International Journal of Scientific Research in Computer Science and Engineering **Research Paper**
Vol.8, Issue.6, pp.38-42, December (2020) **E-ISSN:** 2320-7639

A Smart Android Based Fuel Price Monitoring System

C. Fiossi[1], A. C. Ameyaw[2], D. Banuoku[3], I. Yemeh[4]*

[1,2,3,4]Department of Computer Science, Sunyani Technical University, Sunyani-Ghana

[*]*Corresponding Author: dkosei2020@gmail.com, Tel.: +233246934642*

Available online at: www.isroset.org

Received: 26/Nov/2020, Accepted: 08/Dec/2020, Online: 31/Dec/2020

***Abstract*—** Fuel products have become essential commodities and the most popular source of energy used by automobiles in Ghana and around the globe. In Ghana, the consumption of fossil fuel energy increased by 33.7% from 1995 to 2014; hence, several fuel and gas stations keep spring up daily across the country, with each selling at a different price. The difference in prices leaves consumers in a search mode, looking for the affordable price among the several stations with a locality. However, the number of these station within the same city makes it a challenge for the consumers to know the fuel prices at the various fuel stations and patronise the same product and buy it at their desired price. Therefore, this study seeks to design and develop an Android-based fuel stations application that will enable customers to view all the available fuel prices of the various fuel stations in the Bono region of Ghana conveniently and reliably. The application is intended to present the prices of daily fuel products available at these fuel stations to help users buy their preferred fuel products at the desired station based on the available prices. The developed application offered a user-friendly Graphical User Interface (GUI), speed and accuracy, time effectiveness and reliability.

***Keywords*—** Fuel-price-Ghana; Mobile-based, Android; Graphical User Interface

I. INTRODUCTION

In this 21st era, the rapid growth and increase in technologies like the internet have become a useful tool for various platforms such as E-Commerce, Businesses, Social Networks, and many more [1]–[4]. Moreover, Android Applications have enabled countless consumers around the world to patronise their preferred products on different available facilities and companies on the online platform. Thus, it has made buying and selling more convenient than the traditional way, which implies the consumer needed to manually visit every local facility and search for the desired commodity and buy for the least affordable price. Many applications that are used to compare prices are now available in the market. Comparing prices can be done in many diverse ways.

Moreover, these price comparison applications have made the shopping experience far simpler and more convenient for customers in all dimensions, whether it may be paid for services, or in case of any further inquiries [5]. Now the consumers are also becoming more interested and satisfied with the prices and the agreements they usually get online. The various fuel stations maintain a good relationship with the customers. It has become the most common marketing master plan nowadays in the sense that many of the big companies launch their products and commodities directly on the online platforms, because of the large number of consumers patronising products online and trusting the activities they perform.

Literature shows that applications for managing the activities of buying and selling of fuel at fuel-stations exist in developed countries. Nevertheless, a high percentage of these applications are meant to help the station manager monitor the fuel gauge in the tanks remotely. On the other hand, fuel consumers in developing countries such as Ghana still must search available station to decide where to buy, which leads to time-wasting.

Hence, this study seeks to propose and android base smart fuel price monitoring system for fuel consumers. The system is expected to make available the product details from the different fuel stations. Provide users with an outline of the complete stipulations about the fuel and their prices on the fuel stations. It also displays the ongoing market activities and allows the administrator to make any updates on the product to notified users when price drop or price increase occurs.

We anticipate that the proposed App will help users of petrol and diesel in the Bono region of Ghana by providing timely updates on fuel prices to help them make an informed decision on where to buy their fuel base on the available prices. To the best of the authors' knowledge, this paper is the first the propose a novel Android app for displaying daily fuel price for the residents in the Bono region of Ghana. Also, it will serve as the bases for comparison in a future study in the same domain in the region.

Rest of this study is organised as follows. Section II contain a brief history and structure of Android and related works; Section III covers the method and tools adopted for developing the proposed android application. Section IV contains the results and discussion of the study. Section V presents study conclusions and the direction of future work in section

II. LITERATURE REVIEW

This section focuses on the history and theories that have been conducted and carried out by some researchers around Android Application development.

