demonstrates that Human-Centred Design principles effectively address complex healthcare management challenges, aligning with organisational missions and stakeholder needs. The study contributes practical frameworks for implementing participatory improvement initiatives in resource-constrained healthcare settings and provides evidence for the effectiveness of stakeholder-centred approaches to financial sustainability.

Keywords: Revenue Mobilisation, Design Thinking Approach, Human-Centred Design, Innovative Solutions, Missionary Hospitals

1. Introduction

Ghana's healthcare system faces complex challenges that significantly impact the financial sustainability of missionary-based hospitals. These institutions have historically served as crucial healthcare providers in underserved communities, particularly in rural and semi-urban areas where government facilities remain inadequate or inaccessible. However, they now confront substantial operational threats due to systemic financial constraints and evolving healthcare dynamics (Adjei et al., 2022).

The financial sustainability crisis in missionary hospitals stems from multiple interconnected factors. The National Health Insurance Scheme (NHIS), while designed to improve healthcare access, has created severe cash flow constraints through intricate documentation requirements, frequent policy changes, and prolonged reimbursement delays extending for months (Mensah & Amponsah, 2023). Compounding these challenges, the emergence of modernized private hospitals has intensified competition for

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paying patients who traditionally subsidized care for indigent populations in missionary facilities.

Revenue mobilisation in this context extends beyond traditional billing and collection activities, requiring a multifaceted approach to identifying, developing, and optimising all potential income streams while maintaining quality patient care. This complex scenario presents a unique opportunity to examine how innovative approaches like Human-Centred Design (HCD) and Design Thinking (DT) can address revenue mobilisation challenges in resource-constrained healthcare settings.

HCD has emerged as a transformative problem-solving approach that prioritizes end-user needs and experiences, offering a promising framework for enhancing both patient outcomes and operational efficiency in healthcare (Brown & Wyatt, 2020). The iterative nature of HCD, with its emphasis on in-depth user study and stakeholder engagement, enables healthcare organizations to address systemic challenges and inform strategic decision-making. DT, as a practical application of HCD, focuses on empathy, ideation, and experimentation to tackle complex problems, particularly in healthcare revenue mobilisation contexts (Thompson & Rodriguez, 2023). Research indicates that DT methodologies can improve revenue through process enhancements and innovative service delivery models (Park & Lee, 2022).

Breman Seventh Day Adventist Hospital in Ghana's Ashanti Region exemplifies these challenges and opportunities. The hospital's diverse patient population, multiple revenue streams, and organizational structure reflect the complexity of healthcare financing in Ghana, making it an ideal setting for examining HCD application in revenue mobilisation.

Despite international research demonstrating HCD effectiveness in healthcare, significant knowledge gaps persist in the Ghanaian context. First, existing studies predominantly examine HCD application to clinical programs rather than comprehensive revenue mobilisation challenges. Second, limited research addresses how HCD methodologies must be adapted for resource-constrained environments where infrastructure limitations and financial pressures impact implementation feasibility (Osei-Bonsu et al., 2022; Asante et al., 2023). Third, no research systematically applies design thinking methodologies to address NHIS-related revenue issues specific to Ghanaian missionary hospitals.

This research aims to address these gaps by investigating how HCD principles can enhance revenue mobilisation in Breman SDA Hospital, potentially serving as a model for similar healthcare institutions in Ghana. The study contributes both practical and theoretical insights, offering evidence-based strategies for financial sustainability while demonstrating how design thinking principles can be systematically applied and evaluated in healthcare operations and finance. The research significance extends to transforming revenue mobilisation approaches from reactive problem-solving to proactive, user-centered system design, ultimately enhancing healthcare delivery and financial management in resource-constrained settings.

2. Theoretical Background

2.1 Human-Centred Design in Healthcare

Human-Centred Design (HCD) has emerged as a transformative approach in healthcare, shifting from provider-centric to user-centric service systems. This methodology prioritizes understanding human needs and designing responsive solutions, particularly valuable in complex healthcare environments with diverse stakeholders (Norman & Stappers, 2021). In healthcare revenue mobilisation, HCD offers a strategic

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framework that places stakeholders at the core of financial sustainability initiatives. It recognizes that sustainable revenue generation must align with the actual needs and experiences of all healthcare system participants (Gulacsi et al., 2021). The application extends beyond patient care to encompass financial processes, administrative workflows, and staff engagement, acknowledging revenue mobilisation as an integrated system.

Roberts et al. (2022) emphasize that HCD enables healthcare organizations to develop solutions balancing desirability (user perspective), feasibility (technical aspects), and viability (organizational sustainability). This triple consideration forms HCD's core value proposition. However, Kumar et al. (2021) caution that while HCD implementation yields improvements in patient satisfaction, clinical outcomes, and operational efficiency, it requires significant initial investment in stakeholder engagement and capacity building, potentially challenging resource-constrained institutions. The HCD framework in healthcare operates through three interconnected principles: empathy-driven stakeholder engagement to uncover both expressed and latent needs; active user participation and co-creation to enhance solution quality and adoption; and iterative refinement to ensure continuous relevance and effectiveness (Thompson et al., 2021).

2.2 Design Thinking Process in Healthcare Financial Improvement

The Design Thinking (DT) process provides a structured framework for implementing Human-Centred Design principles in healthcare settings. This five-stage methodology Empathise, Define, Ideate, Prototype, and Test enables healthcare organizations to systematically address complex challenges through iterative, user-focused approaches (Brown & Katz, 2021). In healthcare financial contexts, this initial phase involves developing deep understanding of stakeholder experiences, including patients navigating payment systems and staff managing billing processes. Sustainable revenue solutions require genuine comprehension of user pain points, motivations, and constraints that influence financial interactions within the healthcare ecosystem.

