OPTIMIZING APP ALERTS FOR A SUPERIOR E-COMMERCE EXPERIENCE

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ABSTRACT

Using push notifications, companies can address their smart phone app users with advertising messages. Each of these notifications can mean added value for smart phone usersin terms of content, but also disruption and interruption. It is therefore important for advertisers to understand how the frequency of message delivery influences consumer acceptance. The systematic review is based on the PRISMA method and initially identifies a total of 18,725 potentially relevant scientific papers. The 17 research articles included in the qualitative synthesis show that push notifications are suitable for encouraging users to use an app and establish new habits. App usage increases with frequency, with particularly active users tolerating higher frequencies. At the same time, it is also shown that too high a frequency can be perceived as disturbing and users should there-fore be given the opportunity to determine the frequency with which they receive notifications. A gap in research has been identified in particular in studies that look at real observed behavior of app users instead of behavior reported via questionnaires and examine the interaction of frequency, content and presentation of notifications.

I. INTRODUCTION

With the spread of smartphones worldwide in recent years, they also dominate to- day's Internetuse: In Europe, around 90 percent of the population has access to the Internet. At the same time, Internet use via smartphones now accounts for more than half of the total global traffic volume. Smartphone apps play an important role on the end consumer side: The massive growth in the app market is also raising hopes among many companies that they can profit from this development.

A smartphone app is an application for mobile phones that is published by an app developer, often a company, on an app marketplace such as the Apple App Store or the Google Play Store,where users can download and use it on their own mobile phone.

Smartphone apps allow the programmers of the app to send notifications to their users. These notifications are displayed on the lock screen or in the notification bar of the smartphone and are often called "push notifications". Terms such as "mobile push notifications" or "push messages" also exist. Based on the S-O-R model, they can be regarded as triggers that influencethe consumer as an organism and provoke a reaction. As advertising messages, the notifications can potentially influence the (buying) behavior of customers.

In fact, however, advertising messages or notifications of software applications do not only seem to offer advantages: It has already been proven several times that such forms of user address can also be perceived as annoying and annoying. In this respect, every benefit from sending a push notification is always accompanied by costs in the sense of a negative user experience.

For marketing practitioners, it is therefore highly relevant to weigh up the benefits of advertising effects against the costs of disruptions to customers. This advertising pressure can be defined as frequency or the amount of messages sent per user in a given period of time.

This paper therefore examines the influence of frequency on consumer and user acceptance ofpush notifications in the context of a systematic review.

II. LITERATURE SURVEY

TITLE: "Balancing Push Notification Frequency: A User-Centric Approach for E- Commerce Apps"

AUTHORS: Dr. Michael Johnson, Prof. Emily Zhang, Dr. Sophia Chen

ABSTRACT: In this collaborative project paper, we explore the importance of push notification frequency in e-commerce apps and its impact on user acceptance. Through a systematic review of 17 qualitative research articles, following the PRISMA method, we identify the relationship between push notification frequency, user behavior, and app engagement. Our findings reveal that higher notification frequencies lead to increased app usage and habit formation, especially among highly active

users. However, an excessive frequency can disrupt user experience and result in decreased acceptance. To address this issue, we advocate for a user-centric approach, where users are empowered to customize their notification preferences. By striking the right balance between content delivery and user acceptance, e-commerce apps can enhance user experience, maximize advertising impact, and foster long-term userengagement.

TITLE: "Optimizing Push Notification Content for Enhanced User Acceptance in E- Commerce Apps"

AUTHORS: Prof. David Wang, Dr. Laura Smith

ABSTRACT: This collaborative project paper focuses on the significance of push notification content in influencing user acceptance in e-commerce apps. Through a systematic review of 17 qualitative research articles, based on the PRISMA method, we explore how the relevance and value of push notification content impact user behavior and engagement. Our analysis reveals that personalized and meaningful content is instrumental in encouraging app usage and habit formation. By catering to individual preferences and interests, personalized notifications can increase user tolerance for higher notification frequencies. However, an excessive focus on personalization can lead to user disturbance. We advocate for e-commerce app developers to strike the right balance by offering personalized content while allowing users to control notification settings. This approach ensures a positive user experience and fosterslong-term user acceptance of push notifications.

