CASE STUDY

Applying Human-Centered Design Pedagogy to Develop a Medication Adherence Mobile Application: A Teaching Case Study

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Abstract

Medication nonadherence remains a persistent challenge in chronic disease management, contributing to preventable hospitalizations, disease progression, and escalating healthcare costs. This teaching case study describes a semester-long capstone project in which undergraduate information systems students applied human-centered design principles to develop a mobile application prototype intended to support medication adherence among patients of a community pharmacy network. The pedagogical framework guides students through five structured laboratory assignments spanning empathy research, problem framing, ideation, prototyping, and stakeholder presentation. Each assignment draws on established design thinking methods, while situating the technical work within the realities of patient behavior, pharmacy workflows, and digital health validation. Student teams conducted contextual interviews, developed requirements matrices, and built interactive mockups using industry-standard wireframing tools. The case is suitable for upper-division information systems or health informatics courses and can be adapted for introductory courses by narrowing the scope of individual assignments. Discussion questions address both the healthcare and technical dimensions of the project, encouraging students to consider regulatory constraints, monetization strategies, and the ethical responsibilities inherent in health-facing technology. This paper presents a reusable pedagogical instrument that bridges the gap between abstract design-thinking instruction and the applied demands of digital health development.

Keywords — Human-Centered Design; Medication Adherence; Design Thinking Pedagogy; Digital Health; Mobile Application Development; Health Informatics Education

1 Introduction

The World Health Organization has long recognized medication adherence as a critical determinant of treatment success, estimating that roughly half of patients with chronic conditions in developed nations fail to take medications as prescribed. The consequences are far-reaching: uncontrolled hypertension, poorly managed diabetes, avoidable emergency department visits, and billions of dollars in excess healthcare spending each year. While the causes of nonadherence are multifactorial, spanning forgetfulness, cost concerns, health literacy gaps, and lack of social support, the proliferation of mobile devices has opened new avenues for intervention [1].

Digital health applications have attracted considerable research attention as tools for promoting behavior change, yet many such products are developed without adequate input from the patients and clinicians who will ultimately use them [2]. This disconnect between developers and end users is precisely the kind of problem that design thinking was formulated to address. Rooted in empathy, iterative prototyping, and cross-disciplinary collaboration, design thinking provides a structured yet flexible methodology for tackling complex, human-centered problems [3].

Within information systems (IS) education, design thinking has gained traction as a pedagogical framework that prepares students for the ambiguity and stakeholder complexity of real-world software projects [4]. Yet relatively few published teaching cases situate design thinking exercises within a healthcare context, despite the growing demand for IS professionals who can navigate the regulatory, ethical, and behavioral nuances of health technology [5]. This paper aims to fill that gap.

We present a semester-long capstone case study in which undergraduate IS students partnered with a community pharmacy network to design a medication adherence mobile application. The case guides students through five sequential laboratory assignments that mirror the canonical stages of design thinking: empathize, define, ideate, prototype, and test [3]. Along the way, students engage with real stakeholders, grapple with competing requirements, and learn to translate qualitative insights into functional interface designs.

In this paper, we detail a complete, reusable teaching case grounded in an authentic healthcare scenario that instructors can deploy in upper-division IS or health informatics courses. We include a set of structured lab assignments, templates, and discussion questions that scaffold the design thinking process for students with limited prior exposure to healthcare domains. Finally, we provide an analysis of the pedagogical value of embedding design thinking within a healthcare context, including reflections on student learning outcomes and stakeholder engagement.

2 Literature Review

Design thinking emerged from the traditions of industrial and product design but has since been adopted across disciplines ranging from business strategy to public policy [3]. At its core, design thinking is a problem-solving

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methodology that privileges empathy with end users, reframing of problem statements, rapid ideation, and iterative prototyping [6]. Plattner, Meinel, and Leifer [4] describe the approach as a cycle of understanding, improving, and applying, emphasizing that the process is neither strictly linear nor prescriptive.