This stage translates empathetic insights into clear problem statements that capture revenue mobilization challenges from stakeholder perspectives. By reframing financial challenges through user experience lenses, healthcare organizations can identify root causes rather than surface-level symptoms, enabling more targeted intervention strategies (Norman & Stappers, 2021).

Leveraging diverse stakeholder perspectives, this phase generates innovative solutions balancing financial sustainability with user needs and organizational capabilities. Collaborative ideation often reveals opportunities for process streamlining and service enhancement that improve both financial performance and user satisfaction, particularly crucial for mission-driven healthcare organizations (Roberts et al., 2022).

Creating tangible representations of proposed solutions allows testing and refinement before full implementation. This approach is especially valuable in resource-constrained environments where failed implementations carry significant consequences. Prototypes may include pilot billing systems or trial communication processes that validate assumptions before substantial resource commitment (Kumar & Singh, 2021).

Systematic evaluation through this final phase gathers quantitative and qualitative data on solution effectiveness, user acceptance, and organizational impact. Testing encompasses both financial metrics (collection rates, revenue growth) and qualitative measures (stakeholder satisfaction, process efficiency), ensuring solutions achieve financial objectives while enhancing user experiences (Martinez & Johnson, 2021).

The non-linear nature of DT allows healthcare teams to move fluidly between stages as new insights emerge, creating adaptive solutions responsive to complex healthcare financial challenges.

2.3 Theoretical Framework

This study employed three theories to explain how HCD principles can enhance revenue mobilisation in missionary hospitals in Ghana.

2.3.1 Innovation and User-Centred Systems Theory

This theory in healthcare provides the foundation for understanding how user-centred approaches can drive organisational transformation and financial sustainability. Developed by Von Hippel and expanded by subsequent researchers, this theory emphasises that sustainable innovations emerge from understanding users' needs, active user participation in solution development, and iterative refinement based on user feedback (Morrison & Roberts, 2021).

This theory suggests that when healthcare organisations involve stakeholders in revenue mobilisation initiatives, they create opportunities to identify previously unrecognised revenue streams, improve process efficiency, and enhance satisfaction, translating into improved financial performance. However, Chen et al. (2022) cautioned that the theory assumes organisational capacity for meaningful stakeholder engagement and iterative development, which may be limited in resource-constrained settings where immediate solutions are prioritised over collaborative processes.

This theoretical framework directly informs the design thinking approach employed in this study, particularly in the Empathise and Define phases, where stakeholder perspectives shape problem articulation, and in the Ideate phase, where collaborative solution generation occurs. The theory's emphasis on iterative refinement underpins the study's commitment to testing and adapting solutions based on stakeholder feedback throughout the implementation process.

2.3.2 Systems Thinking Theory

Systems thinking theory examines the interdependence between revenue generation, stakeholder satisfaction, and organisational performance in healthcare settings. Developed and applied extensively in organisational contexts, this theory emphasises that financial sustainability depends on optimising the entire system that requires integrated approaches, including stakeholder interactions, process interdependence, and feedback loops (Senge et al., 2022).

The theory suggests that sustainable revenue improvements require coordinated changes across multiple subsystems, recognising that isolated interventions may produce limited or temporary results. It emphasises that stakeholder engagement in revenue mobilisation initiatives influences system performance and financial outcomes (Senge et al., 2022).

In this study, systems thinking theory provides the theoretical foundation for understanding how iterative HCD processes create systemic improvements in revenue mobilisation. Specifically, the theory explains why the design thinking approach must consider multiple stakeholder perspectives. The iterative nature of design thinking, with its Test phase providing feedback to Define and Ideate phases, reflects systems thinking's emphasis on feedback loops and continuous adaptation. Again, this theory explains why successful revenue solutions require alignment across the hospital's interconnected subsystems rather than isolated departmental interventions.

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2.3.3 Service Design Theory

This theory provides insights into how healthcare organisations can create value through enhanced service delivery that improves patient experience and generates sustainable revenue. Rooted in marketing and organisational studies, the theory emphasises that services are co-created through interactions between providers and users, requiring organisations to design service experiences that meet user needs while achieving organisational objectives.

This theory posits that financial sustainability in healthcare facilities depends on creating service experiences that patients value and are willing to pay for (Brown & Martin, 2022). When healthcare organisations design services that genuinely meet patient needs and preferences, they create value propositions that support premium pricing, increase patient loyalty, and generate positive referrals that drive revenue growth. The theory emphasises that sustainable revenue generation requires organisations to understand and respond to patient value perceptions, not just clinical needs (Thompson et al., 2021).

This theory enhances the study's impetus by explaining why improved patient experiences translate to financial sustainability. The theory's emphasis on co-creation aligns with the HCD principle of user participation, providing theoretical justification for involving patients, staff, and administrators in designing revenue mobilisation processes. It explains how the Prototype and Test phases generate financial value through iterative refinement of service delivery.

2.3.4 Empirical Review

Contemporary research on revenue strategies in healthcare institutions reveals a complex scene of challenges and opportunities that require innovative approaches to financial sustainability. A study examined Latin American hospitals and found that institutions implementing interactive revenue diversification strategies achieved better financial performance (Rodriguez et al., 2023). While these findings are encouraging, critics note that the study's small sample size and focus on relatively well-equipped urban hospitals limit generalizability to rural settings where community purchasing power may be insufficient to support diversification strategies (Mensah & Amponsah, 2023).

