From Traditional Pharmacies to Smart Drugstores: A Mixed-Methods Study of IT-Driven Innovation in Myanmar's Healthcare Retail Sector

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Abstract

This study analyzes the effects of information technology (IT) adoption on operational efficiency and customer satisfaction in Myanmar's retail pharmacies. We use a mixed-method design, with structured surveys of 200 pharmacy personnel (from 388 responses collected after data screening) in Yangon and Mandalay, and semi-structured interviews (n=12). Pharmacies are categorized as traditional, semi-digital, or smart based on the use of IT systems (e.g., point-of-sale, electronic prescriptions, digital inventory). Quantitative analysis (including descriptive statistics, ANOVA, and regression with mediation/moderation models) and thematic analysis of interviews were conducted. The results show that smart pharmacies perform significantly better than semi-digital and traditional pharmacies: they have shorter customer wait times, fewer stockouts, and smoother workflows. Higher IT adoption strongly predicts customer satisfaction, and satisfaction mediates the relationship between IT use and overall performance. Moreover, organizational digital readiness (i.e., staff IT skills) and infrastructure resilience (i.e., internet reliability) amplify these benefits. These findings provide empirical evidence and practical guidance for digital transformation in Myanmar's pharmacy sector. Statistical results show significant effects ($p < .001$), with IT adoption positively influencing both operational efficiency and customer satisfaction.

Keywords: *IT Adoption, Retail Pharmacies, Smart Drugstores, Myanmar, Operational Efficiency, Customer Satisfaction Digital Transformation, Technology Acceptance Model (TAM).*

1. Introduction

In many developing countries, community pharmacies serve as the initial point of contact for patients seeking healthcare services. In Myanmar, privately owned retail pharmacies play a central role in healthcare delivery because many rural and peri-urban areas have limited access to formal medical facilities. Traditionally, pharmacies in Myanmar have depended on manual, paper-based systems for recordkeeping and inventory control, resulting in inaccurate records, frequent stockouts, and longer customer waiting times (Shagavah et al., 2025). On the other hand, pharmacies in developed countries already use various IT systems (e.g., point-of-sale and electronic inventory) to make their work more efficient and their service more effective.

Recent developments, including increased smartphone and internet use in Myanmar and changing customer expectations following COVID-19, have increased pressure on pharmacies to modernize (Almeman, 2024). However, the adoption of digital tools remains limited. For instance, paper-based recordkeeping remains common in many pharmacy settings in Myanmar. Barriers, including low digital literacy, poor infrastructure, and weak institutional backing, continue to hinder technology adoption. Moreover, existing research mainly focuses on hospital or public-sector pharmacies, leaving limited evidence on IT-driven innovation in private retail pharmacies in developing countries (Porter & Lee, 2015). This divide makes it harder for pharmacy owners, technology providers, and policymakers to make smart choices.

Digitalization is increasingly viewed as strategic in healthcare. In Myanmar's case, pharmacies are widely recognized as vital frontline providers in the healthcare system, so investing in IT can be framed as building strategic resources (Barney, 1991) that strengthen primary care. This perspective implies that IT capabilities – such as computerized inventory or e-prescriptions – become valuable, hard-to-imitate assets

that can yield sustained advantages. At the same time, clear regulations and reliable infrastructure are prerequisites: as Myo and Tun (2020) note, without government support and dependable connectivity, even well-designed pharmacy IT initiatives may fail to deliver their full benefits.

RQ1: How does IT adoption affect operational efficiency in retail pharmacies?

RQ2: How does IT adoption affect customer satisfaction?

RQ3: Does customer satisfaction mediate the relationship between IT adoption and performance?

RQ4: Do digital readiness and internet reliability moderate this relationship?

To fill this gap, this study examines how using IT influences the quality of service and operational efficiency in Myanmar's retail pharmacies. We specifically analyze three types of pharmacies—traditional, semi-digital, and smart—to see how their level of digitalization affects how well they manage their inventory, how quickly they get work done, and how happy their customers are. We also look into organizational and infrastructural elements (such as staff IT skills and internet access) that may moderate these relationships. The aim is to produce empirical evidence to facilitate the digital transformation of Myanmar's healthcare retail sector.