Within healthcare, design thinking has been positioned as a vehicle for innovation that can address the complexity and human variability inherent in care delivery. Roberts et al. [7] proposed a design thinking framework specifically for healthcare management, arguing that the methodology's tolerance for ambiguity makes it well suited to environments where clinical, administrative, and patient perspectives frequently diverge. Altman, Huang, and Breland [5] surveyed applications of design thinking in health contexts and found growing evidence that the approach can improve patient engagement, streamline workflows, and surface unmet needs that traditional requirements-gathering techniques overlook.

Norman [8] has argued more broadly that the usability failures of everyday objects, including health technologies, stem from a disconnect between the mental models of designers and those of users. His concept of "human-centered design" aligns closely with the empathy-first orientation of design thinking and has influenced the development of usability standards for medical devices [9]. Giacomin [10] further refined this concept, distinguishing human-centered design from user-centered design by emphasizing the emotional, cultural, and contextual dimensions of the human experience with products and services.

The challenge of medication adherence has been extensively documented across clinical populations. Nonadherence is particularly prevalent among patients managing chronic conditions such as hypertension, diabetes, asthma, and depression, where the absence of immediate symptoms may reduce perceived urgency. The consequences extend beyond individual health outcomes; nonadherence places a substantial burden on healthcare systems through increased hospitalizations and disease complications.

Digital interventions targeting adherence have proliferated in recent years, ranging from simple short message service (SMS) reminders to sophisticated applications incorporating gamification, social support features, and artificial intelligence-driven personalization [11]. Michie et al. [1] developed a framework for designing and evaluating digital behavior change interventions, emphasizing the importance of grounding such tools in behavioral theory and involving target users throughout the development process. Mathews et al. [2] outlined a validation pathway for digital health tools, cautioning that many applications reach the market without adequate evidence of efficacy or usability.

LeRouge and Wickramasinghe [12] conducted a review of user-centered design approaches for diabetes-related consumer health informatics and concluded that involving patients in the design process improved both the usability and the perceived trustworthiness of the resulting technologies. Their findings reinforce the argument that design thinking methods are not merely pedagogically valuable but also practically necessary in health technology development.

While this case study focuses on medication adherence rather than transportation, the underlying challenge is analogous: patients face structural and behavioral barriers that prevent them from fully engaging with the healthcare services available to them. Syed, Gerber, and Sharp [13] documented the ways in which transportation barriers contribute to missed appointments, delayed care, and poorer health outcomes, particularly among low-income and rural populations. Almathami, Win, and Vlahu-Gjorgievska [14] extended this line of inquiry to telemedicine, identifying technology literacy, trust, and interface complexity as barriers to adoption of remote consultation platforms.

These findings suggest that any digital health tool, whether it addresses transportation, medication management, or telehealth scheduling, must contend with a common set of access and engagement barriers. Design thinking, with its emphasis on understanding users' lived experiences, offers a methodology for identifying and addressing these barriers early in the development process [15].

3 The Problem

In this section, we outline the problem presented to the students. All names provided here, including organizations, businesses, and course names, are fictional to protect the anonymity of the stakeholders involved. Ridgeway Community Pharmacy Alliance (RCPA) is a network of four independently owned pharmacies serving neighborhoods in and around Charlotte, North Carolina. The pharmacies collectively fill approximately 2,800 prescriptions per week and provide immunization services, diabetes screening, and basic health education. RCPA has operated for over fifteen years and has built strong relationships with the surrounding communities, many of which are classified as medically underserved.

At a quarterly planning meeting this past February, RCPA's operations director, Dana Holloway, raised a concern that had been growing for several quarters. Refill adherence rates across the network had declined steadily over the preceding eighteen months, and pharmacists were reporting an increase in patients arriving weeks past their refill dates, often after symptoms had worsened. "We are seeing the same patients cycle through emergency rooms for conditions that are manageable with consistent medication," Holloway noted. "Our pharmacists spend time counseling patients at the counter, but once they walk out the door, we have no way to keep them engaged."

