8/15/2025

ITMDA3-B23
Introduction

Prototyping a mobile engagement app: Evaluating push notification strategies for improved customer engagement

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1. Introduction

In today's digital environment, businesses need to maintain quick and effective communication with their customers to stay competitive and build relationships. Traditional channels, such as email newsletters, could possibly face challenges like inbox congestion, delayed delivery, and lower engagement over time, which may limit their ability to capture attention. This has created an opportunity for businesses, especially smaller retail businesses that need to compete for customer attention to explore different communication methods.

By developing a mobile engagement application with push notifications as its main interaction method, this project looks to close this gap. Businesses can share product launches, special offers, and important information in real time with customers thanks to push notifications, which give users instant, visible, and customizable updates. The app is intended to increase customer satisfaction, retention and engagement by providing businesses with control over the content, timing, and frequency of notifications.

In addition to being a functional prototype that small businesses can use to effectively communicate with their customers, the application will also be used as a research tool to examine the efficiency of different push notification strategies. The project will gather information on how notification design, frequency and delivery effect user behaviour in comparison to traditional email communication through focus groups and user surveys.

2. Background of research

In the past few years mobile applications have become essential for customer engagement in both retail and subscription-based business sectors. The COVID-19 pandemic has significantly changed how businesses interact with their customers and accelerated the already ongoing shift toward mobile-first consumer behaviour caused by today's digital transformation. Mobile commerce accounts for more than half of total e-commerce transactions worldwide now, and digital transformation is becoming necessary for business strategy rather than just being cost-reduction (Kilcourse and Rowen, 2023). Small and medium enterprises (SMEs) are also implementing mobile engagement tools to enhance customer experiences, despite there being financial and technical constraints (Ewim *et al.*, 2024). These developments highlight that mobile technologies are needed for a competitive advantage across the market.

Push notifications have become a good mobile engagement tool for direct, real-time communication from businesses to customers. With the correct implementation, push notifications can increase app engagement, retention, and customer loyalty. Reinforcement learning (RL) done on notification scheduling have shown that engagement can be maintained or even improved while reducing notification overload (O'Brien *et al.*, 2022). Similarly, the Temporal Interaction Model (TIM) aims to optimize notification timing and balance immediate interaction with long-term retention, while trying to minimize notification overload (Ji *et al.*, 2024).

Personalizing notifications also enhances their effectiveness. Kim and Park (2025) found that by allowing users to customize the content and frequency of their notifications increased their engagement and also reduced cognitive load and information overload. These findings are consistent with behavioural research that shows when notifications are relevant to a user, they are more likely to respond to the content. A micro-randomized trial on the 'Drink Less' behaviour-change app observed that contextually timed notifications got more engagement than fixed or randomly timed notifications (Bell *et al.*, 2023). For example, notifications were sent shortly after relevant user events.

Despite these studies, research on push notifications specifically within SMEs in retail and subscription-based businesses remain limited. Most research done focuses on large-scale platforms or specific industries like social media and health. There is a gap in empirical data that focuses on how notification strategies can combine timing, frequency, and personalization to benefit smaller retail and subscription-based businesses.

Few studies address how to implement notification strategies like these in mobile applications, especially for cross-platform frameworks like Flutter. Some existing research looks at technical trade-offs including latency, reliability, and battery impact (Bidkar *et al.*, 2024). While Acer et al. (2015) also explores server-side scheduling to reduce energy consumption while not impacting timeliness.

This study will address the mentioned gap by developing and evaluating a mobile engagement application that is capable of implementing customizable push notification strategies. By integrating context timing, adaptive frequency, and the personalization of notifications, the research aims to gather insights that are relevant for SMEs wanting to compete in a mobile-first market.

3. Aim of research

The Aim of this research assignment is to conduct research into varying push notification strategies and the design of an app which centers around them. The research will be done using literature reviews as well as user surveys and findings will be used to build an app to facilitate communication between businesses and their customers as a replacement for email-based communication. The aim of the app is to improve profits for businesses using the app as well as to improve their communication with customers, allowing for better customer-business relations.

4. Problem settings

The problem at hand is that subscription-based businesses struggle with customer interaction when making use of traditional forms of communication such as email. Agachi et al. (2023) found that periodic email prompts did not significantly improve app usage. These types of businesses suffered from low open rates and a decrease in customer engagement due to the fact that these traditional methods were not designed to engage with customers in real time. As a consequence to having these low customer engagement rates, businesses faced difficulties in maintaining customer relationships, retaining their subscribers, and struggled to effectively promote new offers.