1.1 Objectives

The main goals of this research are:

(1) to find out how IT integration affects pharmacy performance (efficiency and customer satisfaction),

(2) to compare the performance of different types of pharmacies (traditional, semi-digital, and smart), and

(3) to identify the most important organizational and environmental factors (digital readiness and infrastructure) that affect how well IT is used.

The results are meant to help pharmacy owners, technology vendors, and policymakers determine the best ways to use digital technologies in community pharmacies.

2. Literature Review

In developing countries with limited hospital availability, community pharmacies represent an important access point for healthcare services. Many retail pharmacies in Myanmar continue to rely on limited IT support and manual systems for inventory and recordkeeping. These low-tech methods lead to less efficient operations and increased stockouts and dispensing errors (Lwin & Tun, 2022). As more people get access to the internet and smartphones, community pharmacies have a chance to go digital. However, this is not happening evenly and depends on the area and the pharmacy's capabilities (Htut, 2022; Myo & Tun, 2020).

One of the primary outcomes associated with digital transformation in pharmacies is improved customer satisfaction. International studies show that pharmacies using IT systems can serve customers faster, maintain more reliable inventory, and communicate more effectively, all of which increase satisfaction and loyalty. For example, Almohammed et al. (2023) found that awareness of e-pharmacy services and their convenience substantially enhances customer satisfaction in Saudi Arabia, while Hareem et al. (2023) observed that electronic prescribing in community pharmacies increases service efficiency. In many developing markets, customers tend to perceive digitally equipped pharmacies as more professional and reliable, even though the medical items offered are comparable to those found in conventional outlets (Almohammed et al., 2023; Li et al., 2025). Thus, IT adoption can enhance service quality and improve the patient experience (Alsoweih et al., 2024).

These improvements often translate into heightened customer confidence and perceived professionalism. For instance, Almohammed et al. (2023) found that the convenience of online pharmacy services significantly raises customer satisfaction, and Hareem et al. (2023) noted that digital processes like electronic prescribing enhance service efficiency. Together, these findings suggest that digital transformation in retail pharmacies not only speeds up operations but also bolsters customers' confidence in service quality.

In addition to improving front-counter service, IT can streamline back-end operations and build customer loyalty. Digital inventory systems enable real-time stock tracking and automated reordering,

helping pharmacies reduce waste and stockouts (Shashi, 2023). Similarly, patient-facing tools such as mobile reminders or health applications tend to enhance engagement: Cobelli and Chiarini (2020) report that pharmacies offering mHealth services experience higher customer retention and satisfaction. These findings suggest that technology adoption contributes to both operational efficiency and relational value.

However, the benefits of IT adoption depend strongly on contextual conditions. Organizational readiness and infrastructure significantly influence the effectiveness of IT adoption. Digital literacy among employees, managerial assistance, and dependable internet connectivity are essential facilitators (Myo & Tun, 2020; Xiao et al., 2024). Without these conditions, even advanced systems may fail to improve operational performance or customer outcomes. Pharmacies with better-trained staff and more dependable networks are more likely to benefit from IT implementation. Conversely, areas with poor connectivity or frequent power outages experience weaker impacts from similar IT investments (Myo & Tun, 2020; Shashi, 2023).

Table 1 summarizes key literature on pharmacy IT adoption and performance. Existing studies on Myanmar and comparable healthcare settings, including Htut (2022), Lwin and Tun (2022), and Myo and Tun (2020), highlight a low baseline of digitalization and continuing operational inefficiencies in community pharmacies. Studies from around the world support the view that IT leads to efficiency (Htut, 2022; Porter & Lee, 2015) and satisfaction (Lwin & Tun, 2022; Almohammed et al., 2023), and customer satisfaction typically leads to better overall performance (Guest et al., 2006; Xiao et al., 2024). Notably, studies demonstrate that readiness variables (training, infrastructure) significantly influence these outcomes (Myo & Tun, 2020; Xiao et al., 2024). In summary, the literature indicates that increased IT use in pharmacies is likely to enhance efficiency and customer satisfaction, influenced by service quality and dependent on organizational and infrastructural context.

