PAKFUEL



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DEPARTMENT OF COMPUTER SCIENCE

**BALOCHISTAN UNIVERSITY OF INFORMATION TECHNOLOGY, ENGINEERING, AND MANAGEMENT SCIENCES**

**Fall 2023**

PAKFUEL



By

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A project report submitted to the

**Department of Computer Science**

in partial fulfillment of requirements for the degree of Bachelor of Science in Computer Science at Balochistan University of Information Technology, Engineering and Management Sciences

Fall 2023

Signature of Supervisor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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# **Undertaking**

It is certified that this work titled “PAKFUEL” is our own work. The work has not been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged / referred to.

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# **Acknowledgements**

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# **Dedication**

This project is truly dedicated to all of the people who have supported and believed in us throughout the entire experience, including our instructor, friends, fellow students, family members, and anybody else who has shown us that we can succeed. We dedicate this to our loved ones.

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| *\*All information in this form should be typed.* **Date:** 28 / November / 2023 | | | | |
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**Declaration**

We agree that the information related to the project titled Pakfuel (Digitalizing Payment and Service System for Vehicle Fueling and Maintenance) under the supervision of Dr. Mehmood Baryalai will be kept confidential. This includes:

1. All the technical and scientific data relating to project discussions, research, design and simulation, processes, and business and/or marketing plans that are developed or are under development.
2. This information will be disclosed solely to individuals who have a signed non-disclosure agreement with, or who have express approval from **Dr. Mehmood Baryalai**, in written, to receive this information.

Understood and agreed on the \_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_.

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# **Abstract**

The **Pakfuel** project marks an innovative attempt composed to redefine the fuel purchasing landscape. In the pursuit of transforming user experiences within the fuel industry, our project integrates innovative technologies and user-centric features. The overarching goal is to streamline transactions, introduce captivating loyalty programs, and deliver an unparalleled fueling experience.

In response to the inefficiencies and inconveniences widespread in traditional fuel purchase processes, **Pakfuel** emerges as a catalyst for change. The project envisions a seamless user journey, allowing individuals to effortlessly select and pay for their desired fuel amount through a dedicated mobile application, eliminating the constraints of conventional payment methods. A key aspect of **Pakfuel** revolves around the implementation of dynamic loyalty programs. Users engaging with the platform will have the opportunity to accrue points or enjoy discounts based on their transactions, fostering enduring relationships between consumers and petrol station proprietors.

The user interface design stands as a foundation stone, prioritizing intuitive and aesthetically pleasing interactions. Transparent and secure transaction processing workflows form the backbone of **Pakfuel**. Leveraging reliable payment gateways, transaction logs, and real-time notifications, the project addresses the imperative need for accountability, simultaneously mitigating the risk of theft or fraud.

In conclusion, **Pakfuel** encapsulates a vision for a future where fueling becomes a seamlessly integrated and rewarding experience. This abstract provides a succinct overview of the project's core objectives, emphasizing its potential to redefine industry norms and deliver a superior fueling experience for a diverse audience.

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**Chapter No. 1**

# **INTRODUCTION**

## **Background**

The **Pakfuel** project is situated within the realm of the fuel and service industries, aiming to revolutionize the traditional processes associated with fuel purchasing at petrol stations. The prevalent methods, often dependent on cash transactions at the pump, have resulted in a suboptimal user experience and presented challenges for petrol pump owners in terms of customer retention and transparent payment systems.

In this context, **Pakfuel** becomes a beacon of innovation, addressing the inefficiencies and limitations of current fueling practices. The project is designed to provide a digitalized alternative, leveraging advanced technologies to offer a more user-friendly and efficient fuel purchasing experience.

## **Problem statement**

The fuel industry is currently facing significant challenges due to the persistent use of cash in gas transactions, leading to inconveniences and safety concerns for both consumers and petrol pump owners. The outdated payment method contributes to security risks associated with carrying cash, and a lack of incentives for customer loyalty. Petrol pump owners are confronted with difficulties in maintaining customer satisfaction, witnessing reduced sales, and dealing with an increased risk of theft.

In response to these challenges, the **Pakfuel** project has emerged with a solution that goes beyond addressing these issues. This innovative initiative aims to revolutionize the fueling experience by introducing a modernized, digitalized payment and service system. The primary objective is to create a seamless and secure process for users, mitigating the inconveniences associated with traditional payment methods. Importantly, the project also recognizes the vital aspect of customer retention.

By embracing this forward-thinking approach, **Pakfuel** not only seeks to enhance the overall efficiency and transparency of transactions at petrol stations but also aims to foster customer loyalty. The introduction of digitalized payment options is expected to provide customers with added convenience and incentives, thereby improving the overall satisfaction of both consumers and petrol pump owners. This strategic focus on customer retention further solidifies **Pakfuel's** commitment to ensuring a more satisfactory experience for all stakeholders in the fueling process.

