Michael G. Albino, 2021, 9:2
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Development of Car Rental Management System with Scheduling Algorithm

Michael G. Albino[1], Victor Acebedo[2]

[1]Program Chairperson, College of Communication and Information Technology-BS Computer Science, President Ramon Magsaysay State University-Castillejos, Zambales, Philippines, malbino@prmsu.edu.ph

[2]Student, College of Communication and Information Technology-BS Computer Science, President Ramon Magsaysay State University-Castillejos, Zambales, Philippines, acebedo.v@yahoo.com

Abstract- A system that will manage the activities of a car rental was the primary objective of this research study. With the implementation of the proposed car rental management system with scheduling algorithm, the transaction of the business will become easy and reliable. The development system will enable the users to effectively manage the transaction, scheduling and inventory of cars of the car rental business. The researchers used Extreme Programming Methodology since this type of software development methodology helped the researchers in the planning, designing, implementation and maintenance of the developed system. Based on the results gathered from the respondents of the study, the application gained a positive response on the criteria Speed and Graphical User Interface. It was noticeable that the respondents were satisfied on the performance of the developed system and the scheduling algorithm implemented in the system efficiently performed its desired operation. Based on the information the researchers gathered, the developed application for car rental business with the integration of scheduling algorithm was useful and appropriate solution to the identified problems by the researchers.

Keywords:- Car Rental, Management System, Scheduling Algorithm.

I. INTRODUCTION

As man develops consciousness about the world, it is undeniable that online transaction has become a trend in transacting business today. It helps in performing task in easy way real time. Some companies have become fully automated while others striving to setup them in automation. Computer programmers develop things like computer system that the rest of us could use.

The advent of new technology gave rise to easy and hassle-free interaction between and among humans. Whether it is in business, science or whatever task a person takes on the quality and speed of carrying it out are enhanced with automation at the core of this efficient. The developed system for Vista entitled "Online Car Rental Reservation System", a transaction processing system is an example of automation.

Car rental business is becoming big, and competition is getting high. Considering the success of online reservation in business like airline, hotel and restaurants, adopting the strategy of online reservation in car rental business will not give a different success and acceptance.

A rented car is a vehicle used temporarily for a period of time with a fee. An individual who wants to rent a car must first contact the car rental company for the desired vehicle. The person has to supply some information such as rent period, the desired type of car. The rental cars are categorized into economy, compact, compact premium, premium and luxury. Customers are free to choose any car based on their budget and availability of such car at the time of reservation.

1. Objective of the Study:

The general objective of this research was to develop a system for Car Rental Business. The outcome was an outline of a car rental service based on a wide online access and utilization of location-based services. That is both acceptable by both the customers and the company.

The Specific objectives of the study were:

- To reduce the time consumed in applying to rent a car using scheduling algorithm;
- To organize transaction records; and
- To provide customers a comprehensive and detailed information of services offered by Car Rental business.

2. Conceptual Framework:

The developed application will enable the business to check and verify customers booking transaction. It will help the system user to validate the pending transaction of the customer to eliminate the possibility of assigning car into multiple customers. This framework shows the overall outline of the study. It can be expressed by using the input-process-output (IPO), a process is viewed as a series of boxes (processing elements) connected by inputs and outputs. Information or material objects flow through a series of task or activities based on a set of rules or description points. What goes in is the input; what causes the change is the process; what comes out is the output. The IPO model provided the general structure and guide for the direction of study.

Table 1 Conceptual Framework

Transaction	Input	Process	Output
Background Checking/ Verifying Customers	Customer's Credentials	Manually Verify the Customer's Credentials	Verified User
Booking a Car	Filling-up Booking form	Manually Verifying Customer's Transaction details	- Booked Car -Pending Transaction
Franchising a Car	Car Information / Car Owner's information	Verifying Car's owner credentials on the logbook	Update logs

Table 1 shows the conceptual framework of the study which the research used in the conceptualization of the research study. It provides the researchers necessary information's on the different processes that the system will perform based on the input from the user.