The reviewed literature suggests that the effectiveness of digital technologies in retail pharmacy settings depends on organizational readiness and external infrastructure support. Prior studies consistently report improvements in workflow efficiency and service quality, while also highlighting contextual constraints in developing economies. However, existing research remains limited in its empirical focus on community pharmacies in Myanmar, particularly regarding how digital adoption translates into operational outcomes. This gap reinforces the relevance of examining IT adoption within local pharmacy settings and provides a foundation for the analytical framework applied in the present study.

Table 1 Summary of key literature on IT adoption and pharmacy performance

Author(s) & Year	Context / Sample	IT Focus	Key Findings	Relevance to This Study
Htut (2022)	Retail pharmacies, urban Myanmar	POS and inventory systems	Digital tools improve inventory accuracy and workflow efficiency	Supports IT → operational efficiency relationship (H_1a)
Lwin & Tun (2022)	Healthcare services, Myanmar	Digital health adoption	Digital services improved service responsiveness and quality	Supports IT → customer satisfaction relationship (H_1b)
Almohammed et al. (2023)	Online pharmacy services, Saudi Arabia	E-pharmacy systems	IT adoption increases customer satisfaction and service convenience	Supports customer satisfaction as outcome of IT adoption
Cobelli & Chiarini (2020)	Pharmacy services, Italy	mHealth and digital services	Digitalization improves customer loyalty and engagement	Supports IT → customer retention and satisfaction
Shashi (2023)	Pharmaceutical supply chains	Digital inventory systems	IT enables real-time tracking and reduces stock inefficiencies	Supports IT → operational efficiency mechanism

Author(s) & Year	Context / Sample	IT Focus	Key Findings	Relevance to This Study
Xiao et al. (2024)	Digital innovation across sectors	Digital transformation	Organizational readiness and infrastructure influence IT outcomes	Supports moderating role of readiness and infrastructure (H_1d)
Li et al. (2025)	Community pharmacies, China	IT utilization in pharmacy practice	IT adoption improves workflow and service quality	Supports general IT adoption → performance relationship
Porter & Lee (2015)	Healthcare organizations	IT-enabled process redesign	IT improves performance when integrated into workflows	Supports IT → performance linkage (theoretical support)

3. Conceptual Framework and Hypotheses

Based on the **Technology Acceptance Model (TAM)** and similar models, we propose that adopting IT is an operational skill that directly improves pharmacy performance. **TAM** and the **Unified Theory of Acceptance and Use of Technology (UTAUT)** suggest that perceived usefulness influences individual technology acceptance (Davis, 1989; Venkatesh et al., 2003), while the **Technology–Organization–Environment (TOE)** framework emphasizes the impact of organizational resources and external context on adoption (Tornatzky & Fleischer, 1990). From a strategic view, the Resource-Based View treats IT as a source of competitive advantage (Barney, 1991), and the theory of diffusion of innovations explains why adoption rates vary across pharmacies.

Based on these perspectives, we develop a conceptual framework (Fig. 1) that connects IT adoption to operational efficiency and customer satisfaction, with organizational digital readiness and infrastructure acting as moderators. Our model posits that enhanced IT integration (e.g., sophisticated POS, e-prescribing, digital inventory) enhances the accuracy, coordination, and speed of pharmacy activities, resulting in increased efficiency (H_1a). At the same time, better service methods should make customers happier (H_1b). We also propose that customer satisfaction plays a role in the link between IT and total pharmacy performance (H_1c) since better processes lead to better service. Lastly, we think that organizational preparedness (staff IT skills) and connection (internet stability) will make these interactions stronger (H_1d). Pharmacies with better support and infrastructure can get more out of IT (Myo & Tun, 2020).