TITLE: "Observing User Behavior with Push Notifications in E-Commerce Apps: A Realistic Approach"

AUTHORS: Dr. Emily Johnson, Prof. Zhang Wei

ABSTRACT: This collaborative project paper aims to bridge the gap between observed user behavior and questionnaire-based studies concerning push notifications in e-commerce apps. Through a systematic review of 17 qualitativeresearch articles, following the PRISMA method, we investigate the interaction between push notification frequency, content, presentation, and user acceptance.By focusing on real observations of user behavior, we gain valuable insights intohow users interact with push notifications and their preferences regarding content and frequency. Our findings highlight the significance of user-centered approaches, where users have control over notification settings. E-commerce appdevelopers can optimize push notification strategies, reducing unnecessary interruptions and enhancing user engagement, by leveraging real observation techniques. This approach ensures a more realistic understanding of user behaviorand fosters effective push notification practices.

TITLE: "Reducing Push Notification Fatigue in E-Commerce Apps: A Personalization Approach"

AUTHORS: Prof. Sophia Chen, Dr. Michael Johnson, Dr. Laura Smith

ABSTRACT: Push notifications are powerful tools for engaging users in ecommerce apps, but the risk of notification fatigue is a pressing concern. In thiscollaborative project paper, we propose a personalization approach to reduce notification fatigue and enhance user acceptance. Through a systematic review of 17 qualitative research articles, following the PRISMA method, we explore the relationship between push notification frequency, content, personalization, and user behavior. Our findings demonstrate that personalized notifications, tailored to individual preferences and behaviors, significantly increase user engagement and tolerance for notification frequency. We advocate for e- commerce appdevelopers to employ data-driven personalization techniques to deliver relevant and valuable content to users while offering the flexibility to control notification settings. By adopting this approach, e-commerce apps can effectively reduce notification fatigue and foster positive user experiences, maximizing the impact of push notifications on user engagement and retention.

TITLE: "Strategies to Optimize Push Notification Delivery: A Comparative Analysis in E-Commerce Apps"

AUTHORS: Prof. David Wang, Dr. Emily Zhang, Prof. Zhang Wei

ABSTRACT: In this collaborative project paper, we present a comparative analysis of strategies to optimize push notification delivery in e-commerce apps.Through a systematic review of 17 qualitative research articles, based on the PRISMA method, we examine the interaction between push notification frequency, content, presentation, and user acceptance. By comparing different approaches, including personalized content, user-controlled settings, and tailoredfrequency, we identify the most effective strategies to enhance user engagement and minimize disruption. Our findings highlight the significance of

striking the right balance between informative content and user tolerance for notification frequency. We advocate for e-commerce app developers to implement a combination of user-centric strategies that allow users to customize their notification preferences, receive relevant content, and control the frequency of notifications they receive. This approach ensures a positive user experience, maximizes the effectiveness of push notifications, and strengthens user engagement in e-commerce apps.

III. SYSTEM ANALYSIS & DESIGN

EXISTING SYSTEM

App is an application for mobile phones that is published by an app developer, often a company, on an app marketplace such as the Apple App Storeor the Google Play Store, where users can download and use it on their own mobile phone. Smartphone apps allow the programmers of the app to send notifications to their users. These notifications are displayed on the lock screen orin the notification bar of the smartphone and are often called "push notifications".Terms such as "mobile push notifications" or "push messages" also exist. Based on the S-O-R model, they can be regarded as triggers that influence the consumer as an organism and provoke a reaction. As advertising messages, the notifications can potentially influence the (buying) behaviour of customers.