Research examining financial sustainability strategies in West African mission hospitals revealed that organisations achieving sustained revenue growth consistently employed participatory approaches (Asante et al., 2023). The study found that hospitals using collaborative approaches achieved higher staff engagement, better patient satisfaction, and more sustainable financial outcomes compared to those implementing top-down revenue strategies. These findings provide direct evidence of HCD adoption in African contexts.

Furthermore, a study examined revenue collection strategies in mission hospitals in Ghana and identified systemic issues, including inadequate staff training in financial management, poor communication between clinical and administrative departments, and limited patient understanding of payment processes (Anderson et al., 2022). The study found that these challenges resulted in revenue leakage averaging 15-20% of potential collections. The authors note that technical solutions are insufficient in addressing underlying communication and coordination challenges. This necessitates the holistic, stakeholder-centred approach of HCD methodologies.

Research by Mensah and Amponsah (2023) suggested that hospitals implementing systematic approaches to insurance claims management can improve revenue without

compromising patient care quality, highlighting the influence of administrative efficiency on revenue optimisation. However, this study's focus on American hospitals limits its applicability to African contexts where infrastructure constraints and resource limitations present additional implementation challenges.

2.3.5 Case Studies of Human-Centred Design in Hospitals

International case studies present compelling evidence of the effectiveness of HCD in improving hospital operations and financial performance, although with notable implementation challenges. A case study in Singapore General Hospital demonstrated HCD adoption in billing processes and patient financial experiences (Lim & Tan, 2021). The design thinking approach led to the development of simplified billing procedures, enhanced patient communication systems, improved staff training programs, reduced billing-related complaints and increased collection rates. However, the authors note that success required strong leadership commitment and protected time for staff participation in design workshops. This may be challenging to replicate in organisations facing acute financial pressures.

Research by Morales et al. (2023) examined five hospitals in South Africa that applied HCD methodologies to develop innovative revenue generation strategies. The study found that hospitals using design thinking approaches achieved average revenue increases while improving patient satisfaction and staff engagement. The authors suggested that successful HCD implementation requires sustained organisational commitment rather than one-time interventions.

A case study by Agyemang-Duah et al. (2023) examining patient experience improvement at a Ghanaian teaching hospital provides direct evidence of HCD potential in local contexts. The study documented how participatory design workshops involving patients, families, and staff identified communication gaps and process inefficiencies that were not apparent to hospital administrators. The study revealed implementation challenges, including language barriers in multilingual patient populations, limited technological infrastructure for proposed digital solutions, and difficulty sustaining staff participation due to heavy clinical workloads, including challenges that must be anticipated in HCD applications to revenue mobilisation.

3. Methods

This study employs a qualitative case study design, which provides in-depth answers to the research questions. The study adopts a field-based approach to ensure that data collection offers authentic insights into stakeholder experiences and system dynamics. The qualitative case study design reflects several methodological considerations that align with the research objectives and theoretical framework. Flick (2022) argues that this approach provides essential frameworks for understanding complex social phenomena that require attention to context, meaning, and stakeholder perspectives.

The study employs a design thinking approach. This approach ensures that solutions are developed collaboratively rather than imposed externally, increasing the likelihood of stakeholder acceptance and successful implementation (Brown & Katz, 2021). The integration of design thinking methodologies with traditional qualitative research methods creates a hybrid approach that combines analytical rigour with practical solution development.

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The study adopts an interpretive philosophy which aligns with HCD principles, emphasising empathetic understanding and stakeholder-centred problem definition. The interpretive approach enables emergent understanding that reflects stakeholder realities and priorities. This supports the development of solutions that address real needs rather than assumed problems. Constructivist epistemology underpins the research approach. This approach emphasises the collaborative nature of knowledge creation through co-constructed research findings (Flick, 2022). Figure 1 illustrates the overall research design framework, integrating qualitative case study methodology with design thinking processes.