II. LITERATURE REVIEW

Information and Communication Technology (ICT) has become and will continue to be an integral part of the day-to-day life of every Filipino across all levels of our society. The occurrence of communication technology around the world necessitates that government get on a cohesive and coordinated strategy on how to prepare its citizens to survive, live and thrive in a digital world.

(The Philippine Digital Strategy Transformation 2.0: Digital Empowered Nation 2011) The main objective of the paper is to have a competitive society where everyone has a reliable, affordable and secure information access in the Philippines.

As stated by **Charles W. Bachman in 1960's** who invented the database management system and the concept of database was put in use and also began grow in commercial. Databases are important in businesses, especially when it comes to keeping of inventory. Databases can be used for controlling inventory as well as reducing the time, cost, and effort of inventory management. Controlling your inventory is essential in order to have good and efficient business.

As reported by **Lee (2006)** that one indisputable benefit of e-commerce is its ability to reduce transaction costs. For consumers or buyers, this is most likely to take the form of lower search costs and better information on products and services. There could be drastic savings in production and delivery costs of electronic or digital goods as well.

Hossain (2009) stated that company's websites should have significant influence on sales and

corporate image, and are expected to contribute to overall customer satisfaction. The easiest way to be reliable to the customer is to maintain an easy and simple image in the company's website, which created positive web experience to the customer. This can be done by having transparent interface, rich content, easily accessible information and having a design that facilitates multiple audiences. This is simply emphasizing the importance of knowing the target visitors as they have different tastes in terms of color and design as a whole. Also, a good design is not enough to make your customers stay in the website; it must be informative as well especially on the product and services.

Many businesses are now engaged with the implementation of information system to expedite the transaction of their companies. In a car rental business, a need to implement such system to easily manage the transaction of the business owner and its customer. Just like an e-commerce business, the car rental management system could also offer online advertisement. It is the most affordable way of advertising compared to some paid commercials that even small businesses can easily implement.

E-Commerce allows consumers to electronically exchange goods and services with no barriers of time or distance. Electronic commerce has expanded rapidly over the past five years and is predicted to continue at this rate, or even accelerate (Franco & Regie, 2016, p. 7).

III. MATERIALS AND METHODS

1. Research Design

The researchers utilized descriptive type of research design in the conduct of the research study. It helped the researchers in the formulation of ideas that was gathered from the respondents of the study. The developed application will be assessed based on the survey questionnaire administered by the researchers on its efficiency and acceptability by the respondents.

2. Systems Development Methodology

The researchers used Extreme Programming to show the systematic way of approach in making the proposed system. Figure 2 illustrates the extreme programming methodology.

2.1 Planning: Where the customers or users meet with the proponents to create 'user stories' and based on the questionnaire answered by them. The proponents convert user stories into iteration that cover a small part or functionality or features required. A combination of iterations provides the customer with final fully functional product.

2.2 Designing: This is where the iteration of Extreme Programming starts. The Proponents makes decisions regarding software layout and logic are recorded in this phase based on the data gathered. Creating spike solutions or programs that explore potential solutions for specific problem.

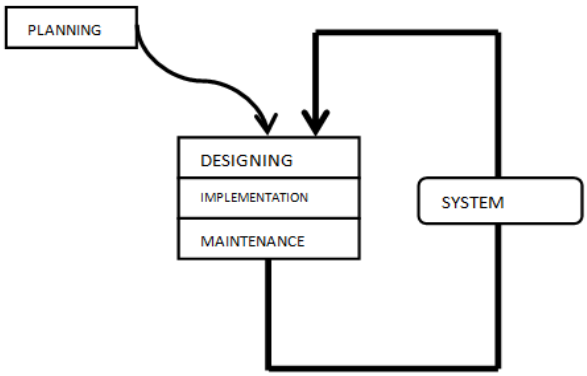

Fig 2. Extreme Programming Methodology.

2.3 Implementation: This phase is where the proponents develop and carried out. The system is tested continually for its functionality. Testing helps eliminate bugs and makes the system more reliable and efficient.

2.4 Maintenance: Continues maintenance of the system is required to meet the customer's Change requirements including additions or renewal of functions.

2.5 System: The system as a whole and continual that iterates thru the process of Extreme Programming.

3. Respondents:

With the use of convenience method, the proponents gather data from the respondents easily. Aside from it is extremely fast and easy, it also satisfies the needs of the proponent research study in terms of being cost effective and readily available.