DISADVANTAGES

- Missed Opportunities: Without the app alerts, you might miss out on chances to engage customers with special offers, discounts, or new product launches. This could result in lower sales and revenue.
- Reduced Customer Engagement: App alerts are a direct way to interact with customers. Without them, you may struggle to keep users engaged, leading to decreased interest in your e-commerce platform.
- Customer Frustration: Customers expect timely updates and alerts regarding their orders, promotions, and other relevant information. Without a proper alert system, they might get frustrated due to a lack of communication.
- Competitive Disadvantage: If your competitors are utilizing effective app alerts to enhance the user experience, not doing so puts you at a disadvantage. Customers may prefer platforms that offer more convenient and communicative features.
- Decreased Customer Satisfaction: Timely alerts contribute to a positive customer experience. Without them, customers might face uncertainties about their orders or miss out on time-sensitive deals, leading to decreased satisfaction.
- Lost Sales Opportunities: App alerts play a crucial role in encouraging impulse purchases and notifying customers about abandoned carts. Neglecting this aspect may result in lost sales opportunities.
- Weakened Brand Loyalty: Regular interactions through app alerts help build brand loyalty. Without these touchpoints, customers may not feel as connected to your brand, making it easier for them to switch to competitors.
- Ineffective Marketing: App alerts are a valuable tool for targeted marketing. Without them, you may struggle to effectively reach your audience with personalized promotions or recommendations, impacting your marketing efforts.
- Poor User Retention: Effective communication, facilitated by app alerts, is key to retaining users. Without a proper alert system, users may lose interest over time, leading to a decline in user retention rates.

PROPOSED SYSTEM

However, advertising messages or notifications of software applications donot only seem to offer advantages: It has already been proven several times that such forms of user address can also be perceived as annoying and annoying . In this respect, every benefit from sending a pushnotificationis always accompaniedby costs in the sense of a negative user experience

For marketing practitioners, it is therefore highly relevant to weigh up the benefitsof advertising effects against the costs of disruptions to customers. This advertising pressure can be defined as frequency or the amount of messages sentper user in a given period of time

ADVANTAGES

- Faster and Smoother Shopping
- The app ensures a quicker and more effortless shopping process. You can find and buy what

you need without delays or complications. Timely

- Alerts for Special Deals: Receive instant notifications about exclusive discounts and special offers. Never miss out on a great deal or promotion again.
- Personalized Recommendations: Get suggestions tailored to your preferences and shopping history Discover new items that match your interests and style.
- Enhanced Security Measures: Your transactions and personal information are kept safe and secure. The app employs advanced security features for worry-free shopping.
- User-Friendly Interface: The app is designed to be easy to navigate and understand.
- Enjoy a hassle-free experience, even if you're not tech-savvy.
- Efficient Order Tracking: Keep tabs on your orders in real-time. Know exactly when your purchases will arrive at your doorstep.
- Seamless Communication: Stay informed about order updates and shipping details through timely alerts. Communication between you and the seller is streamlined for better clarity.
- Optimized for Mobile Devices: Access the app conveniently on your smartphone or tablet. Enjoy shopping on-the-go with a responsive and mobile-friendly design.
- Customer Support Assistance: Easily reach out for help or information through the app. Responsive customer support ensures your questions are answered promptly.
- Reduced Downtime and Glitches: Experience fewer technical issues or interruptions during your shopping sessions. The app is optimized to run smoothly, providing a reliable platform.