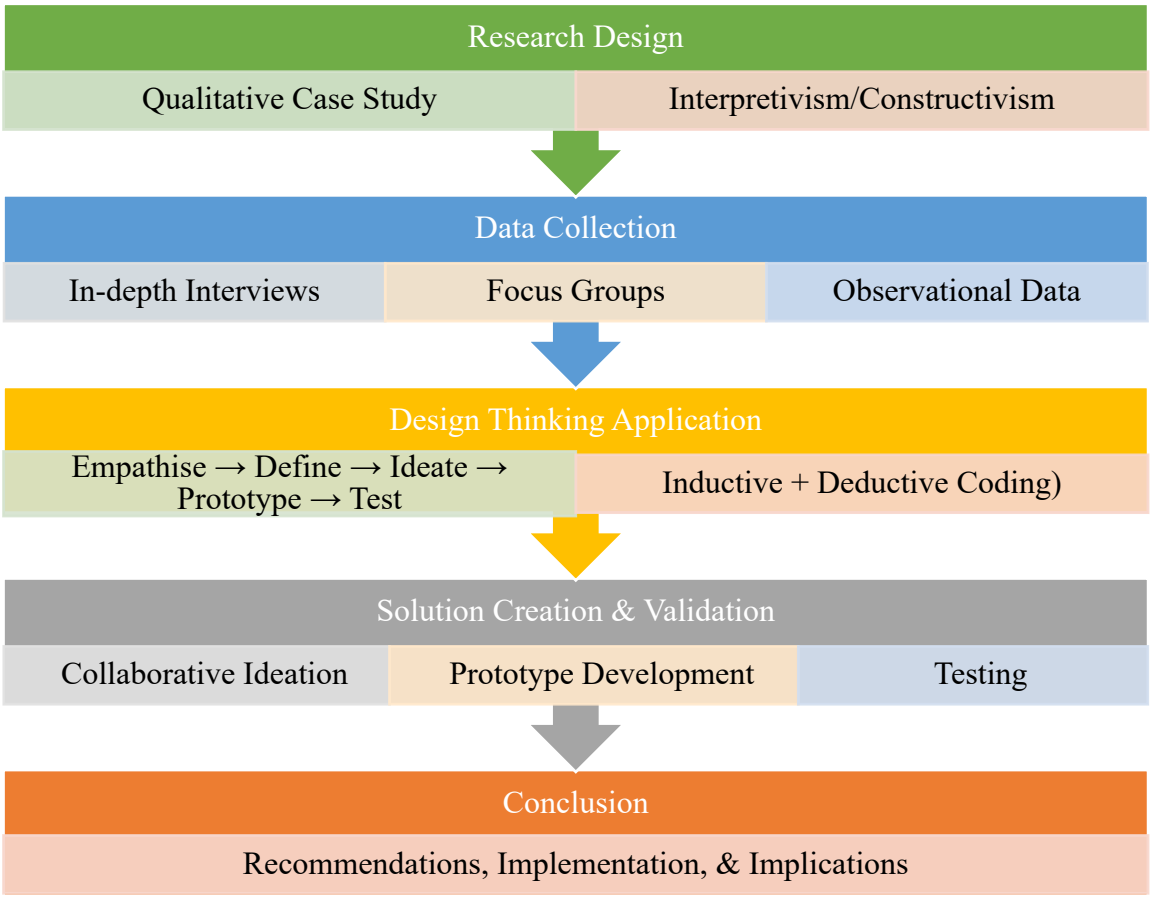

Figure 1. Research Design Framework
Source: Author's construct (2025)

3.1 Profile of Respondents

The study's respondents encompass three primary stakeholder groups. First is the finance group, which includes finance officers, billing clerks, insurance coordinators, and cashiers. This group frequently interacts directly with revenue generation and collection processes. Second is the clinical staff, including physicians, nurses, and other healthcare professionals whose clinical activities generate revenue. Patients and their families form the third stakeholder group. This group includes paying patients, insurance beneficiaries, and individuals with various socioeconomic backgrounds and healthcare utilisation patterns.

3.2 Sampling Technique and Sample Size

The study employs a mixed sampling approach. This approach enables systematic selection of participants while maintaining feasible recruitment and participation processes. For the finance group, a stratified sampling technique targets individuals across different levels of the hospital's financial hierarchy. The stratification criteria include position level and years of experience. This approach captures diverse perspectives on revenue challenges and solutions. This ensures that different experiences and responsibilities are represented in the research process.

The study employs a purposive sampling technique to select clinical staff. The purposive selection criteria emphasise experience with patient financial counselling, involvement in discharge planning processes, and understanding of how clinical decisions impact hospital revenue. This approach ensures that selected clinical staff possess relevant experience and knowledge. The study utilises the convenience sampling technique on the patient group. This approach recognises patient availability and willingness to participate. Recruitment occurs across departments at different times to capture varied patient experiences and perspectives.

The study recruits 24 participants across the three stakeholder groups, distributed as follows: 7 participants from the finance group, including two senior managers, 6 clinical staff from different departments and ranks, and 11 patients with diverse payment plans and service utilisation patterns. The sample size determination reflects established principles for qualitative research that emphasise data saturation rather than statistical power as the primary criterion for adequacy (Flick, 2022). This study sets a precedent from similar qualitative studies in African healthcare systems, suggesting that a sample size of 10 to 15 participants achieves saturation when examining specific processes with clearly defined stakeholder groups (Asante et al., 2023; Brown & Martin, 2022). Therefore, the study's sample size provides sufficient diversity within each stakeholder group while remaining manageable for intensive qualitative analysis.

3.3 Data Collection Methods and Instruments

The study employs multiple data collection methods. The study utilises structured interview guides tailored to address different dimensions of revenue mobilisation across stakeholders' experiences, including operational processes, interpersonal interactions, system capabilities, and improvement opportunities. The study organised separate focus group discussions for each stakeholder group, creating safe spaces for participants to share experiences, discuss challenges, and engage in collaborative problem-solving activities.

Additionally, the study employs observation techniques, providing comprehensive coverage of the revenue ecosystem. Systematic observation enables documentation of actual practices and behaviours that may differ from practices discussed in interviews and focus groups. Figure 2 illustrates the data collection process and timeline.