Cost effective in a way that there is no elaborate setup and the proponents can pull from local

population groups. In a manner that it is readily available that it doesn't typically have to travel great distance to collect data.The data gathering was performed by the use of survey questionnaire which was given to one hundred twenty-five (125) respondents.

Table 2. Distribution of Respondents.

Respondents	Frequency	Percentage
Owners/Proprietors	2	1.6
Employees/Staffs	18	14.4
Existing Clients	105	84
TOTAL	125	100 %

4. Research Instrument:

The researchers design a questionnaire for the data gathering process to get qualitative data. The primary aim of the questionnaire is to determine the approach used by a Car Rental Business to overcome the challenges given by the competitive strategy of different car rental business. This research used closed questions in the questionnaire. A closed question is one that has pre-coded answers. Through closed questions, the proponents will be able to limit responses that are within the scope of this study.

The questionnaire was structured in such a way that respondents will be able to answer it easily. Thus, the set of questionnaires was structured using the Likert format with a five-point response scale. A (5) five-point Likert scale is a rating scale that requires the subject to indicate his or her degree of agreement or disagreement to a statement. In this type of questionnaire, the respondents were given five response choices. These options served as the quantification of the participants' agreement or disagreement on each question item.

5. Data Gathering Procedure:

The data for this research were collected using a survey questionnaire. In making the data gathering, the researchers visited the business location thrice a week in meeting and interviewing the respondents. The survey was created using suitable questions modified from related research and questions formed by the proponents.

The survey was comprised of eight main questions regarding online reservation for car rental. After the validation of the questionnaire, this was distributed to one hundred five clients and employees of the car rental business. The participants were given a time to answer the questionnaire. Then the proponents collected the survey questionnaire right after it was being answered. There was no incentive offered for participating in the research.

6. Statistical Tool and Treatment of Data:

The following statistical methods were used to analyze the data gathered and were employed to answer specific questions stated in the statement of the problem.

6.1 Frequency: It is used to determine the total scores of the respondents with the same responses to an item or a particular statement.

6.2 Ranking: It is use to compare items to each other by placing them in order of preference.

6.3 Percentage: It is used by dividing the frequency and the total number of respondents.

6.4 Formula: (N/f) *100

Where: N is the number of respondents.

Where f: is the total number of respondents.

6.5 Likert Scale: Like other studies, this technique contributes a lot to this research which employs questionnaires. Likert scale is the most widely used approach to scaling responses in survey research, such that the term is often used interchangeably with rating scale, or more accurately the Likert-type scale. The five-point Likert scale qualitative values for measuring the extent of use are as follows: (5) strongly agree, (4) agree, (3) undecided, (2) disagree and (1) strongly disagree.

7. Scheduling Algorithm Integration:

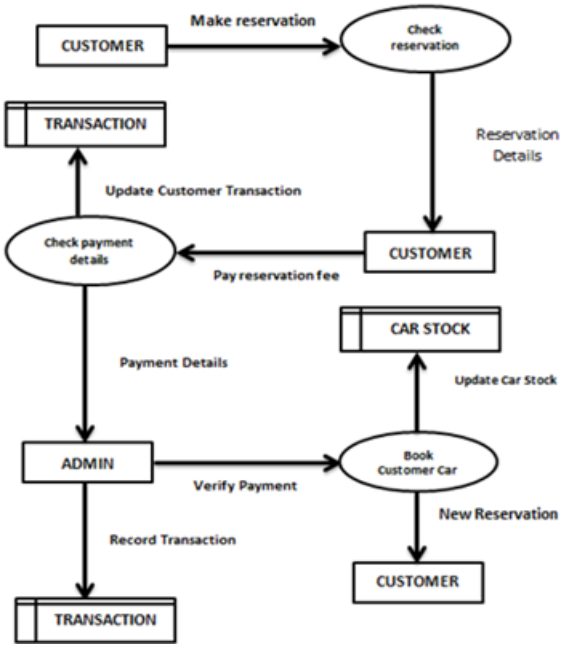

Fig 3. Scheduling Algorithm Integration on the Developed Application.