A. History of Android

Before the term "smartphone" came into the public domain in October 2003, Apple introduced its first iPhone and its iOS, Company Android Inc. It began with four people who were Rich Miner, Andy Rubin Nick Sears, and Chris White. At the time of its public funding, Rubin was quoted as saying that Android Inc. was going to develop "smarter mobile devices that are more aware of its owner's location and preferences [6]." In 2005, the next significant phase in Android's history was made when Google bought the original company. From there rest of the team (Rubin and Co) remain to develop the OS under their fresh owners. They agreed to Linux as the foundation for the Android operating system, which made the Android free to third-party mobile phone producers. Google and the Android team proposed additional ways of making money by developing apps and other programs that use the OS android [6].

B. Structure of Android

Figure 1 illustrates the structure of the Android App. The structure is relatively rigidly defined, for things to work correctly, there is the need to put specific files in the right places. Several application modules usually are contained in a typical Android App structure. For example, activities, garbage, amenities, content-providers, and transmission receivers. Typically, a high percentage of these modules are declared in the app manifest. The Android operating system uses these files to resolve how to fit-in the developed App in the device's user experience. Usually developing an Android project, requires the installation of the Android studio, including all necessary plug-ins; it also requires some knowledge in Java programming [7].

C. Fuel Management

Fuel management systems (FMS) is a technological-tool that preserves, overseer, and regulator fuel usage and stock in the transportation business. Computer-based FMS are widely positioned in both moneymaking and non-profit companies. FMS are designed to accurately measure and manage fuel use within the transportation and allied industries.

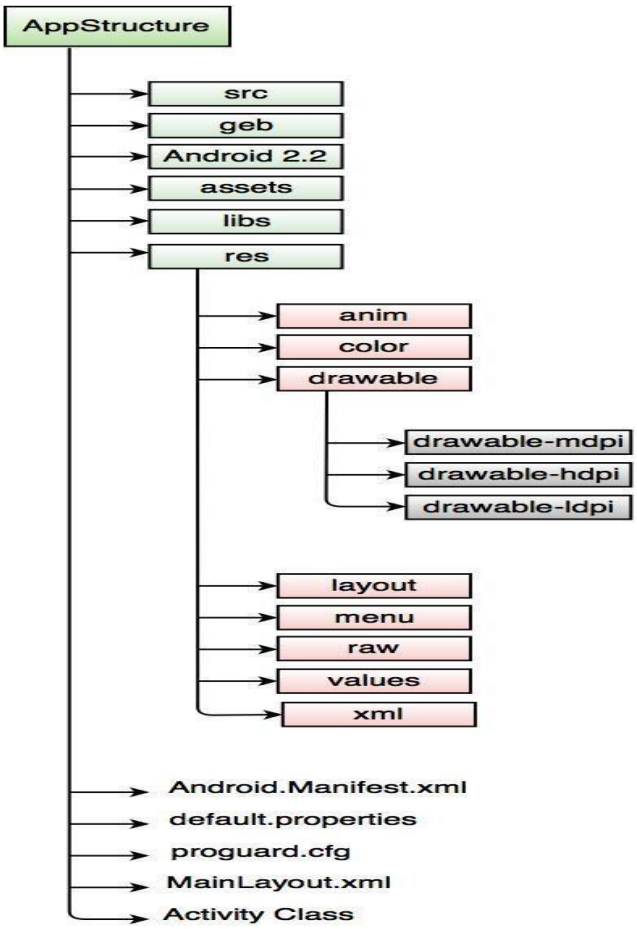

Figure 1. Structure of Android

D. Related Works

Since its development, the Andriod OS has been used to develop a state-of-the-art application in several areas.

Sayyad et al. [8] employed the android OS and IoT technology to develop a system capable of detecting water flood in the river. Similarly, a smart parking system for vehicles was proposed [9], based on IoT technology and android OS. A home automation system based on the Android OS and IoT technology was proposed [10] in for controlling electronic and electrical equipment in a home from a remote distance. Likewise, Reddy et al. [11], proposed an Android-based application for monitoring the speed of vehicles and driver categorising using GPS technology. In [12], the study proposed an online signature authentication based on dynamic properties, through an android app interface.