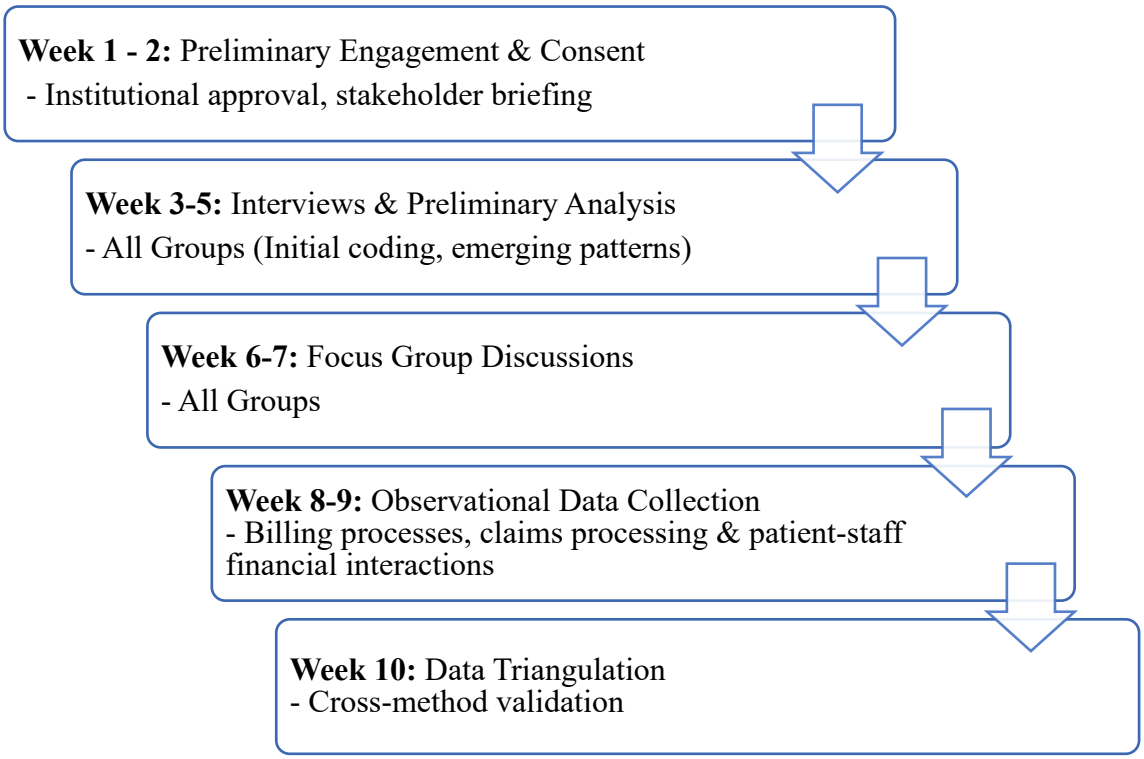

Figure 2. Data Collection Process and Timeline
Source: Author's construct (2025)

3.4 Data Analysis and Interpretation

The study employs thematic analysis. The analytical approach follows systematic data coding, theme development, and interpretation of emergent insights and unexpected findings.

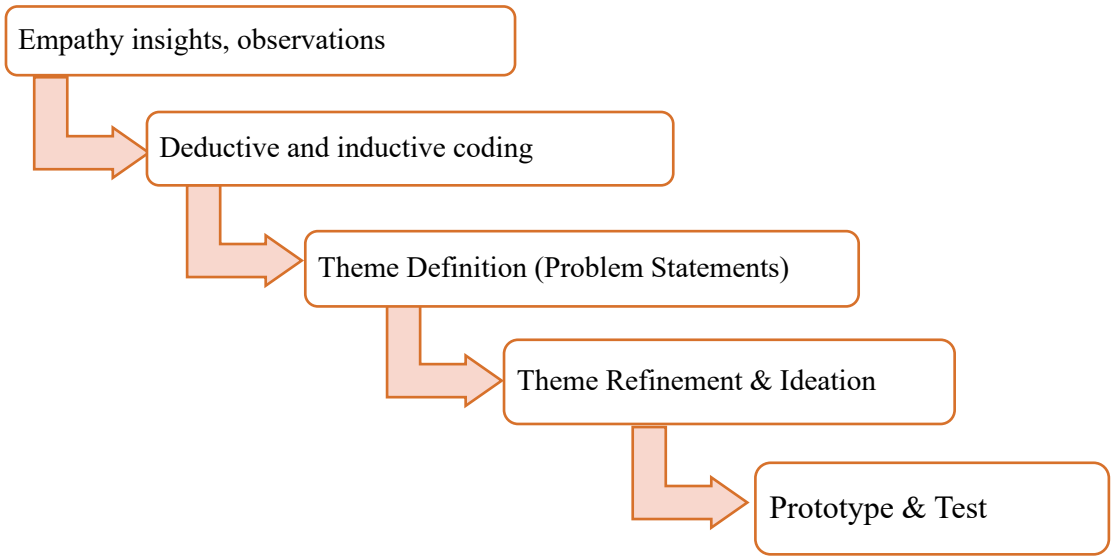

Figure 3. Integrated Thematic Analysis and Design Thinking Process
Source: Author's construct (2025)

The study employs coding processes, including both deductive approaches, where predetermined categories are derived from the theoretical framework and concepts, and

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inductive approaches, which allow themes to emerge organically from the data without predetermined frameworks. This dual approach ensures comprehensive analysis that captures theoretical insights and unexpected findings. The study interprets findings, emphasising insights that are analytically rigorous and practically relevant. This ensures that research output contributes to academic knowledge and organisational improvement. The study employs collaborative processes that involve participant feedback and validation to ensure that findings accurately represent stakeholder perspectives and experiences.

3.5 Integration of Design Thinking Principles and Data Analysis

The study integrates design thinking principles throughout data analysis and interpretation processes. The process occurs through systematic application of empathy, definition, ideation, prototype, and test phases. This approach ensures that findings support providing collaborative solutions while maintaining academic rigour. Figure 4 presents the flow of design thinking principles to the study's qualitative data.