## **Objective**

The objectives of the **Pakfuel** project are strategically aligned to address the identified challenges in the conventional fuel purchasing process. These objectives are framed using the SMART criteria to ensure clarity, measurability, achievability, relevance, and time-bound specificity.

1. **Implement Seamless Digital Payment:**

* **Smart Goal**: Integrate a digital payment system into the Pakfuel app within the first six months of development.
* **Contribution to Problem**: Reducing reliance on cash transactions, enhancing user convenience, and streamlining the fuel purchasing process.

1. **Enhance Customer Loyalty Programs:**

* **Smart Goal**: Establish a dynamic loyalty program, allowing users to earn points or discounts, within the first eight months of development.
* **Contribution to Problem:** Fostering customer loyalty, encouraging repeat transactions, and addressing the challenges of customer retention for petrol pump owners.

1. **Optimize User Interface Design:**

* **Smart Goal:** Complete the design and implementation of an intuitive and user-friendly interface within the first five months of development.
* **Contribution to Problem**: Improving the overall user experience, making fuel transactions more accessible and engaging.

1. **Introduce Transparent Transaction Processing:**

* **Smart Goal**: Implement secure payment gateways, transaction logs, and real-time notifications within the first ten months of development.
* **Contribution to Problem**: Enhancing transparency in payment systems, mitigating the risk of theft or fraud, and establishing a reliable mechanism for both users and petrol pump owners.

Achieving these objectives will contribute significantly to addressing the identified problem. The implementation of a seamless digital payment system, coupled with enhanced loyalty programs and an optimized user interface, will collectively revolutionize the fuel purchasing experience. Transparent transaction processing will not only ensure the security of transactions but also build trust among users and petrol pump owners. The SMART goals provide a structured roadmap for the project, guiding its development toward effective solutions to the challenges within the fuel industry.

## **Scope**

The **Pakfuel** project ambitiously aims to transform the fuel industry by digitalizing payment and service systems at petrol stations. The project's focus is on streamlining the fuel purchasing process and improving user experiences. However, certain boundaries and limitations are acknowledged. The project concentrates primarily on petrol purchasing, excluding other services. Furthermore, broader industry issues such as fuel pricing and geopolitical factors are beyond the project's scope.

The project specifically covers the development of a secure and user-friendly digital payment system, the creation of engaging loyalty programs to enhance customer retention, optimization of the user interface for a more intuitive experience, and the integration of secure payment gateways, transaction logs, and real-time notifications.

## **Significance of the Study**

## **Organization of the Thesis**

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**Chapter No. 2**

# **LITERATURE REVIEW**

In recent years, the fuel and service industries have witnessed a surge in technological innovation aimed at addressing the inefficiencies prevalent in traditional fuel purchasing processes. The emergence of projects like Pakfuel reflects a growing recognition of the need for transformative solutions in an industry that has long been reliant on conventional methods, particularly cash transactions at petrol stations.

This literature review serves as a critical component of the research project, offering a comprehensive overview of existing knowledge and research related to the issues addressed by the Pakfuel. Its primary purpose is to contextualize the project within the broader academic and practical landscape, providing a foundation for understanding the challenges faced by the fuel industry and the potential impact of Pakfuel's proposed solutions.

**Digitalization in the Fuel Industry**

The implementation of digital changes within the fuel and energy sector results in heightened efficiency and streamlined financial record-keeping [1]. The fuel and energy industry is undergoing a significant digital transformation, with new technologies being implemented to increase competitiveness [2].

The application of digital technologies in the oil and gas industry enhances sustainable development and the competitiveness of emerging industrial enterprises by implementing intelligent management strategies rooted in Digital Analytics [3]. Legal regulation is also a key consideration, particularly in the area of procurement digitalization [4]. From digital payment systems to advanced supply chain management, this digital evolution marks a pivotal moment, promising a future where convenience, security, and sustainability converge to redefine the landscape of fuel-related transactions and services.

**Challenges of Cash Transactions**

The challenges of cash transactions are multifaceted and vary across different contexts. In the Philippines, [5] highlights the need for coordinated efforts between the central bank and the private sector to address the limitations of the financial system. M. Lutsyk [6] emphasizes the urgency of reducing cash circulation to minimize associated risks, but also notes the socio-economic factors that constrain the use of non-cash transactions. Tetiana Matkivska, O. Popovych [7] focuses on the problems and proposed improvements in the accounting of cash transactions, particularly in the context of business entities.

**Customer Loyalty Programs in Fuel Retail**

Research on customer loyalty programs in the fuel retail industry highlights the need for innovative, personalized programs that create and increase customer value [8]. However, the success of these programs is not guaranteed, as they may not always lead to ultimate loyalty [9]. In fact, other factors such as product range, price, location, and customer relationships may be more influential in customer satisfaction [10]. Despite this, the implementation of loyalty programs continues to be a popular strategy, with a significant number of loyalty cards being distributed in the retail sector [11].