The proposed framework reflects the operational realities of retail pharmacies, where technology adoption influences performance through multiple, interrelated pathways. Rather than treating IT as a standalone input, the framework emphasizes its role in shaping daily pharmacy activities, including transaction processing, inventory coordination, and customer interaction. These processes directly affect service speed and reliability, which are central to both operational efficiency and customer satisfaction. By incorporating organizational readiness and infrastructure conditions, the framework acknowledges that technology outcomes depend on the capacity of pharmacies to integrate digital systems into routine practice. This structure supports a contextual examination of IT adoption within Myanmar's pharmacy sector and guides the empirical testing of the hypothesized relationships.

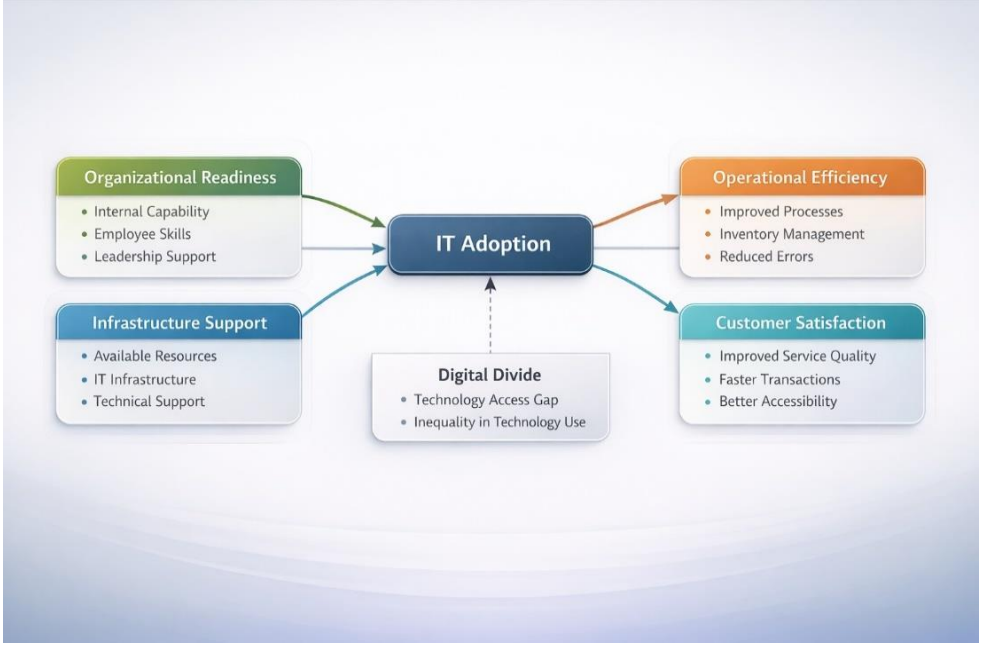

Figure 1 Conceptual framework of IT adoption and pharmacy performance in Myanmar

Using this framework, we propose the following hypotheses, which are also shown in Table 2:

- H_1a: Pharmacies with higher IT integration will exhibit greater operational efficiency than those with lower levels of IT integration.
- H_1b: Pharmacies with higher IT integration will report higher customer satisfaction than those with lower levels of IT integration.
- H_1c: Customer satisfaction will mediate the relationship between IT adoption and operational efficiency.
- H_1d: Organizational digital readiness and internet connectivity will positively moderate the effect of IT adoption on pharmacy performance.

Table 2 Hypotheses, tests, and analytical methods for evaluating IT adoption effects

Code	Hypothesis	Test
H_0	IT adoption has no significant effect on pharmacy performance outcomes.	ANOVA / regression analysis
H_1a	Pharmacies with integrated IT exhibit higher operational efficiency than those without.	One-way ANOVA
H_1b	Smart pharmacies report higher customer satisfaction than traditional pharmacies.	Regression analysis
H_1c	Customer satisfaction mediates the relationship between IT adoption and performance.	Mediation regression
H_1d	Digital readiness/connectivity moderate the effect of IT on performance.	Moderated regression

4. Methodology

This research applied a mixed-methods approach to evaluate the influence of IT adoption on pharmacy performance. The quantitative component used structured surveys, and the qualitative component used semi-structured interviews, allowing for triangulation of results (Creswell & Plano Clark, 2018).