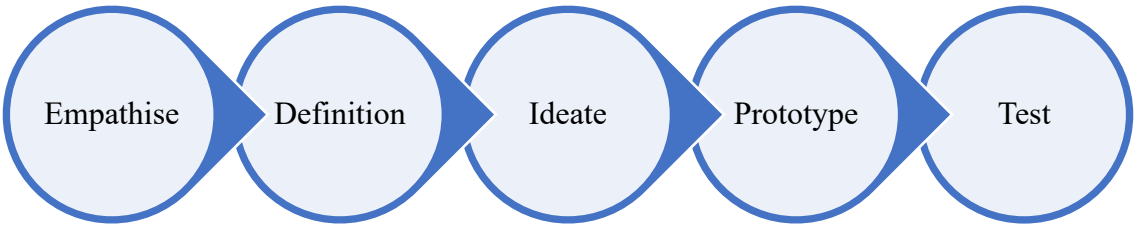

Figure 4. Design Thinking Application
Source: Roberts et al., 2022

The study implements a Design Thinking approach through sequential phases. The empathy phase analyzes stakeholder perspectives, experiences, and needs from interview and focus group data. The define phase synthesizes these insights to formulate clear, actionable problem statements. The ideate phase conducts workshops with finance and clinical staff to generate solution concepts. Selected concepts are developed into tangible prototypes during the prototyping phase. Finally, the testing phase validates prototypes with participant subgroups to ensure practicality and user acceptance. This process systematically transforms qualitative data into empirically-grounded, stakeholder-validated solutions.

4. Results and Discussion

4.1 Revenue Mobilisation Challenges in Missionary Hospitals

Table 1 presents the frequency of challenges cited across stakeholder groups, demonstrating both shared concerns and perspective-specific issues.

Table 1. Revenue Mobilisation Challenges in Breman SDA Hospital

Challenge Category	Finance Group (n=7)	Clinical Staff (n=6)	Patients (n=11)	Total Mentions
NHIS Processing Delays	7 (100%)	6 (100%)	1 (9%)	14
Billing Complexity/Confusion	5 (71%)	5 (83%)	11 (100%)	21
Payment Method Limitations	5 (71%)	4 (67%)	9 (82%)	18
Patient Flow Inefficiencies	3 (43%)	5 (83%)	4 (36%)	12
Communication Gaps	7 (100%)	5 (83%)	9 (82%)	21
Technology Integration Issues	6 (86%)	3 (50%)	0 (0%)	9

Sources: Author's Construct (2025) with Microsoft Excel

As presented in Table 1, billing complexities and communication gaps are critical challenges affecting revenue mobilisation. However, these problems varied across perspectives. Most finance staff frequently cited “patients' difficulty understanding billing statements”, while clinical staff (83%) narrated inadequate preparation of patients for financial care. Frequent patient group narratives include “insurance coverage is unclear”, "I often receive bills that I don't understand”, and “charges weren't explained during my visit.” Observational data documented patient anxiety during billing interactions, with 70% of observed patients seeking clarifications from multiple staff members. Focus group discussions revealed that this anxiety stems from a perceived lack of transparency. Findings indicate that the hospital might underestimate how baffling the billing system appears to patients. Patients narrated willingness to engage in financial planning "if provided with appropriate support and resources."

This finding demonstrates the emotional dimensions of financial interactions, extending the analysis of Anderson et al. (2022), who mentioned communication gaps as a source of revenue leakage in Ghanaian public hospitals. While Anderson et al. (2022) emphasised improvements in technical communication, this study reveals that trust-building through empathetic engagement may be equally critical for sustainable revenue collection.

Payment method limitations were identified by all stakeholder groups (71%, 67%, and 82%). The study found that current reliance on cash and bank transfers excludes prevalent mobile money platforms. Finance staff frequently cited “bank transfers create unnecessary delays in revenue collection”. Patients quoted "the hospital only accepts cash or bank transfers”, “sometimes bank transfer hitches cause frustrations and defer treatment” and “I prefer mobile money payments that are more convenient."

Observational data revealed that cash transactions require approximately 2 hours daily of cashiers’ time to do manual reconciliation. Focus group discussions recorded security concerns. This finding aligns with Morales et al. (2023), who identified patient payment behaviours in resource-constrained settings. This indicates that irregular income patterns and limited banking access necessitate flexible payment mechanisms, aligning with local financial practices.

Furthermore, all finance staff and clinical staff identify NHIS reimbursement delays as a primary cash flow impediment. Frequent narratives are that the NHIS reimbursement system creates a significant administrative burden with frequent policy changes and documentation requirements that consume substantial staff time. Finance staff stated, "manual processes in NHIS claims” and “NHIS reimbursement delays."

Observational data reveal that claims processing involves extensive manual review, consuming an average of 45-60 minutes per claim. Additionally, the study observed inefficiencies, including redundant data entry across multiple systems (100% of billing transactions), complex manual verification procedures, and communication gaps between departments.

While Mensah and Amponsah (2023) found that NHIS reimbursement delays averaging 3-6 months create operational difficulties in Ghanaian mission hospitals, this study extends those findings by revealing that administrative inefficiency stems from external policy factors and inadequate internal systems for managing requirements. The findings reinforce infrastructure and workflow challenges identified by Asante et al. (2023) in sub-Saharan African healthcare settings.

The study identified that systemic accessibility challenges, including patient flow inefficiencies (cited by 83% of clinical staff) and technology integration gaps (revealed

by 86% of finance staff), limit service capacity and prevent information delivery between clinical and financial systems. These findings support Martinez and Johnson's (2021) argument that sustainable revenue improvement requires holistic approaches addressing entire patient journeys rather than isolated process improvements.