A Real-time Android-based mobile-App prototype monitoring and controlling system for Fuel Tank at a Gas Station was propped in [13]. The student aimed at cutting down the cost associated with monitoring the level of the fuel on the fuel station. The paper reported a success rate of 98.9%, 93.33% for data transfer through Bluetooth and SMS gateway connection, respectively. Similarly, Weis et al. [14] proposed an Internet of Things (IoT) application for monitoring the volume of fuel currently a vehicle through and smartphone. If the fuel level is low, the system

alerts the driver of the nearest gas station and gas prices within the vicinity. The work of Komal D/o Shoukat Ali et al. [15] presented an automatic fuel monitoring and theft alert in road tankers carrying fuel from oil-depots to end-users petrol-stations. Meseguer et al. [16], proposed a mobile application capable based on data mining methods and neural networks (NN) for displaying the driving styles and fuel-use behaviour in a vehicle.

Given the above review, shows that most of the existing studies were geared toward the monitoring of fuels in a way to prevent theft, linking fuel shortage in a vehicle to the nearest fuel station and safety operation. Thus, the consumers of the fuel are left to find out which station offered the lowest price at any point in time.

III. METHODOLOGY

Figure 2 shows the agile software development. The Agile methodology, according to O'Regan [17], is a project management activity, primarily used for the development of software; where requests and answers develop by means of the co-operative endeavour of self-establishing and cross-functional teams and their customers. Obstructing from the benefits and concepts of the Agile Manifesto was generated as feedback to the insufficiencies of conventional software development methods (e.g., Waterfall).

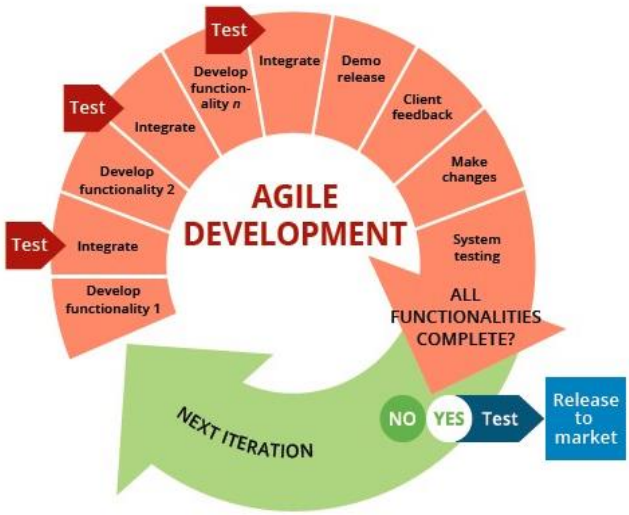

Figure 2. Agile Software Development

A. *Development Tools*

There are several tools and process by which applications are created for devices running the Android operating system. Examples are Android Studio, Eclipse, DriodEdit, Corona and others.

Android studio was chosen and used as the integrated development environment (IDE). It has been designed to provide new tools for app development and currently the most widely used IDE. This was where most of our work was done. It was used to facilitate our application development in terms of creating, designing, testing, and polishing our mobile App. Java programing language was adopted for this project, due to its ability to protects native code from memory leaks. The language is highly secure, and everything is executed inside the JVM. Also, the project team was more familiar with it as compared to other programming languages. MySQL software was utilised in designing the Back-End of the Application. This was done by creating the server-side and database modules required for enhancing functions of our App.

B. *Application Development*

Figure 3 shows the data flow diagram of the proposed App. A typical mobile application project is made up of three integral parts, namely, (i) Application back-end/server technology, (ii) API(s) Application Programming Interface and (iii) Application front-end.

Back-end/server technology: During this stage, we designed all necessary supporting functions such database, and server-side objects of our proposed mobile App were designed. The server produces the desired output based on a user request from the GUI if front-end and back-end comprehend the user's request. PHP was used for the server-side (back-end) scripting language.

API (Application Programming Interface): In other for the App to communicate with the server, there must be a software intermediate that connects both. The volley was used as the library to connect the App to the server.

