Gas-TO - a Case Study in Project-based Learning

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***Abstract*—This paper presents a case study of Project-based Learning applying translational research. The novelty proposed consists in how the Project-based Learning approach can be used to obtain a solution for a problem in society. The supporting project is a real-life problem, about filling up on gas. Its development was planned in phases: bibliographical research, survey for obtaining the level of interest for the solution proposed, prototype and deployment of Gas-TO. We employed strategies to ensure that the proposed development methodology can be carried out by any academician, regardless of their area of training, thus ensuring an interdisciplinary methodology for developing solutions for the community.**

Keywords-Project-based Learning; methodology; mobile technologies; application.

I. INTRODUCTION

Nowadays, quick and easy access to information has become a necessity [1] and has motivated the development of applications used by users in general [2].

In this scenario, when we consider applications that have information about filling stations in state of Tocantins in Brazil, we identify that there are no instruments to provide online and cooperative information about filling station locations and fuel distributor names and about how much fuel there is in each one. This was confirmed by searching for this kind of application on Play Store and App Store.

Therefore, our goal is to apply the concept of translational research [3] in order to obtain a solution to the problem described. To that end, all authors use the knowledge they have acquired beforehand in writing contributions. We use Project-based Learning - PBL to integrate the several life and technical backgrounds of our team members [4][5], in order to find a way to achieve a positive and collaborative solution for informing people where it is less expensive to buy gasoline.

Therefore, we have developed an application named Gas-TO. Our goal was to develop a collaborative application [6], in which data updates can be made by the users [7]. Thus, through PBL we have developed a solution that offers users the price, location, and distributor name of each filling station. In developing of this app, we used tools that made it possible to develop an app without high-level programming [8].

The rest of the paper is organized as follows. In Section II, we present some relevant related work. In Section III, we present the proposal of the article and the methodology used. Next, in Section IV, we show the results obtained. Finally, in Section V, we discuss the results and conclude with possible future directions.

II. RELATED WORK

In this section we will present some works that use the Google Appsheet as an easy way for developing solutions involving database and cellular applications, in order to show the real importance of the Google AppSheet tools for facilitating database development and operation.

Thus, the authors in [9], show how the AppSheet was used for calculating water consumption by the reference plants, presenting an easy way for storage and development an application.

In the same way, the authors in [10], address use of the AppSheet for building a database for facilitating location and development of a warehouse management system. The authors present a database model totally based on Google Appsheet, showing its performance and ease of operation.

The authors in [11] address a low-cost electronic data collection tool for a health facility survey study. They used a Google Appsheet to develop this tool, using the appsheet functionalities for create an online application, showing its efficiency.

On the other hand, the use of Google Appsheet is shown in [8], where the authors use the tool for development a web solution to support decision making. In this work, Google Appsheet is used as the main tool for development and the authors note the advantages of the Appsheet, considering its operation and programming facility, as well as the its database robustness.

III. PROPOSAL

Our proposal can be described as an application for showing information about price, location and distribution of filling stations at Tocantins State - Brazil. This application was created using a cooperative approach. That means the users can update the data according to their experiences as customers.

The app enables easy navigation for the user and has a structure and mechanisms that aim to encourage user collaboration. The app was developed in order to ensure that the user is able to view of the registered filling stations, and is thus able to choose to register a new filling station, verify

 ISBN: 978-1-61208-676-7

the prices by type of fuel and/or update information, as represented in Figure 1.

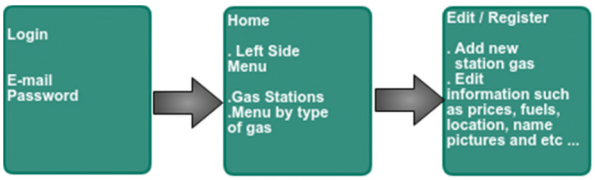

Figure 1. Flowchart.

A. Materials

The choice of tools was strongly influenced by the limiting factor of technical feasibility, considering the heterogeneity of the group, as well as the weekly workload that each member of the group had available for developing the application. The selected tool (AppSheet) supports the methodology proposed in this work and was presented to the Telematics class. It was used as the main tool for development of the Gas-TO application.

The AppSheet is defined as a smart platform that does not need to use a programming language to obtain apps, enabling people who are not experts in Information Technology to use it without difficulty [12]. The AppSheet has a simple structure, as shown in Figure 2.

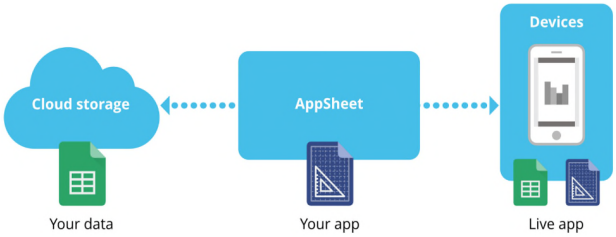

Figure 2. AppSheet Architecture.