IV. RESULTS AND DISCUSSION

The developed system covers the registration login page for customer and administration. The system is designed with a security access level. The system is responsible for determining who is the administrator to user and redirect them to their perspective dashboard. The administrator has the only right to access the admin dashboard which has the modules for verifying user, adding car, and booking the customer when they had paid the reservation fee.

Table 3. Frequency and Percentage of Distribution of the respondents who answered strongly agree on the proposed website.

Questions	Frequency	%	Rank
I. Speed			
a) Background Checking for customers became much easier rather than the manual.	52	41.60	1
b) Managing of Car reservation is much faster than the manual.	33	26.40	4
Easy to track in the car's inventory.	46	36.80	3
c) Modifying data became faster	50	40.00	2
II. Graphical User Interface			
a) The proposed system was created based on the motif suited to the business.	91	72.80	1
b) All pages of the proposed system were easy to navigate.	73	58.40	4
c) All links and navigation were fully functional content.	87	69.60	2
d) Proposed website was visually appealing.	75	50.00	3

The system is also responsible for determining whether if user was verified or not, only the verified user could make a reservation, the car inventory, customer who was paying reservation fee, and customer who was scheduled for background checking can also be identified by the system. Table 3 shows the frequency and percentage of distribution of the respondents who answered strongly agree on the proposed website.

Table 4 Frequency and Percentage of Distribution of the respondents who answered agree on the proposed website.

Questions	Frequency	Percentage	Rank
I. Speed			
a) Background Checking for customers became much easier rather than the manual.	73	58.4	4
b) Managing of Car reservation is much faster than the manual.	92	73.6	1
c) Easy to track in the car's inventory.	79	63.2	2
d) Modifying data became faster	75	60.0	3
II. Graphical User Interface			
a) The proposed website was	34	27.2	4

International Journal of Science, Engineering and Technology

An Open Access Journal

created based on the motif suited to the business.			
b) All pages of the proposed website were easy to navigate.	52	41.6	1
c) All links and navigation were fully functional content.	38	30.4	3
d) Proposed website was visually appealing.	50	40	2

Among four questions included in terms of speed, the "Background checking for customers became much easier rather than the manual" got the highest percentage in terms of speed while in terms of graphical user interface the "The proposed system was created based on the motif suited to the business" got the highest percentage.

Table 3 shows the frequency and percentage of distribution of the respondents who answered agree on the proposed website. It is noticeable that among four questions included in terms of speed, the "Managing of Car reservation is much faster than the manual" got the highest percentage in terms of speed while in terms of graphical user interface the "All pages of the proposed website were easy to navigate." got the highest percentage.

1. Screen Shots:

Fig 4. Algorithm for Booking Car.

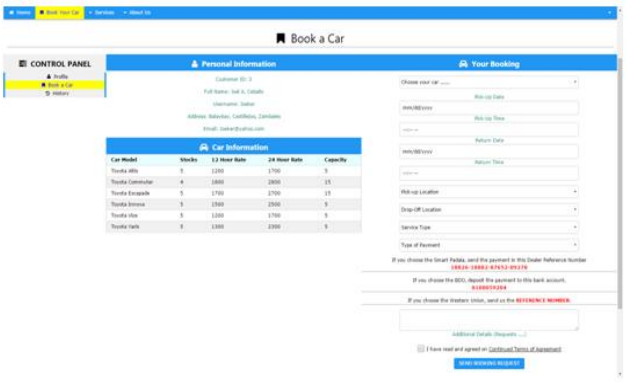

Fig 5. Book a Car Page.

Fig 6. Selection of Available Cars.

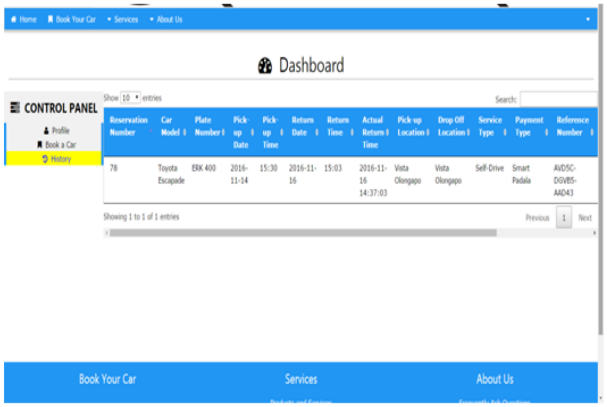

Fig 7. Transaction History Page.