**Digital Payment using E-Wallet**

Research on digital payment using e-wallets has explored various aspects of their usage and implementation. [12] conducted a study in Coimbatore district, focusing on stakeholder perspectives, while [13] proposed a mobile-based secure digital wallet for peer-to-peer payment systems. N. Bakar et al. [14] developed a transactional framework for e-wallets in the digital economy, with a specific focus on Islamic financial engineering. These studies collectively highlight the potential of e-wallets in enhancing convenience, security, and efficiency in digital transactions.

## **Review of Similar Applications**

The existing literature on applications, studies, and projects related to fuel transactions, particularly those addressing challenges similar to Pakfuel, reveals a burgeoning landscape of digital innovations within the fuel industry. Several key themes and trends emerge, providing insights into the strengths and weaknesses of previous approaches and methodologies.

**Digital Payment Solutions:**

A consistent theme across existing literature is the emphasis on digital payment solutions. Applications like MobilePay Fuel, PSO Fuellink, Shell BoxFuel, ExxonMobil Speedpass, BPme, and Chevron with Techron underscore the industry's recognition of the need to move away from cash transactions. This aligns with Pakfuel's objective of implementing a seamless digital payment system.

**User-Centric Design:**

User experience is a central theme in the reviewed literature. Successful applications prioritize user-friendly interfaces to make fuel transactions more accessible and engaging. Saeed et al. [15] underscores the importance of user-focused designs in technological systems, highlighting their role in increasing technology adoption. This aligns with Pakfuel's focus on optimizing user interface design to enhance overall satisfaction.

**Loyalty Programs:**

Loyalty programs are a prevalent trend, seen in applications such as PSO Fuellink, MobilePay Fuel and ExxonMobil Speedpass. These programs aim to foster customer loyalty, encourage repeat transactions, and address challenges related to customer retention, aligning with one of Pakfuel's strategic goals.

**Transparency and Security:**

Ensuring transparent and secure transactions is a common thread in existing literature. Applications like Chevron with Techron emphasize secure payment gateways and transaction logs. This resonates with Pakfuel's objective to introduce transparent transaction processing, mitigating risks of theft or fraud.

**Related Project**

**PSO Fuelink**

PSO Fuelink stands out as a notable case study in the realm of fuel management applications, particularly in the context of Pakistan's fuel industry. The app, owned by Pakistan State Oil (PSO), aims to revolutionize fuel expense management for both individual and corporate users. While it offers a range of features that contribute to efficient fuel expenditure control, there are notable aspects that reveal areas for improvement, especially in terms of real-time functionality.

**Methodology:**

The Fuelink app employs a user-friendly interface accessible through both a web-based dashboard and a mobile application. It allows users to manage their fuel cards, track expenses, and extract various reports. The application's functionality is designed to provide convenience and control, with features such as real-time alerts, account information tracking, and analytics presented in graphical form.

**Findings:**

Fuelink's strengths lie in its comprehensive approach to fuel management. It offers users the ability to track bills, manage accounts 24/7, and receive real-time alerts for fuel consumption. The analytics feature provides valuable insights for users to make informed decisions regarding their fuel expenses. However, certain aspects, particularly related to the real-time functionality, present challenges.

**Issues Identified:**

One significant drawback observed in Fuelink is the delay and inefficiency in updating account balances, especially when users add balance through external platforms like Easypaisa. The delayed update may lead to discrepancies in real-time information, potentially impacting the user experience and control over fuel expenditure.

**Lessons Learned:**

The case of PSO Fuelink underscores the importance of seamless real-time functionality in fuel management applications. While the app offers valuable features for control and convenience, delays in updating account balances can diminish its effectiveness. Timely and accurate updates are critical for users to have confidence in the application's ability to provide up-to-date information.

**Informing and Supporting Pakfuel:**

The findings from the PSO Fuelink case study serve as a valuable source of insight for the development of Pakfuel. Emphasizing the importance of instantaneous updates in account balances, Pakfuel can prioritize the implementation of a robust real-time functionality system. Learning from the challenges faced by Fuelink, Pakfuel can aim to provide users with an experience that is not only convenient and controllable but also ensures timely and accurate information on their fuel expenditure.

## **Summary**

Despite the comprehensive overview provided by the literature review, there are gaps that warrant further exploration. These include a more in-depth analysis of the socio-economic factors influencing the adoption of non-cash transactions and a closer examination of the limitations and challenges faced by existing digital payment solutions in the fuel industry.

The literature review has played a pivotal role in informing the development of the Pakfuel project. It has provided a contextual understanding of the challenges faced by the fuel industry and the potential impact of digital solutions. Insights from the review have influenced the project's goals, emphasizing the importance of seamless digital payment, user-centric design, loyalty programs, and transparency and security in transactions. The PSO Fuelink case study, in particular, has influenced the project's approach by highlighting the critical need for real-time functionality.

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