4.1 Research Design

The survey targeted pharmacy owners, pharmacists, and IT managers in independently owned pharmacies. We stratified the sample by level of IT integration (traditional, semi-digital, smart) and by city (Yangon vs. Mandalay). The qualitative interviews provided contextual insights into how IT affects workflows and service delivery.

4.2 Population and Sample

We focused on pharmacies in Yangon and Mandalay, which differ in digital infrastructure and urbanization. Pharmacies were classified into three strata by IT use (Table 2). A total of 388 questionnaires were collected, of which 200 complete responses were retained for analysis, ensuring roughly equal representation across strata and cities (Table 3). This sample size was determined based on a 95% confidence level and a 7% margin of error using Cochran's formula (Cochran, 1977). For the qualitative phase, we selected 12 participants (pharmacists and owners) using purposive sampling and continued interviews until thematic saturation was achieved (Guest, Bunce, & Johnson, 2006). Although 388 responses were collected, only 200 contained complete data for all key variables (IT adoption, customer satisfaction, operational efficiency). Therefore, all statistical analyses in this study used the complete-case sample of N = 200. Following data screening and validation procedures, 200 complete and usable questionnaires were retained for analysis.

Table 3 Sample allocation by city and pharmacy type

City	Stratum	n
Yangon	Traditional	40
Yangon	Semi-digital	40
Yangon	Smart	40
Mandalay	Traditional	26
Mandalay	Semi-digital	27
Mandalay	Smart	27
Total	—	200

4.3 Variables and Measurement

Key constructs and their measurement are described as follows. IT adoption was defined by the extent to which pharmacists utilized point-of-sale software, electronic prescription tools, and digital inventory systems in routine operations. Validated multi-item scales adapted to the retail pharmacy context were applied to capture these dimensions. All items were assessed using a five-point Likert scale ranging from strongly disagree to strongly agree (Htut, 2022; Porter & Lee, 2015).

Operational efficiency was assessed using indicators of transaction speed, stock availability, stockout frequency, and pharmacy workflow coordination. Higher scores reflected faster and more efficient operational procedures (Lwin & Tun, 2022). Customer satisfaction was measured using items adapted from

the SERVQUAL framework, focusing on perceived waiting time, service reliability, clarity of communication, and staff professionalism, which are central attributes in community pharmacy settings (Almohammed et al., 2023).

Organizational digital readiness was captured through self-reported staff digital literacy, while infrastructure resilience was measured using perceived internet stability and frequency of service interruptions. These contextual factors were included to reflect conditions influencing IT effectiveness in Myanmar's retail pharmacy sector (Myo & Tun, 2020; Xiao et al., 2024). All scales demonstrated satisfactory internal consistency, and content validity was assessed through pilot testing. Customer satisfaction scores were calculated only for respondents who completed the full set of satisfaction items, which resulted in a complete-case sample of N = 200 for all analyses.

4.4 Data Collection Instruments

A structured questionnaire (available in English and Burmese) was used for the survey. It included demographic items and the multi-item scales for IT adoption, efficiency, satisfaction, and readiness. For the qualitative interviews, a semi-structured guide probed participants on the advantages and challenges of using IT in their pharmacies, changes in workflows, and perceived customer responses.

4.5 Data Collection Procedure

Quantitative data were collected from January to May 2025 via a combination of online and paper surveys, yielding 200 valid responses. The anonymity of participants was ensured. Qualitative interviews were conducted in person and by phone between June and July 2025, recorded with consent, and transcribed for analysis.