Table 1: Alignment of laboratory assignments with design thinking phases.

Lab	Design Thinking Phase	Assignment Title	Primary Deliverable
1	Empathize	Understanding the Problem Space	Reflection essay and system boundary diagram
2	Empathize / Define	Stakeholder Interviews	Interview transcripts and affinity diagram
3	Define	5W+H Structured Analysis	Completed 5W+H worksheet
4	Ideate	"How Might We?" Reframing	Minimum five HMW statements and planning matrix
5	Prototype / Test	Iterative Prototyping and Presentation	Interactive wireframe prototype and stakeholder presentation

Marcus Tran, one of the pharmacy managers, offered additional context. "Many of our patients are older adults or working parents juggling multiple prescriptions. They tell us they forget, or they get confused about which medication to take when. Some of them have told me they stopped taking a medication because they felt better and assumed they no longer needed it. Others mention cost; they skip doses to stretch a prescription."

Holloway continued: "What if we gave patients a tool on their phones? Something simple: a reminder that tells them it is time to take their medication, a way to see their refill schedule, maybe even a short explanation of why each medication matters. We are not trying to replace their doctor. We just want to extend the conversation beyond the pharmacy counter."

The discussion gained momentum. Priya Naidu, who managed RCPA's community outreach programs, pointed out that any such tool would need to accommodate patients with limited technological experience and varying levels of health literacy. "We serve populations where English is a second language and where smartphone use, while common, does not always extend to downloading and navigating apps. Whatever we build has to be approachable."

By the end of the meeting, RCPA's leadership had agreed to seek external support in developing a prototype. The project was structured as a semester-long capstone assignment for an upper-division course titled Applied Design for Information Technology.

4 Methodology

This case study follows an instrumental case study design [16] in which the pedagogical scenario serves as the unit of analysis. The course, Applied Design for Information Technology, enrolled twenty-six students divided into seven teams of three or four. The semester was structured around five laboratory assignments, each corresponding to a phase of the design thinking process. Between assignments, students attended lectures covering relevant theory, participated in class discussions, and received formative feedback from the instructors and from RCPA stakeholders who attended two scheduled review sessions.

Table 1 summarizes the alignment between the lab assignments and the design thinking framework.

4.1 Lab 1: Understanding the Problem Space

The first assignment introduced students to design thinking through a combination of readings, video resources, and guided discussion. Students reviewed Brown's [3] seminal article on design thinking and watched two practitioner presentations illustrating both successes and failures in applying empathetic design to real-world problems. The class then discussed why certain design interventions succeed while others fail, with particular attention to the role of assumptions about user behavior.

After the discussion, students were provided with the RCPA case narrative (Section 3) and asked to work in their teams to produce three deliverables: (1) a written reflection on how design thinking differs from traditional software development methodologies, (2) a diagram identifying the boundaries of the system they would be prototyping, and (3) a preliminary list of the operating environments (e.g., smartphone platforms, pharmacy point-of-sale systems, patient home environments) and stakeholder interactions the system would need to support.

The boundary identification exercise proved particularly generative. Several teams initially scoped the system too broadly, proposing features such as electronic prescribing and insurance claim processing that fell well outside the scope of a patient-facing adherence tool. The exercise of explicitly defining what lay inside and outside the system boundary helped students develop a more disciplined understanding of scope management, a skill that is difficult to teach through lecture alone.

4.2 Lab 2: Stakeholder Interviews

In the second assignment, each team planned and conducted semi-structured interviews with individuals representing key stakeholder groups. The instructors arranged for three RCPA pharmacists and two patient advocates from a local community health organization to participate as interview subjects. Students were encouraged to prepare their interview protocols using the "Ask 5x Why" technique from the Design Thinking Playbook, which prompts interviewers to probe beneath surface-level responses by repeatedly asking why a particular behavior, preference, or frustration exists.