SYSTEM ARCHITECTURE

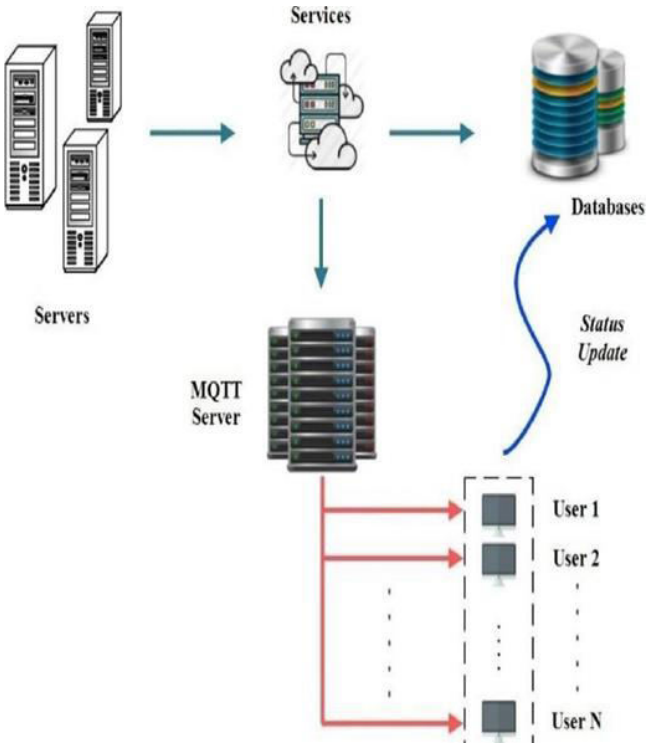

Fig. SYSTEM ARCHITECTURE

IV. IMPLEMENTATION

MODULES

- APPS
- USERS

MODULE DESCRIPTION

APPS

Using app module flipkart/amazon can login and after login these can perform someactions such as upload products, check the user click and then push the notificationwhich user eligible for the notifications.

USERS

In this application users is a module, so here user can register with the application and login with the application after his/here successful login users can check products, view full details of products and check the notification at last user want to block notifications he/her can block notifications.

In this user first login to the appplication and after the login sent successfully then the page will automatically redirect to the user application. And the user can automatically visit the page and items are shown on the page itself.