C. *Experimental Setup*

Four (4) fuel stations in Sunyani were selected for this study, because it is the administrative head office of the within the Bono region of Ghana [18], [19]. These companies were selected due to closer proximity to authors institution. The prices of petrol and diesel of the selected companies were collected for 60 days and tabulated in an excel file. The file hard four columns, thus station name, date, petrol-price, and diesel price. The minimum system requirement to run the proposed App are, Android version 4.2, processor: 1.2 GHz, internal storage: between 850 MB and 1.2 G, memory size: 512 MB (2 GB is recommended). Video feature should be 1280 x 800 pixels or better. However, for this study, an Infinix x650d smartphone was used to experiment the proposed design. Its specs were as follows (RAM 3GB, ROM 32GB, GPU 2.0GHz*4), Android 9.0 Pie (XOS 5.0 Cheetah), Processor: 4x 2.0GHz ARM Cortez-A53, 4x 1.5GHz ARM Cortez-A53.

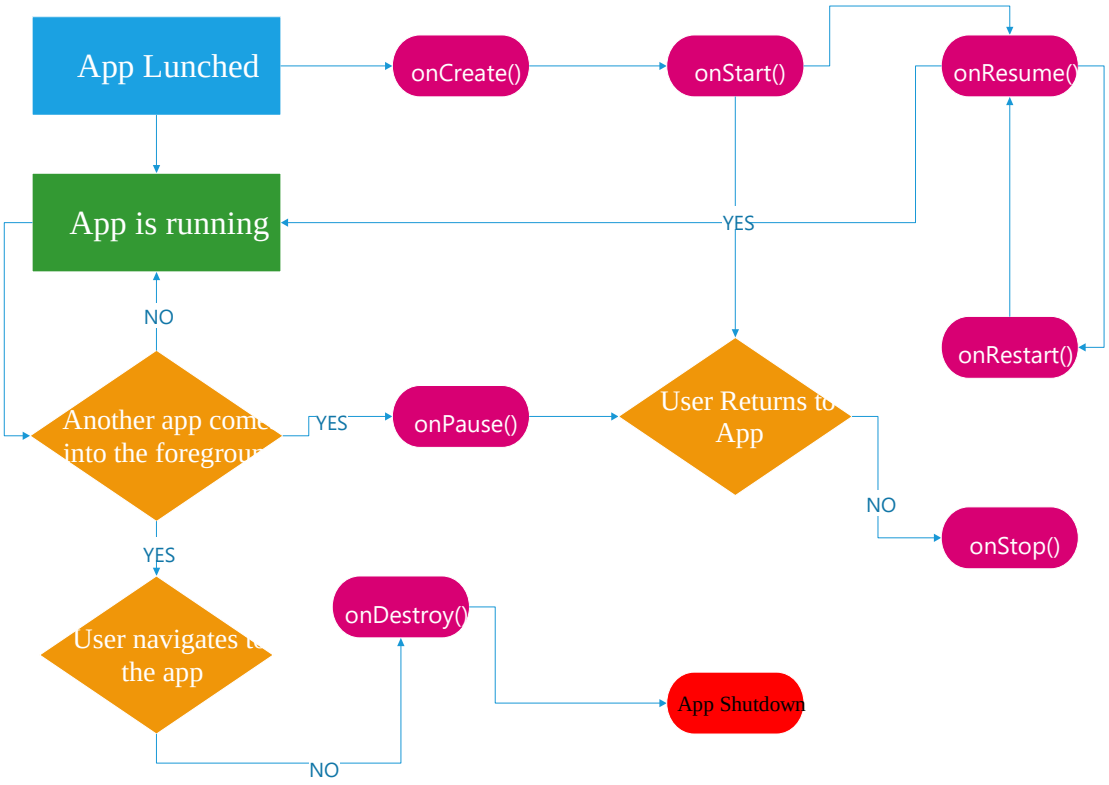

Figure 3. Data Flow Diagram

IV. RESULTS AND DISCUSSION

We tested the proposed application unit by unit to verify the atomic units of our source code, such as a class or a method using the preintegrated Junit 3.0 framework on the Android platform. The second phase was the integration test, where all tested units were combined and verified. At this stage, we checked integration with Android components such as activity-testing, service-testing, and content provider-testing. After the integration test, we carried out functional test also called operational test or acceptation test, to check the exactness and wholeness of the proposed App. Finally, we performed the system test, i.e., we tested the system, where we check the interaction between the software, components, and hardware.

A. Key screenshots resulting from the application launching phase

Figure 4(A) shows the main screen on launching the App. As seen, the GUI (landing page) of the Application is straightforward, which display to the user a graphical list of all petrol station within the immediate geographical location. This enables consumers to choose among the respective logos to view the selling prices of diesel and petrol on a specific day, as seen in Fig 3(B). The interface provides updates on the costs of diesel and petrol, which differs among the gas stations.