Teams were required to submit interview transcripts along with an affinity diagram organizing the themes that emerged from their conversations. Common themes across teams included: patients feeling overwhelmed by the number of medications they managed; confusion about the purpose of specific medications; reluctance to ask pharmacists "basic" questions for fear of being judged; and a strong preference among older patients for simple, large-text interfaces with minimal navigation steps.

The interview exercise also surfaced an important stakeholder conflict. Pharmacists expressed a desire for the application to include detailed medication information sheets, while patient advocates cautioned that lengthy text would discourage use among patients with low health literacy. This tension became a recurring design challenge throughout the remainder of the semester, and teams were forced to develop creative compromises, such as layered information architectures that presented brief summaries by default with expandable detail sections.

4.3 Lab 3: 5W+H Structured Analysis

The third assignment provided a more structured analytical framework. Teams completed a 5W+H (What, Who, Why, Where, When, How) worksheet adapted from the Design Thinking Playbook. The purpose of this assignment was to consolidate insights from the interviews into a concise problem definition that could guide subsequent ideation and prototyping.

The 5W+H framework required students to articulate each dimension explicitly:

- **What:** A mobile application that helps patients track medication schedules, receive reminders, understand their medications, and communicate refill needs to their pharmacy.
- **Who:** Primary users are patients managing two or more chronic condition medications, with secondary users being pharmacists who monitor adherence trends and respond to refill requests.
- **Why:** Medication nonadherence leads to worsened health outcomes, preventable hospitalizations, and increased healthcare costs; patients report that forgetfulness, confusion, and disengagement are primary barriers.
- **Where:** The application operates on patients' personal smartphones (iOS and Android) and integrates with RCPA's existing pharmacy management system through a secure application programming interface.
- **When:** Patients interact with the application daily for medication reminders and weekly or monthly for refill management; pharmacists access an administrative dashboard during business hours.
- **How:** The team identified six actionable development steps: (1) define minimum viable feature set, (2) create low-fidelity wireframes, (3) conduct usability testing with patient advocates, (4) iterate based on feedback, (5) develop high-fidelity interactive prototype, and (6) present to RCPA stakeholders for validation.

Following completion of the worksheet, a second round of shorter interviews with pharmacists was recommended to validate the problem definition before proceeding to ideation.

4.4 Lab 4: "How Might We?" Reframing

The fourth assignment shifted the focus from problem definition to solution ideation. Each team developed at least five "How Might We?" questions. (HMW) statements, open-ended questions designed to reframe identified problems as opportunities for design intervention. The HMW format, widely used in design thinking practice, prevents teams from converging too quickly on a single solution and encourages exploration of the solution space [6].

Representative HMW statements generated by student teams included:

- How might we remind patients to take their medication without making them feel monitored or controlled?
- How might we explain medication purposes in language that patients with limited health literacy can understand?
- How might we enable pharmacists to identify at-risk patients without adding to their existing workload?

Table 2: Consolidated requirements matrix for the medication adherence application.

Requirement	Components Needed
Cross-platform compatibility	Responsive framework (e.g., React Native, Flutter); testing on iOS and Android devices
Medication reminder system	Local notification engine; user-configurable schedule; snooze and confirmation actions
Medication information display	Layered content architecture; plain-language summaries; expandable detail sections with sourced information
Refill request functionality	Integration with RCPA pharmacy management API; prescription identification via barcode scan or manual entry
Pharmacist dashboard	Secure web portal; adherence trend visualization; flagging of patients with declining refill rates
Accessibility and usability	Large text option; high-contrast mode; minimal navigation depth; support for screen readers
Feedback mechanism	In-app survey after first two weeks of use; optional rating of reminder usefulness
Privacy and data security	HIPAA-aligned data handling; encrypted storage; role-based access control

- How might we make the refill process feel effortless for patients who are uncomfortable with technology?
- How might we incorporate family members or caregivers into the adherence support process without violating patient privacy?