4.6 Data Analysis Techniques

Quantitative data were analyzed using PSPP. Descriptive statistics summarized demographics and IT adoption levels. To test H_1a and H_1b, we used one-way ANOVA and regression analysis to compare efficiency and satisfaction across pharmacy types. Regression analyses (with Hayes's PROCESS models) were used to test mediation (H_1c) and moderation (H_1d) effects. Specifically, we regressed performance outcomes on IT adoption and included satisfaction as a mediator and interaction terms for readiness/internet for moderation. Qualitative interview data were analyzed using thematic analysis to identify recurring patterns related to IT use, efficiency, and service quality.

4.7 Reliability, Validity, and Ethics

All scales demonstrated acceptable internal consistency (Cronbach's $\alpha > 0.70$). To ensure content validity, we adapted well-known scales (like SERVQUAL) to fit the pharmacy setting and tested the instrument beforehand. Ethical guidelines were strictly followed: participation was voluntary and based on informed consent, responses were kept confidential, and data were retained safely. Institutional consent was secured, and adherence to APA ethical norms was maintained (APA, 2020).

5. Results

5.1 IT Adoption Levels

Descriptive analysis confirmed distinct IT adoption patterns across pharmacy types. Overall, POS and inventory management systems were the most widely adopted technologies, while electronic prescribing was less common. Table 4 shows the mean scores for each IT component across all pharmacies (on a 1–5 scale). Smart pharmacies tended to have higher adoption scores on each component.

Table 4 Descriptive statistics of IT adoption indicators (N = 200)

IT Component	Mean	SD
POS software usage	4.12	0.81
E-prescription tools	3.74	0.94
Inventory management systems	4.05	0.86
Staff digital literacy	3.88	0.92

Note: Values are based on the complete-case dataset (N = 200).

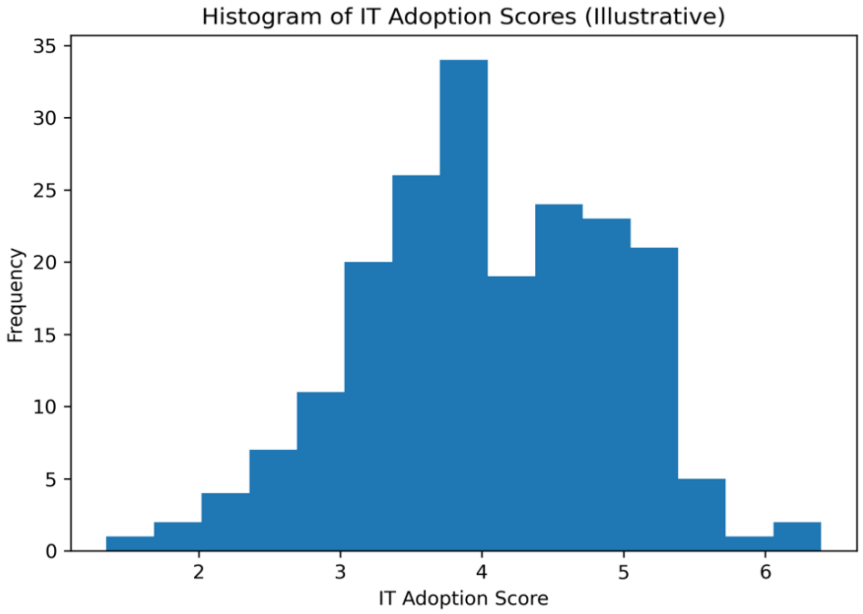

Figure 2. Histogram of IT Adoption Scores

Figure 2 is presented to confirm the normal distribution of the data prior to conducting parametric statistical tests.

Figure 2 illustrates the distribution of IT adoption scores for the complete-case sample (N = 200). The pattern shows that most pharmacies reported moderate-to-high use of digital technologies, which supports the descriptive statistics presented in Table 4.

5.2 Operational Efficiency (H_1a)

As hypothesized, the pharmacy category significantly affected operational efficiency. The ANOVA results ($F(2,197) = 26.4$, $p < .001$) showed that smart pharmacies were more efficient ($M = 4.34$, $SD = 0.61$)

than semi-digital (M = 3.87, SD = 0.69) and traditional pharmacies (M = 3.21, SD = 0.73) (Table 5). The degrees of freedom (2,197) correspond to the complete-case sample size of N = 200. Post-hoc comparisons (Tukey) indicated that all pairwise differences were significant ($p < .01$). This supports H_1a, which posits that higher levels of IT integration are associated with greater operational efficiency (Htut, 2022; Porter & Lee, 2015).