This issue is notable in the current digital marketplace, where it is expected from customers that they receive timely, interactive and personalised communication. Low engagement would not only result in a decrease in revenue potential for these businesses, but it would also on their ability to compete with competitors that use platforms that use more dynamic forms of communication, such as push notifications or in-app messaging.

Therefore, this research seeks to assess other real-time communication techniques that can increase customer interaction and retention in subscription-based businesses, providing insights that could inform more effective communication practices.

5. Benefits of study

The mobile app prototype will give smaller businesses the ability to compete with larger enterprise companies in terms of customer engagement capabilities. The prototype will offer customisable push notification options to the companies to give them the opportunity to more effectively communicate with their customer base.

Customers can benefit from this by receiving personalised, timely and relevant notifications. This app will have the ability for users to have more control over their notification preferences which will lead to less irritation and promote long-term engagement with the platform.

The Prototype will also benefit users by providing them an easy way to stay up to date with these businesses. Timely notifications can be sent regarding new stock,

specials or exclusive offers based on what is relevant to the users. This will create a better connection between users and the businesses leading to more transparency and improving customer satisfaction.

Insights gained from the research will guide businesses on the most effective notification timing, frequency, and content type for increasing conversions and retention, helping to avoid strategies that lead to user fatigue (Wheatley and Ferrer-Conill, 2021). By strengthening the relationship between small businesses and their customers, the prototype also has the potential to support local communities, boost customer loyalty, and contribute to sustained economic growth.

6. Delimitation of study

This study's data collection will be conducted through online surveys and focus groups, primarily focusing on small/medium businesses. This study is limited to push notification strategies on customer engagement, not SMS, social media

The application will be a prototype and will not be commercially deployed. The research methodology for this study is a pragmatist paradigm with the use of recent Q1 journals as resources.

7. References

Acer, U. *et al.* (2015) ‘Energy Efficient Scheduling for Mobile Push Notifications’, *EAI Endorsed Transactions on Energy Web* [Preprint]. Available at: https://doi.org/10.4108/eai.22-7-2015.2260067.

Agachi, E. *et al.* (2023) ‘The Effect of Periodic Email Prompts on Participant Engagement With a Behavior Change mHealth App: Longitudinal Study’, *JMIR mHealth and uHealth*, 11, p. e43033. Available at: https://doi.org/10.2196/43033.

Bell, L. *et al.* (2023) ‘How Notifications Affect Engagement With a Behavior Change App: Results From a Micro-Randomized Trial’, *JMIR mHealth and uHealth*, 11, p. e38342. Available at: https://doi.org/10.2196/38342.

Bidkar, D. *et al.* (2024) ‘Developing user-facing experiences in Android applications: A focus on push notifications and background operations’, 11, pp. 721–725. Available at: https://doi.org/10.5281/zenodo.14235549.

Ewim, C. *et al.* (2024) ‘Customer-Centric digital transformation framework: Enhancing service delivery in SMES for underserved populations’, *International Journal of Management & Entrepreneurship Research*, 6, pp. 3493–3516. Available at: https://doi.org/10.51594/ijmer.v6i10.1658.

Ji, H. *et al.* (2024) ‘TIM: Temporal Interaction Model in Notification System’, *Proceedings of the 2024 International Conference on Multimedia Retrieval* [Preprint]. Available at: https://doi.org/10.48550/arXiv.2406.07067.

Kilcourse, B. and Rowen, S. (2023) *The Digital Transformation of the Retail Business Model*. Available at: https://www.impinj.com/getmedia/3a19672f-9c81-4299-844d-c1aee1ed7bf3/The-Digital-Transformation-Of-The-Retail-Business-Model.pdf.

Kim, J. and Park, S. (2025) ‘Empowering Individual Preferences in Mobile Notifications: A Balanced Approach to Cognitive Load and Information Needs’, *IEEE Access*, 13, pp. 44936–44950. Available at: https://doi.org/10.1109/ACCESS.2025.3549033.

O’Brien, C. *et al.* (2022) ‘Should I send this notification? Optimizing push notifications decision making by modeling the future’, *ArXiv*, abs/2202.08812. Available at: https://doi.org/10.48550/arXiv.2202.08812.

Wheatley, D. and Ferrer-Conill, R. (2021) ‘The Temporal Nature of Mobile Push Notification Alerts: A Study of European News Outlets’ Dissemination Patterns’, *Digital Journalism*, 9(6), pp. 694–714. Available at: https://doi.org/10.1080/21670811.2020.1799425.