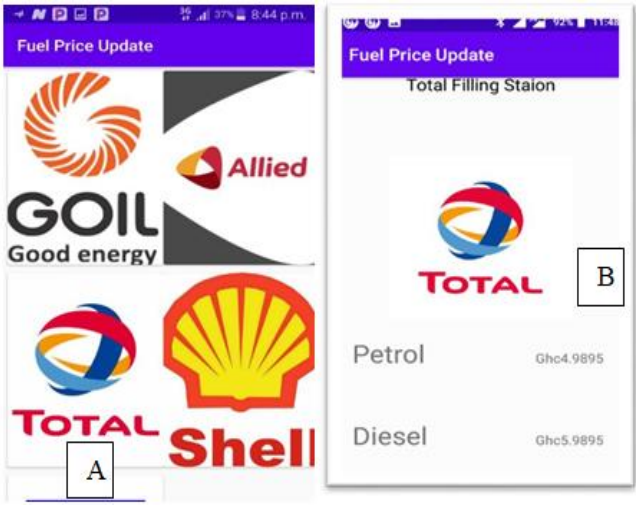

Figure 4. Screenshot of proposed system interface

V. CONCLUSION AND FUTURE SCOPE

The introduction of Android has opened the door for several remote monitoring and controlling of device and system. The petrol and diesel industries are one of the fields that have enjoyed several innovations from this platform. The current study sought to design and developed an Android-based application to help fuel consumers view fuel prices before they visit the various fuel stations. App performance and acceptability of the system in terms of accuracy, reliability, security, and user-friendliness of the proposed App proved useful. The proposed system is user-

friendly and allows viewing of fuel prices, provides daily and accurate updates on fuel prices to users. The App is anticipated to overcome the drawbacks of preceding applications, which provided fuel prices only at the fuel stations and not accessible to the consumers anywhere. Despite the successful completion of this study, we wish to state with sincerity that the tools used in the development were limited to saving resources (money, energy, and time). Hence, when the App reaches more extensive users, the tools should be adapted to the new needs, which means a more interactive user interface, and a more reliable database system. Also, adding a search bar to enable easy finding of fuel stations as more of the fuel stations are being added to the App, a form to update or add fuel prices into individual fuel station tables.

ACKNOWLEDGMENT

We express our thanks to all staff of the Department of Computer Science, Sunyani Technical University (STU), especially, our supervisor, for introducing us into the world of research. We say God bless you all for your help, support, and motivation.

REFERENCES

[1] A. Ambre, P. Gaikwad, K. Pawar, and V. Patil, "Web and Android Application for Comparison of E-Commerce Products," *Int. J. Adv. Eng. Manag. Sci.*, vol. **5**, Issue. **4**, pp. **266–268**, **2019**.

[2] I. K. Nti, A. F. Adekoya, M. Opoku, and P. Nimbe, "Synchronising Social Media into Teaching and Learning Settings at Tertiary Education," *Int. J. Soc. Media Interact. Learn. Environ.*, vol. **6**, Issue. **3**, p. **1-12**, **2020**.

[3] O. Nyarko-Boateng, I. K. Nti, A. F. Adekoya, B. Weyori, Asubam, and S. Appiah, "Conceptual Framework for Efficient 802.11 A/B/G/N Wireless Networks Infrastructure to Improve Campus Internet Connectivity," *Int. J. Eng. Technol. Manag. Res.*, vol. **7**, Issue. **11**, pp. **1–8**, **2020**.

[4] V. Appiah, I. K. Nti, and O. Nyarko-Boateng, "Investigating Websites and Web Application Vulnerabilities: Webmaster's Perspective," *Int. J. Appl. Inf. Syst.*, vol. 12, Issue. **3**, pp. **10–15**, **2017**.

[5] K. Jung, Y. C. Cho, and S. Lee, "Online shoppers' response to price comparison sites," *J. Bus. Res.*, vol. **67**, Issue. **10**, pp. **2079–2087**, **2014.**

[6] Techverto, "Everything about 'Android' In a Nutshell!," 2017. http://www.techverto.com/2017/09/everything-about-android-in-nutshell.html.