4.2 Revenue Mobilisation Processes and Financial Interactions in Missionary Hospitals

The study employs a cross-participatory analysis, examining each group's perspectives on revenue mobilisation processes and financial interactions at the Breman SDA Hospital. Finance staff demonstrated technical knowledge of revenue systems, but recognised deficiencies in patient communication on bill financing. Narratives include "we focus primarily on technical accuracy in billing but haven't invested sufficiently in helping patients understand their financial obligations." This contradicts the findings of a study in Ghanaian mission hospitals (Anderson et al. 2022), where administrators primarily attributed revenue challenges to external factors rather than internal capacity gaps.

Clinical staff expressed the disconnect between medical care and inadequate financial preparation. They frequently cited: "we provide excellent medical care but often fail to educate patients on financing," "we barely prepare patients for each service cost," and "patients are sometimes surprised about their bills, creating anxiety and confusion." This reflects the growing recognition of patients experiencing clinical quality but limited financial planning (Thompson & Rodriguez, 2023.

Patients converged desires for transparency, flexibility, and support rather than cost reduction. They repeatedly narrated their willingness to engage in financial planning and education activities if provided with appropriate support. This challenges traditional revenue optimisation strategies focused primarily on enforcement rather than enablement. These findings support and facilitate collaborative solution development. The convergence of diverse perspectives demonstrates that when given structured opportunities for patient financial education, each group can identify shared priorities despite divergent problem framings. This supports the participatory design approach advocated by Lim and Tan (2021).

4.3 Integration of Design Thinking Approach

The study employs a design thinking framework to transform empirical findings into practical solutions.

4.3.1 Empathy and Definition

The study found that financial interactions carry significant emotional weight for all stakeholders. Patients (100%) experience anxiety and confusion, system inefficiencies that frustrate clinical staff (83%), and finance personnel (100%) who are facing communication gaps. These emotional elements facilitate attributing revenue mobilisation challenges to stakeholder relationship menace rather than technical and administrative factors.

The study synthesised these insights into three problem statements. First, patients lack transparent and supportive financial education throughout their care journey. This creates anxiety and confusion that leads to avoidance behaviours and delayed payments. Second, disconnection between clinical, administrative, and financial systems requires redundant manual processes that consume staff time while creating information gaps and errors. Thirdly, current payment mechanisms and rigid processes fail to accommodate diverse

patient financial capabilities and preferences, creating unnecessary barriers to timely revenue collection.

4.3.2 Ideate

The study hinges on defined problems and generates solutions, focusing on designs that reduce friction while building trust. This approach aligns with service design theory, which emphasises that sustainable revenue mobilisation emerges from creating value propositions that patients appreciate rather than coerced payments. The study's ideation workshops with participants generated distinct solution concepts. Table 2 presents high-priority solutions with implementation timelines based on participants' confirmation.

Table 2. Prioritised Solutions from Collaborative Ideation

Solution Category	Immediate	Medium-term	Long-term
Patient Education & Communication	Simplified billing statements	Financial counselling in healthcare	Patient portal with billing access
Payment Flexibility	Mobile money integration	Instalment payment plans	Automated payment reminders
Process Efficiency	Dedicated NHIS liaison officer	Billing-clinical system integration	Automated claims processing
Staff Capacity	Cross-departmental communication protocols	Financial counselling training for clinical staff	Continuous improvement teams

Sources: Author's Construct (2025) with Microsoft Excel 365

The study found that approximately 92% of the participants endorsed patient education and mobile money integration. This reflects convergence solutions addressing immediate practical barriers and underlying deficiencies. Participants prioritised organisational change and capacity building over technological solutions. They recognised that sustainable revenue improvement depends on cultural and operational changes.

While findings misalign with revenue expansion approaches centred on technological upgrade in well-resourced settings (Lim & Tan, 2021), it concurs with findings in Africa, emphasising human relationships and adaptive processes (Asante et al., 2023).

4.3.3 Prototype and Test

The study developed three prototype interventions. These prototypes underwent two rounds of stakeholder feedback and refinement.

1) Simplified Billing Statement Prototype: The redesigned billing format reduces text density by 60%. It incorporates visual images to distinguish service categories and clear descriptions of charges. Patient testing revealed 87.5% (n=8 additional patients beyond study participants) improved understanding compared to current statements. Patient average time to understand basic charges reduced from 8-10 minutes to 2-3 minutes. While finance staff expressed initial concern about format deviations, they endorsed the design after observing improved patient understanding during testing. Figure 5 presents a prototype of the interface of the simplified billing statement.

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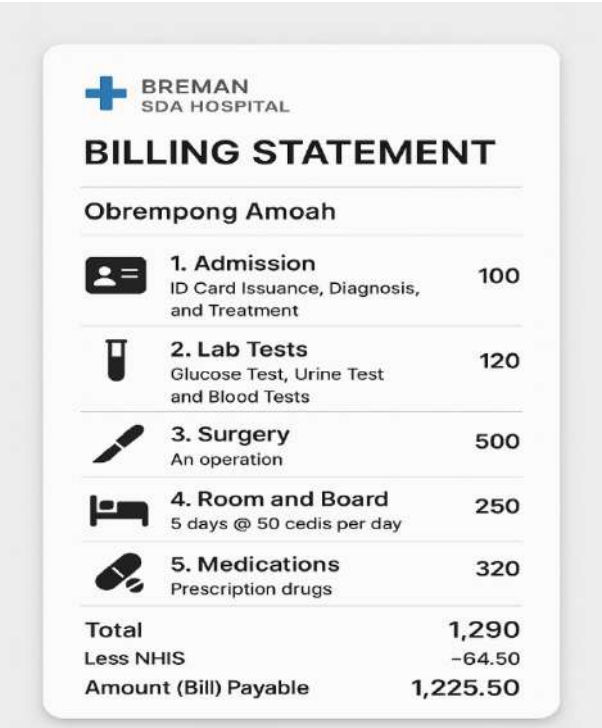