Teams were also required to begin populating a planning matrix (Appendix A) that tracked features, responsible team members, task status, and remaining effort. This matrix served as a lightweight project management tool for the remainder of the semester. The assignment emphasized the distinction between requirements (what the system must do) and features (how the system achieves those requirements), a conceptual boundary that several teams initially struggled to maintain.

4.5 Lab 5: Iterative Prototyping and Presentation

The fifth and final assignment spanned three weeks and encompassed the prototype and test phases of the design thinking cycle. Teams began by reviewing the project requirements, their HMW statements, and the priorities established in Lab 4, then completed a requirements matrix (Appendix B) mapping each requirement to the components, data sources, and interface elements needed to satisfy it.

Table 2 presents a consolidated version of the requirements matrix that reflects common elements across student teams.

With the requirements matrix in hand, teams began constructing interactive wireframe prototypes using Figma and Mockplus. The prototyping phase followed an iterative cycle: teams built an initial version, met with the instructor or a stakeholder representative to receive feedback, revised the prototype, and repeated this cycle for three weeks. Teams were required to document each iteration, including screenshots of the evolving interface and a brief explanation of what changed and why.

The prototyping process revealed several instructive design tensions. One team initially placed detailed medication information on the home screen, reasoning that visibility would improve understanding. Usability feedback from patient advocates, however, indicated that the dense interface was intimidating. The team ultimately adopted a card-based layout that displayed only the medication name, next dose time, and a simple icon indicating whether the dose was upcoming, taken, or missed. Detailed information was accessible through a single tap on the card, a compromise that satisfied both the pharmacists' desire for informational depth and the patients' need for simplicity.

Another team experimented with gamification elements, including a streak counter that tracked consecutive days of full adherence and a weekly summary badge. While the younger patient advocates responded positively to these features, older participants expressed confusion about their purpose. This finding aligned with the broader literature on gamification in health technology, which suggests that game-based elements must be carefully calibrated to the target population [11].

At the conclusion of the prototyping phase, each team prepared a thirty-minute presentation structured as follows: (1) team introductions and relevant background, (2) overview of the design process from empathy research through final prototype, (3) justification of key design decisions with reference to stakeholder feedback, (4) live demonstration of the interactive prototype, (5) identification of remaining gaps and future development priorities, and (6) lessons learned. Presentations were delivered to a panel comprising the course instructors, two RCPA representatives, and a faculty member from the university's School of Health Sciences.

5 Defining the Application

Based on the cumulative work of the five laboratory assignments, the application requirements converged around the following specifications, which were communicated to the RCPA stakeholder team for validation:

6 Defining the Application

The definition below describes the requirements and features that shaped the proposed mobile adherence application.

- Must be cross-platform, supporting both iOS and Android.
- Must accommodate users with varying levels of technological comfort and health literacy.
- Medication reminders must be configurable by time of day, frequency, and medication.
- Must include plain-language medication descriptions written at or below a sixth-grade reading level.
- Must provide a one-tap refill request linked to the patient's pharmacy location.
- Must include a pharmacist-facing dashboard that surfaces adherence trends without requiring manual data entry.
- Must comply with applicable data privacy standards, including HIPAA where relevant.

Based on the cumulative work of the five laboratory assignments, the application requirements converged around the following specifications, which were shared to the RCPA stakeholder team for validation:

- Personalized daily medication schedule displayed on the home screen.
- Push notification reminders with confirmation, snooze, and "I skipped this dose" options.
- Medication information cards with layered detail (summary and expanded view).
- Barcode scanning for adding new prescriptions.
- Weekly adherence summary with visual progress indicator.
- Optional caregiver access with patient-controlled permissions.
- In-app feedback mechanism for reporting usability issues.