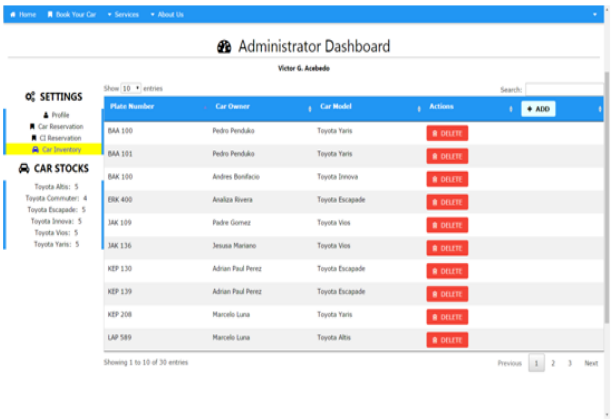

Fig 8. Car Inventory Page.

With the developed web application for Car rental to manage existing and new transaction in able for the car business to facilitate a more and convenient transaction to its customer. The developed web application has the capability to accept incoming request from the customer who wish to book car and schedule the time and day of renting the car. The scheduling algorithm works best in this kind to web application since it allows the user to easily check and management the transaction to the system.

The developed application has a two (2) level access for the user. It is the administration login privilege and the user privilege accounts. By providing this kind of user login privilege, the system could restrict the access of some modules available in the system. It provides a high level of security that the application could offer to a car rental business. Thus, the records in its database could be prevented to other users for security and privacy of the data.

The car management system with the integration of scheduling algorithm provides several modules for the administrator and users of the system. It allows the booking of cars by the customers and the business could easily schedule and manage the request of the customers. The application also offers the viewing of the available cars in a car rental business. It has a transaction page where the administrator of the system could easily check the availability of the car and other information's needed by the car rental business.

With the car rental management system, the administrator account can easily check the inventory of the available cars and other credentials by visiting the car inventory page of the application. A mark will appear in the inventory panel for the non-available cars and those which has low inventory.

IV. CONCLUSION

Based on the information the researchers gathered, the proponents concluded that the developed application for car rental business with the integration of scheduling algorithm was useful and appropriate solution to the identified problems by the researchers.

The integration of scheduling algorithm helped the researchers in the development of the online application to efficiently managed the request of the clients in the reservation of car and in checking of available cars in the rental business. It is noticeable based on the result of the questionnaire that the user interface of the system is friendly and can be used by anyone. The speed of the system in terms of processing and viewing of information's was also exemptional.

REFERENCES

[1] Commission on Information and Communications Technology (n.d.). The Philippine Digital Strategy Transformation 2.0: Digitally Empowered Nation. https:// dict.gov.ph/wp-content/uploads/2014/06/ philippine-digital-strategy-2011-2015.pdf

[2] Dr. C. Eugine Franco, and Bulomine Regi. S (2016). "Advantages and Challenges of E-Commerce Customers and Businesses: In Indian Perspective". International Journal of Research – Granthaalayah, Vol. 4, No. 3: SE (2016): 7-13.

[3] E. Hossain, M. A. Babar and H. Paik, "Using Scrum in Global Software Development: A Systematic Literature Review," 2009 Fourth IEEE International Conference on Global Software Engineering, Limerick, Ireland, 2009, pp. 175-184, doi: 10.1109/ICGSE.2009.25.

[4] Hyoung Yong Lee, Hyunchul Ahn and Ingoo Han, "Analysis of Trust in the E-Commerce Adoption," Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06), Kauai, HI, USA, 2006, pp. 113c-113c, doi: 10.1109/HICSS.2006.61.

[5] The New York Times (2017, July). Charles W. Bachman, Business Software Innovator. https://www.nytimes.com/2017/07/16/technology/ charles-w-bachman-dies.html

[6] Author's details