Figure 5. Simplified Billing Statement
Source: Author's construct (2025)

2) Patient Financial Education Program: This prototype integrates financial training into patient admission processes. It is a structured 15–20 minute lecture on insurance benefits, expected costs, payment options, and available assistance programs. The education program proactively provides information rather than reacting to patient confusion. The program is structured in four stages. First, finance and clinical staff meet patients during registration; second, a structured training session; third, patients receive a written summary and contact information for financial questions; and finally, follow-up financial counselling during and after hospitalisation. Figure 6 is a prototype of a patient financial education program at the hospital. Pilot testing with 29 patients demonstrated 89.65% reported reduced anxiety on healthcare financial burdens, and 100% indicated they would recommend the program to others. While clinical staff were initially concerned about time requirements, they reported reduced interruptions from patient financial questions. Finance staff reported reduced patient account receivables, detention, and absconding behaviours, increasing revenue collection.

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Figure 6. Patient Financial Education Program at Breman SDA Hospital
Source: Author's Construct (2025)

3) Bedside Financial Counselling Protocol: This intervention embeds financial counselling into clinical care by training clinical staff to conduct brief financial scrutiny during daily visits, providing concurrent billing updates and addressing patient concerns. Key counselling topics include insurance coverage, itemised charge explanation, payment options, and assistance program information. Anticipated impacts include improved patient satisfaction, reduced billing disputes at discharge, enhanced NHIS documentation accuracy through proactive clarification, and strengthened patient-provider relationships.

Figure 7. Finance and Clinical Staff Training Program at Breman SDA Hospital
Source: Author's Construct (2025)

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Figure 8. Bedside Financial Counselling Protocol
Source: Author's Construct (2025)

Staff training for both prototypes emphasised empathetic communication techniques derived from empathy phase findings, addressing not just information delivery but emotional dimensions of financial discussions. Interdepartmental training sessions facilitated mutual understanding between clinical and finance staff.

Testing protocols involved financial metrics, including willingness to pay, time to resolve billing questions, and experiential measures, including patient anxiety levels, perceived transparency, and staff satisfaction. Participants emphasised sustainable implementation and cultural change to achieve full benefits. Patients reported feeling more relieved and cared for when staff addressed financial concerns alongside medical needs. One participant cited, "It showed they understand healthcare involves more than just medical treatment." This finding supports service design theory's emphasis on value co-creation through comprehensive experience design (Thompson et al., 2021).

5. Conclusion

The study concludes that revenue mobilisation challenges at Breman SDA hospital require addressing stakeholder relationships, communication systems, and organisational integration. This study demonstrated that systemic approaches are feasible in missionary hospitals that focus on relationship-building interventions more than technological infrastructure. The research suggests that successful revenue mobilisation strategies must balance external compliance requirements with internal stakeholder needs. The study's HCD principles successfully engaged stakeholders who might otherwise remain peripheral to revenue improvement initiatives. The design thinking process facilitated

collaborative problem solving and generated practical solutions. These validated service design theories' emphasis on value co-creation and innovation, and user-centred systems theory's emphasis on revolutionising factual needs, to achieve higher adoption rates.

The research demonstrates that HCD applications in healthcare settings require adaptation to organisational cultures and operational constraints. Design thinking methodologies generated innovative solutions that address multiple stakeholders' needs concurrently. The study concludes that successful implementation depends on organisational capacity, resource availability, and change management requirements that support solution adoption and sustained utilisation. This confirms systems thinking theory's emphasis on coordinated subsystem changes. The study's proposed solutions are feasible in most Ghanaian hospitals. They offer significant potential for positive impact on revenue performance and stakeholder satisfaction. Solutions emphasising patient education, staff training, and process integration align with existing organisational capabilities and address identified needs and constraints.

The hospital should integrate mobile money payment options into revenue collection systems, addressing concerns cited by 100% of patient participants. Implementation requires establishing merchant accounts with mobile money providers (MTN, Telecel, and AirtelTigo), training cashiers, and updating billing systems to record mobile money transactions.

The hospital should adopt the simplified billing statement prototype tested in this study, which demonstrated 87.5% improved patient comprehension. Implementation requires redesigning standard billing templates to incorporate visual images and clear descriptions of charges. Furthermore, the hospital should integrate financial counselling into clinical care pathways.

Ghanaian hospitals should invest in patient portal technology providing real-time access to billing information, payment options, and insurance coverage details. Technology enhancements should prioritise user experience design, accommodating diverse digital literacy levels and provide information that supports informed healthcare decisions.

Clinical staff can integrate financial counselling and patient education responsibilities into existing patient care workflows without compromising clinical quality or efficiency. Likewise, administrative staff can develop patient engagement abilities that complement their technical skills in billing, collection, and claims processing. Educational institutions can integrate HCD principles and stakeholder engagement competencies into curricula for healthcare administrators, clinical staff, and other healthcare professionals. This can facilitate addressing operational challenges beyond revenue mobilisation in healthcare delivery.

Due to a few limitations, future research should consider quantitative evaluations of revenue mobilisation improvements achieved through HCD interventions. This could provide valuable evidence for policy and investment decisions.

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