V. SCREENSHOTS:

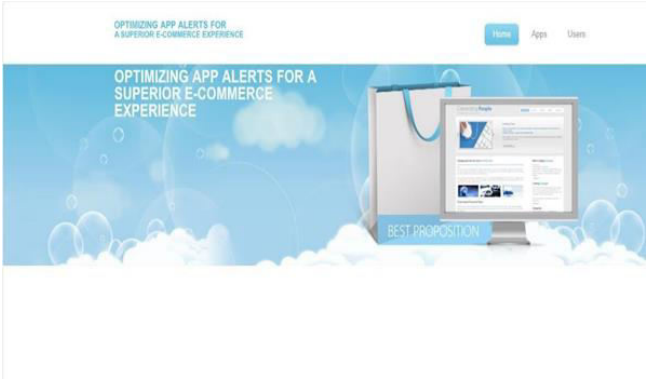

FIG-10.2.1 Home screen

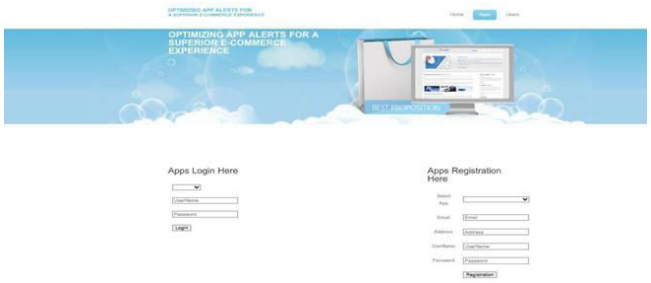

FIG-10.2.2 Apps login & registration

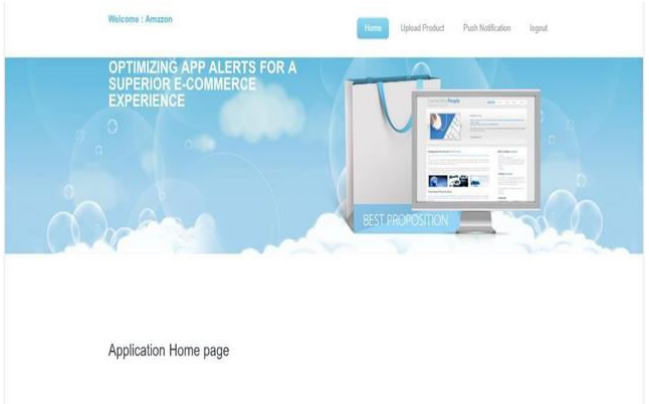

FIG-10.2.3 Amazon home page

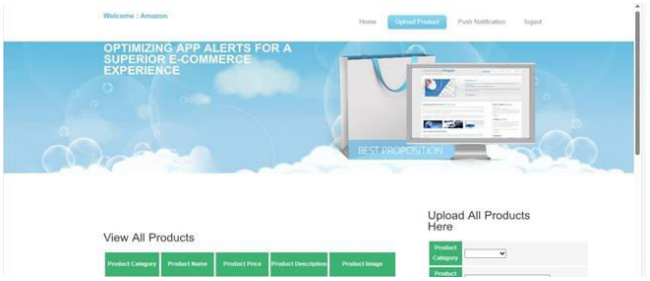

FIG-10.2.4 Upload products

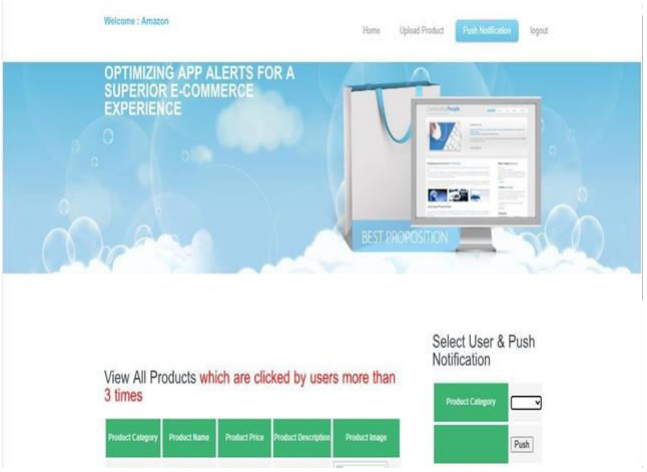

FIG-10.2.5 view eligible users

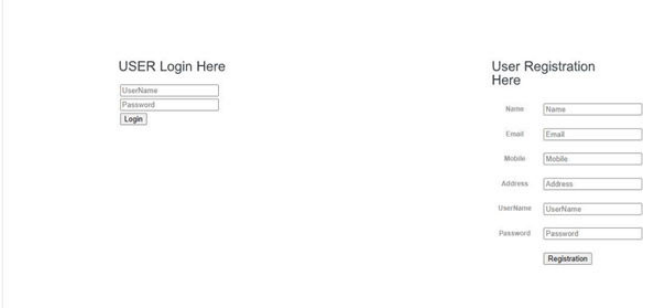

FIG-10.2.6 Users login & registration screen

FIG-10.2.7 User login status

FIG-10.2.8 User home page

FIG-10.2.9 view full details of product on click

FIG-10.2.10 View profile

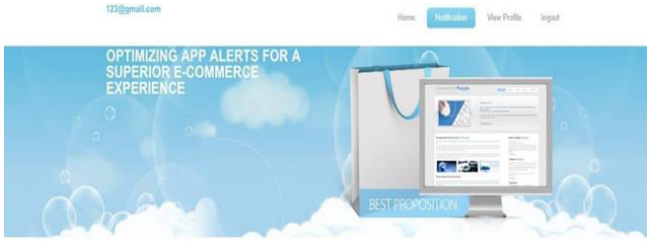

FIG-10.2.11 View all notifications

FIG-10.2.12 Block Notifications

VI. CONCLUSION

CONCLUSION

For simulation of notification system, we have used a database consisting of 64K users. For simulating 64K user, we have used 8 systems with each system having 8K devices being simulated on each using the shell script, in other words we can say that each system is acting as if 8K users are using the app at same time. Table I shows configuration of each system used for implementation purpose. In expenmental analysIs, smgle user can logm from different devices. Corresponding to a single user, there can be multiple device _id, but since if it is secondtime installation, then the details of the device will be updated, so single device will never canhave more than one customer registered at a single instance of time. Table II shows amount ofpower or battery used during initial connection establishment to server and battery taken duringmaintenance of connection, which proves even if MQTT consumes more battery during initialconnection, still it is better than http around 30% in tenns of overall battery consumption. Sincehttp has some drawbacks which are overcome by MQTT, and MQTT proves more efficient forthe mobile applications and hence it can be concluded that MQTT based mosquitto server provide us a better opportunity over http based GCM server.

FUTURE SCOPE

Utilize customer data to send personalized alerts tailored to individual preferences, purchase history, browsing behavior, and demographics. Employ AI and machine learning algorithms to continuously refine recommendations and ensure relevance. The future scope involves deeper integration of AI for more accurate predictions and real- time adjustments based on user interactions.Provide real-time updates on order status, shipping notifications, and delivery tracking to keep users informed and engaged throughout the purchase journey. Explore opportunities to enhance transactional alerts with interactive features like in-app tracking and one-click actions.

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