The development of this work, would not be possible if we used a complex development tool or if we needed to use programming languages, considering the time we had. Because of that, we choose to develop Gas-To with AppSheet, which allowed us to develop the app within the scheduled time.

After choosing the development tools, we conducted a survey with possible future users of the application to measure the degree of interest in the proposed solution. 71.6% of them indicated that they would use an application like the one presented in this solution. For applying all the surveys, we used Google Forms, a free service for creating forms online. With Google Forms, the user can produce multiple-choice searches, make discursive questions, request numerical-scale evaluations, and use other options [13]. Consequently, we obtained feedback on a number of issues that guided the development of our work and validated our methodology.

IV. RESULTS

We applied an online form for drivers in Tocantins State to verify their interest in using the application and to indicate what information about filling stations is most important for them. With the survey we obtained 74 answers. These answers influenced the development of the application, since they demonstrated the real degree of interest in it.

Figure 3 presents the answers to the question: When you are you going to fill your tank, what is most relevant to you? For 59.5% it is the price, for 27% it is the distributor and 13.5% answered that distance is the most important factor.

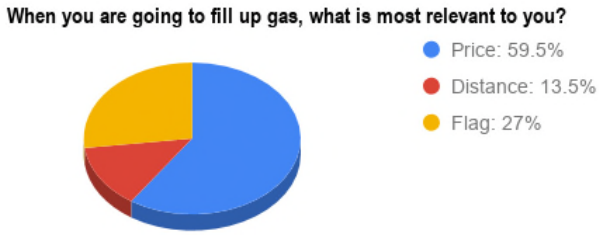

Figure 3. What is most import when filling up?

Figure 4 presents the answers to the question: Would you use an application that tells you about fuel prices, and the location of the filling stations? Zero means little interest in the use and 10 much use interest. The maximum level of interest was shown by 71.6% of the drivers; 13.5% answered 9; 6.8% answered 8; 5.4% answered 7; 1.4% answered 6 and 1.4% answered 1.

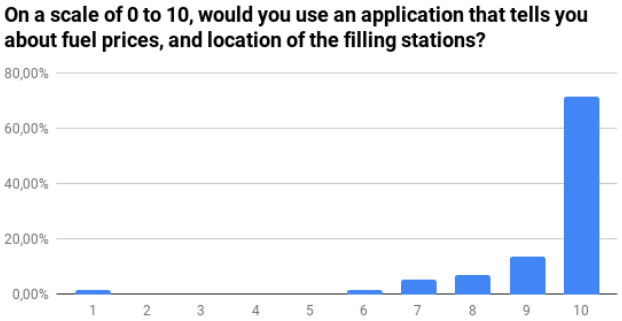

Figure 4. Would you use an application that tells you about fuel prices, and the location of the filling stations?

We considered the answers shown in Figures 3 and 4, in implementing the function to present the ranked list of the filling stations, as shown in Figure 5.

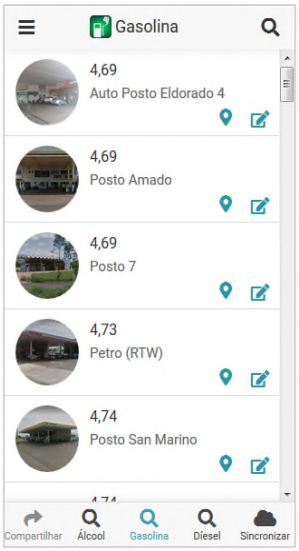

Figure 5. App screen.

Figure 6 presents a summary of the answers to the question: What type of fuel do you use in your vehicle? We can see that 90.3% answered that they use regular gasoline, 22.2% said they use premium gasoline, 20.8% answered that they employed ethanol and 5.6% answered that they used diesel.

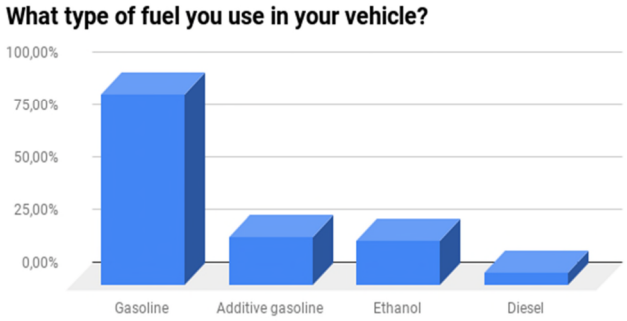

Figure 6. What type of fuel do you use in your vehicle?

Figure 7 presents the answers to the question: Do you fill up your vehicle at filling stations: on the way home, to work, school or place that you regularly go to? As shown in Figure 7, 36.5% answered that they fill up when they are on the way home, 32.4% said when they are on the way to work, 24.3% said they fill up in other circumstances and 6.8% answered that they stop at the filling station on their way to school or college.