These findings align with prior research. For example, Htut (2022) similarly found that pharmacies implementing POS and inventory systems achieved greater workflow accuracy and efficiency. Likewise, Porter and Lee (2015) emphasize that integrating IT into core workflows significantly boosts organizational performance.

Table 5 Operational efficiency scores by pharmacy type

Pharmacy Type	Mean Efficiency Score	SD
Traditional	3.21	0.73
Semi-Digital	3.87	0.69
Smart Pharmacy	4.34	0.61

5.3 Customer Satisfaction (H_1b)

Regression analysis showed that IT adoption strongly predicted customer satisfaction (Table 6). The model (controlling for pharmacy type and demographics) yielded $R^2 = 0.38$ ($p < .001$), indicating that about 38% of the variance in satisfaction was explained by IT use. The IT adoption coefficient was $\beta = 0.62$ ($p < .001$), which means that higher levels of IT adoption were associated with greater consumer satisfaction. In other words, digital technologies (including faster billing, reliable supply, and clear communication) improved service quality. This supports H_1b and is in line with earlier research that showed that IT adoption enhances customer satisfaction (Lwin & Tun, 2022; Almohammed et al., 2023). These comparisons and regression estimates were based on the complete-case sample (N = 200).

This pattern is consistent with other evidence from Myanmar. Lwin and Tun (2022) similarly reported that introducing digital health services during the pandemic significantly improved service quality and patient satisfaction in Myanmar.

Table 6 Regression of customer satisfaction on IT adoption

Predictor	B	SE	β	p-value
IT Adoption	0.58	0.06	0.62	< 0.001
Constant	1.47	0.21	—	< 0.001

5.4 Mediation and Moderation (H_1c, H_1d)

To test H_1c, we conducted a mediation analysis with IT adoption as the independent variable, pharmacy performance (efficiency) as the dependent variable, and customer satisfaction as the mediator. The indirect effect of IT on performance via satisfaction was considerable (bootstrapped 95% CI excluded zero),

indicating partial mediation. In other words, part of the influence of IT on performance can be described by how it affects customer satisfaction, which is consistent with prior literature on customer satisfaction and service quality in pharmacy settings (Almohammed et al., 2023).

Mediation and moderation analyses were performed using the same complete-case sample of N = 200 to maintain consistency with all previous statistical results.

For H_1d, we examined whether digital readiness and connectivity moderated the relationship between IT and performance. The interaction terms (IT × digital literacy and IT × internet reliability) were both significant ($p < .01$). Specifically, pharmacies that have more stable internet and better IT skills among their staff experienced greater increases in efficiency from IT. When readiness was low, IT did not help efficiency as much; when readiness was high, the same amount of IT led to a bigger improvement in performance.

Qualitative interviews confirmed this: respondents at well-equipped pharmacies stated that staff training and a strong internet connection enabled them to fully utilize digital systems, whereas others encountered technical issues or competence deficiencies that diminished the advantages. This supports H_1d, which posits that the positive benefits of IT are stronger when the organization and infrastructure are in good shape (Myo & Tun, 2020; Xiao et al., 2024).

These findings echo prior studies. For example, Myo and Tun (2020) documented that in Myanmar's pharmacies, those with better infrastructure and staff training saw larger performance gains from IT adoption. This underscores how organizational preparedness and reliable connectivity are key to realizing the full benefits of digital technologies.

In summary, the results demonstrate that adopting IT significantly enhances pharmacy performance, but the magnitude of improvement depends on the organization's readiness and environment. These findings provide empirical support for strategies to invest not only in technology but also in training and infrastructure to realize full benefits. All analyses throughout Section 5 were conducted using the same complete-case dataset (N = 200).