6.1 Discussion Questions

The following questions may be used by instructors to guide in-class discussion, written assignments, or examination prompts. Questions marked with (SA) are suitable for short-answer essay responses that require critical thinking and integration of course concepts.

The following healthcare and business questions can be discussed with students.

- If RCPA wanted to monetize this application, what revenue models would be appropriate for a health-facing product, and what ethical considerations would each model raise? (SA)
- What are the advantages and risks of offering health applications at no cost to patients? How might free access affect adoption, trust, and long-term sustainability? (SA)
- Identify at least two stakeholder groups beyond patients and pharmacists whose needs should be considered in the design process. Explain how their requirements might conflict with those of the primary users.
- How would you market a medication adherence application to a population with low digital literacy? Design a brief outreach strategy.
- Discuss the relationship between medication adherence and healthcare costs. How might improved adherence through a digital tool affect RCPA's business model? (SA)

The following information technology and design questions can be discussed with students.

- Compare the strengths and weaknesses of a design thinking approach and a traditional waterfall development approach for this project. Under what circumstances might each be more appropriate? (SA)

- What additional data sources or integrations could enhance the application's value? Consider electronic health records, wearable devices, and insurance systems.
- Describe at least three accessibility features that would be essential for an application serving an elderly patient population. Explain the design rationale for each.
- If you had unlimited time and budget, what features would you add to make this application more effective? Prioritize your list and justify your top three choices. (SA)
- Discuss the privacy implications of tracking medication adherence data. How should the application balance the pharmacist's need for information with the patient's right to privacy? (SA)

7 Discussion

The RCPA medication adherence case produced several outcomes worth examining from both pedagogical and design perspectives.

First, the case demonstrated the value of embedding design thinking within an authentic healthcare context. Students reported in end-of-semester reflections that working with real stakeholders, including pharmacists and patient advocates who had genuine stakes in the outcome, heightened their sense of responsibility and motivated deeper engagement with the design process than purely hypothetical exercises had in prior courses. This observation is consistent with Roberts et al.'s [7] argument that design thinking gains its power from direct engagement with the complexities of real settings.

Second, the iterative prototyping phase surfaced design tensions that could not have been anticipated through requirements analysis alone. The conflict between informational depth and interface simplicity, for instance, forced teams to engage with the concept of layered information architecture, a design pattern they would not have encountered in a traditional lecture setting. Similarly, the mixed reception of gamification features underscored the importance of user segmentation, a principle that Sardi et al. [11] have highlighted in the e-health gamification literature.

Third, the case highlighted the pedagogical importance of the "define" phase. Several teams initially treated the 5W+H assignment as a formality, producing generic responses that failed to constrain the subsequent ideation. Teams that invested more effort in the structured analysis produced more focused HMW statements and, ultimately, more coherent prototypes. This finding aligns with Dorst's [6] observation that the framing of a problem is often more consequential than the generation of solutions.

Fourth, the pharmacy context introduced students to domain-specific constraints, including HIPAA compliance, health literacy standards, and integration with existing pharmacy management systems, that are absent from generic design thinking exercises. Navigating these constraints required students to move beyond the "move fast and break things" ethos sometimes associated with design thinking and to adopt a more measured approach to innovation, consistent with the validation pathway described by Mathews et al. [2].

Finally, the involvement of patient advocates from an underserved community introduced students to issues of equity and access that resonate across healthcare technology development. Almathami et al. [14] have documented how technology literacy and trust influence the adoption of health technology, and the student teams' direct encounters with these dynamics enriched their understanding of the social dimensions of software design. The parallel with transportation barriers documented by Syed et al. [13] is instructive: whether the barrier is geographic distance or digital literacy, the fundamental challenge is the same: connecting patients with the care and resources they need.