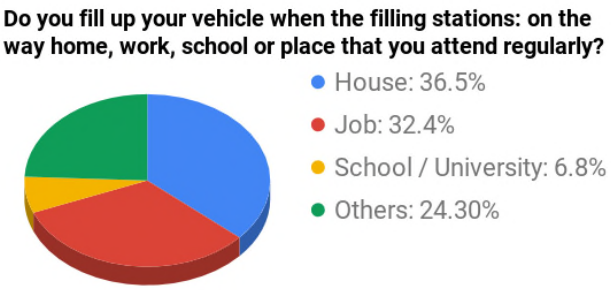

Figure 7. On the way home, to work, school or place that you go to regularly?

We considered the answers for adding a function to the app, so that users can see the location of the filling station registered using Google Maps and even request a route to reach the selected filling station. The screen with this function is represented in Figure 8.

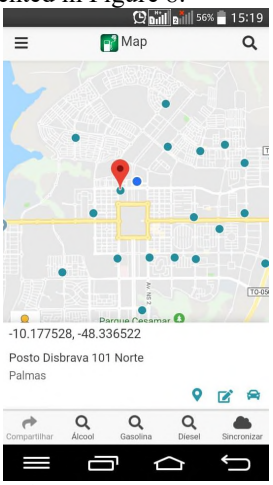

Figure 8. App screen - Map

Figure 9 shows the list of application menus, used to access all the features of the application.

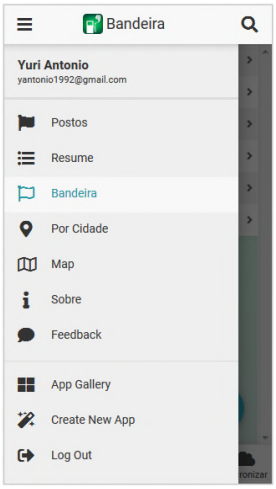

Figure 9. App screen - Menu.

Figure 10 shows the query screen for the filling station.

Figure 10. App screen - Fuel Station.

Figure 11 presents the Flag Menu (Fuel Distributors), meaning that the filling stations are grouped according to their distributors.

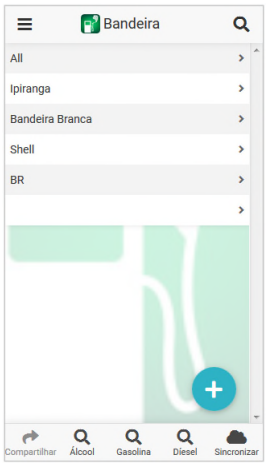

Figure 11. App screen – Flag Menu.

Figure 12 shows the screen for editing filling station information.

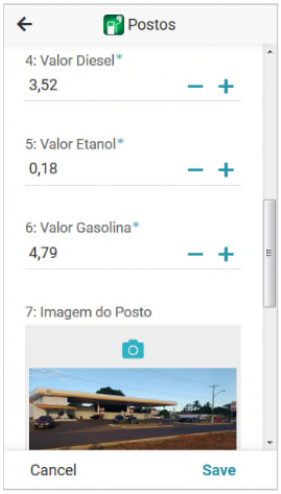

Figure 12. App screen - Editing Fuel Station.

In developing this application, our priority was to provide a user interface similar to the most commonly used applications. WhatsApp was chosen as the designer model, as represented in Figure 13.

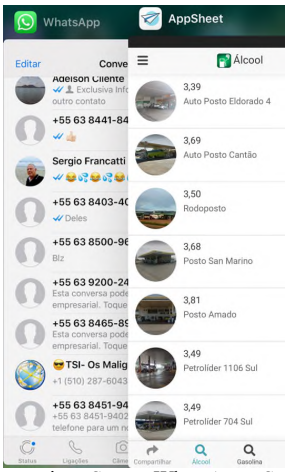

Figure 14. Comparison Screen WhatsApp - Screen Gas-TO.

V. CONCLUSION AND FUTURE WORK

The methodology used illustrates the feasibility of developing solutions for society, enabling students from different areas of knowledge to create tools that can be used as facilitators for the daily life of their communities. This challenges the pervasive current thinking that only information technology professionals with a focus on programming can be providers/developers of technological solutions.

In addition, it is very important to emphasize that through the translational methodology used in this work, it was possible to traverse all the stages of project-based learning, starting from the acquisition of theoretical knowledge, passing through definition of the project, until the development and obtention of a solution.

 ISBN: 978-1-61208-676-7

Through the feasibility study, it was possible to verify that future users of the app believe that the application will contribute information that will provide input for their decision-making regarding where to refuel their vehicles

In view of this, because it is an application with a collaborative bias, the user is the centerpiece; in other words, without this collaboration, this solution becomes obsolete and unfeasible to maintain. This means that the major challenge is yet to come. That is, to put Gas-TO into production and stimulate the collaboration of users to ensure its viability.

As for implications for future work, although the Gas-TO application was developed in Palmas, Tocantins, and Brazil; this solution can also be distributed in other regions.

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 ISBN: 978-1-61208-676-7