[7] Developer.android.com, "Guide to app architecture." https://developer.android.com/jetpack/guide.

[8] M. S. Sayyad, P. Surve, N. Shaikh, M. Gharat, and P. Tambe, "IOT Based Early Flood Detection and Avoidance," *Int. J. Sci. Res. Comput. Sci. Eng.*, vol. **3**, Issue. **12**, pp. **50–55**, **2020**.

[9] S. Rajbhandari, B. Thareja, V. Deep, and D. Mehrotra, "IoT based smart parking system," *2018 Int. Conf. Innov. Intell. Informatics, Comput. Technol. 3ICT 2018*, vol. **6**, Issue. **6**, pp**. 50–52**, **2018**.

[10] V. Tiwari and P. Adkar, "Implementation of IoT in Home Automation using android application," *Int. J. Sci. Res. Comput. Sci. Eng.*, vol. **7**, Issue. **2**, pp. **11–16**, **2019**.

[11] N. R. Reddy and S. Subhani, "Monitoring Vehicle Speed using GPS and Categorizing Driver," *Int. J. Sci. Res. Comput. Sci. Eng.*, vol. **7**, Issue. **5**, pp. **14–21**, **2019**.

[12] E. Lingappa, B. Geetavani, and J. Hareesha, "Online Signature Verification using Dynamic Properties," *Int. J. Sci. Res. Comput. Sci. Eng.*, vol. **5**, Issue. **6**, pp. **33–38**, **2017**.

[13] R. Sulityowati and B. B. K. Rafik, "Prototype Design of a Realtime Monitoring System of a Fuel Tank at a Gas Station Using an Android-Based Mobile Application", In the Proceedings of the Second International Conference on Electrical Systems, Technology and Information 2015 (ICESTI 2015), Singapore. pp. **685–692**, **2016.**

[14] A. Weis, M. Strandskov, K. Yelamarthi, M. S. Aman, and A. Abdelgawad, "Rapid deployment of IoT enabled system for automobile fuel range and gas price location," In the Proceedings of the *2017 IEEE International Conference on Electro Information Technology (EIT)*, pp. **452–455**, **2017**.

[15] K. Komal D/o Shoukat Ali, B. Arif Ali, V. O. Mihalca, and Țarcă Radu Cătălin, "Automatic fuel tank monitoring, tracking & theft detection system," *MATEC Web Conf.*, vol. **184**, p**. 201-208**, **2018**.

[16] J. E. Meseguer, C. K. Toh, C. T. Calafate, J. C. Cano, and P. Manzoni, "Drivingstyles: a mobile platform for driving styles and fuel consumption characterization," *J. Commun. Networks*, vol. **19**, Issue. **2**, pp. **162–168**, **2017**.

[17] G. O'Regan, "Concise guide to software engineering," Springer, pp. **297–305**, **2017.**

[18] S. Akyeramfo-Sam and I. K. Nti, "State of Affairs in ICTs Usage within the Hospitality Industry (Guest House & Hotel) Operations: A Case of Brong Ahafo Region Ghana," *Int. J. Sci. Eng. Appl.*, vol. **6**, Issue. **5**, pp. **143–149**, **2017**.

[19] I. K. Nti, J. A. Ansere, and A. Appiah, "Investigating ATM Frauds In Sunyani Municipality: Customer's Perspective," *Int. J. Sci. Eng. Appl.*, vol. **6**, Issue. **2**, pp. **59–65**, **2017**.

AUTHORS PROFILE

Mr C. Fiossi1 is a final year student at the Department of Computer Science, Sunyani Technical University pursuing HND in Computer Science. His main research work focuses on Network Security, Web-programming, Data Mining, IoT and Mobile Apps development.

Mr A. C. Ameyaw is a final year student at the Department of Computer Science, Sunyani Technical University pursuing HND in Computer Science. His main research work focuses on Cloud Security and Privacy, HTML, IoT, CSS and Mobile App development.

Mr D. Banuoku is a final year student at the Department of Computer Science, Sunyani Technical University pursuing HND in Computer Science. His main research work focuses on Data Mining, Networking and Mobile App development.

Mr I. Yemeh is a final year student at the Department of Computer Science, Sunyani Technical University pursuing HND in Computer Science. His main research work focuses on Cloud Security and Privacy and Mobile Apps development.