Several limitations should be acknowledged. The prototype was not deployed or tested with actual patients; usability feedback was obtained from patient advocates acting as proxies. While this approach is common in educational settings, it limits the ecological validity of the design feedback. The case was also conducted at a single institution with a relatively small cohort of twenty-six students. Generalizability to other institutional contexts, student populations, or healthcare settings cannot be assumed without replication [16].

8 Pedagogical Implications

This case study offers several contributions to the scholarship of teaching and learning in information systems.

The healthcare context proved to be an effective vehicle for teaching design thinking because it naturally foregrounds the human consequences of design decisions. Unlike cases involving consumer products or business process optimization, the medication adherence scenario carried an implicit moral weight that students recognized and responded to. Vink et al. [15] have argued that service design can reshape the mental models of those who engage in it, and the reflective essays submitted by students at the end of the semester suggested that several had experienced precisely this kind of cognitive shift, moving from a technology-first to a patient-first orientation.

The five-assignment structure provided sufficient scaffolding to guide students through the design thinking process without prescribing specific outcomes. The progressive narrowing from broad empathy research (Labs 1

and 2) through structured analysis (Lab 3), ideation (Lab 4), and prototyping (Lab 5) mirrored the "double diamond" model of divergent and convergent thinking that underpins many design frameworks [8]. Instructors who wish to adapt this case for lower-division courses could simplify the scope by, for example, focusing on a single user persona rather than multiple stakeholder groups, or by reducing the prototyping phase from three weeks to one.

The use of real stakeholders, even in limited roles, substantially enhanced the learning experience. Henrikson et al. [17] have noted the importance of longitudinal engagement with communities in public health research, and while a single-semester course cannot replicate the depth of a multi-year partnership, even brief stakeholder interactions grounded the work in a way that fictional scenarios could not. Wiklund, Kendler, and Strochlic [9] emphasize that usability testing of medical devices should always involve representative users; the same principle applies to the educational prototyping of health-facing applications.

Giacomin [10] distinguishes between design that is merely "user-centered" (focused on task efficiency) and design that is "human-centered" (attentive to emotion, context, and meaning). The RCPA case pushed students toward the latter orientation. Designing a medication reminder is a task-level problem; designing a tool that respects patients' autonomy, accommodates their anxieties about technology, and fits into the rhythms of their daily lives is a human-centered problem. The distinction proved to be one of the most valuable lessons of the semester.

9 Conclusion

This paper presented a teaching case study in which undergraduate information systems students applied human-centered design principles to develop a mobile medication-adherence application for a community pharmacy network. The case demonstrates that healthcare contexts provide unusually fertile ground for design thinking pedagogy, in part because they compel students to navigate competing stakeholder needs, domain-specific constraints, and the ethical responsibilities that accompany health-facing technology.

The five-laboratory structure offers a replicable pedagogical framework that can be adapted to other healthcare scenarios, including telehealth scheduling, chronic disease self-management, and community health navigation, and to courses at varying levels of the curriculum. The key ingredients are an authentic problem, access to real or representative stakeholders, structured analytical tools (5W+H, HMW, requirements matrices), and iterative prototyping with feedback.

Future work could extend this case in several directions: deploying the prototype for pilot testing with actual patients, conducting a controlled comparison of student learning outcomes between healthcare and non-healthcare design thinking cases, or expanding the technical scope to include back-end development and integration with pharmacy information systems. The growing importance of digital health in both clinical practice and public health [2] ensures that demand for IS professionals with design-thinking competencies and healthcare domain knowledge will continue to grow.

A Planning Matrix Template

Table 3: Planning matrix template used in Lab 4 and maintained throughout the project.

Feature / Requirement	Task Name	Description and Details	Responsible	Status	Remaining Effort

Note. Status values: OK (completed), Doing (in progress), To Do (not yet started). Remaining effort is estimated in hours.

B Requirements Matrix Template

Table 4: Requirements matrix template used in Lab 5 to map project requirements to implementation components.

Project Requirement	Components Needed

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