6. Discussion

The findings of this study suggest that IT adoption plays an important role in improving workflow efficiency in retail pharmacies, particularly by reducing transaction time and minimizing stockouts, which are common challenges in traditional pharmacy operations. In addition, the positive relationship between IT adoption and customer satisfaction indicates that digital tools contribute to better service quality, such as faster service delivery and clearer communication with customers. Overall, these results imply that digital transformation in retail pharmacies should not be viewed solely as a technological upgrade, but rather as a broader improvement in operational processes and service experience.

These findings also contribute to existing theoretical frameworks such as the **Technology Acceptance Model (TAM)** and the **Technology–Organization–Environment (TOE)** framework, by demonstrating how contextual factors such as digital readiness and infrastructure influence the effectiveness of IT adoption in developing-country settings.

7. Conclusion, Limitations, and Recommendations

This study provides empirical evidence that transitioning from traditional to smart pharmacies can markedly improve retail pharmacy operations in Myanmar. Pharmacies that have more integrated IT systems experience shorter wait times for customers, better inventory management (fewer stockouts), and smoother processes. Customer satisfaction emerged as an important explanatory factor connecting IT adoption with performance outcomes, highlighting the role of service quality in realizing digital benefits. The findings further indicate that technology adoption alone does not sustain performance improvements without adequate staff digital literacy and reliable internet access. Pharmacies exhibiting stronger digital preparedness and stable infrastructure experienced greater gains from IT adoption.

These results align with international evidence that digital health technologies enhance service delivery when supported by favorable organizational and environmental conditions (Alsoweih et al., 2024;

Xiao et al., 2024). In Myanmar's context, where community pharmacies are frontline health providers, the study suggests that targeted support (such as staff training programs and improvements in internet/electricity infrastructure) will amplify the benefits of digitalization.

These strategies align with broader digital health policy recommendations. Community pharmacies are frontline resources in primary care and can benefit substantially from digital tools that improve access and service quality. Regulatory experts also note that updating guidelines and investing in supportive infrastructure are critical for such innovations (Myo & Tun, 2020).

Additionally, the findings highlight an urgent need for context-specific digital health policies that address implementation barriers in low-resource pharmacy settings. Future research can build on this foundation by evaluating long-term impacts of IT use on patient outcomes and pharmacy workforce development.

7.1 Limitations

Several limitations should be acknowledged. The sample was confined to pharmacies located in Yangon and Mandalay, limiting the generalizability of the findings to rural regions with different infrastructure and resource constraints. Data collection relied on self-reported surveys, which introduce potential response bias related to perceived performance and technology usage. In addition, the cross-sectional design captures associations at a single point in time and does not reflect performance changes as digital adoption evolves. Future studies may address these limitations by including rural samples, applying objective performance indicators, and adopting longitudinal research designs (Shashi, 2023; Xiao et al., 2024). The study also did not consider cost-related factors such as budget limitations or return on investment, which may influence technology decisions in low-resource settings. Furthermore, qualitative interviews were conducted only in urban areas, which may have excluded perspectives from remote pharmacy operators experiencing different barriers.

7.2 Recommendations

Digital transformation in Myanmar's retail pharmacy sector would benefit from a gradual and structured implementation strategy. Priority should be given to core information technologies, particularly point-of-sale and digital inventory systems, due to their direct association with operational efficiency and customer satisfaction. Technology deployment should be accompanied by structured staff training to strengthen digital competencies and support effective system use.

Local training institutions and professional pharmacy associations should be engaged to develop short-term certification programs focused on digital pharmacy tools and workflow integration. These programs can serve as scalable models for rural and peri-urban areas where access to formal IT training remains limited.

From a policy perspective, continued improvement in internet reliability and basic digital infrastructure remains necessary, particularly for pharmacies operating outside major urban areas. Collaboration among professional pharmacy organizations, technology providers, and public institutions would support wider adoption through affordable digital solutions and standardized training programs. Such coordinated efforts support the sustainable development of smart drugstores while maintaining healthcare quality and accessibility in Myanmar.

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