E-Payment and Transactions using QR Codes

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Abstract - Expeditious growth in E-Commerce trade has led to various user centric applications throughout the world. The ever growing popularity of online shopping and ticket booking has shown new dimensions of technology. The Debit or Credit card fraud and personal information security are major issues for customers and banks particularly in the case of funds transfer or during online shopping. In this paper, an alternative method is proposed which uses application of E-Payment and Transactions using QR Codes. The proposed work was analyzed using the Unified Modeling Language (UML) and focused on creating an application for smart phones with android system.

Key Words: E-Payment, QR-codes, Unified Modeling Language (UML).

1. INTRODUCTION

Online shopping refers to the retrieval of product related information from the vendor’s site and purchase of products via Internet through fund transfer. The main concern of purchase order through electronic purchase is the filling of credit or debit card information which may end up in the hands of criminals or hackers. Identity theft, phishing and pharming are the common issues in online shopping [1, 2].

The QR Code system has become popular due to its quick readability and greater storage capacity compared to standard barcodes. A QR code (Quick Response) is a specific matrix barcode, readable by dedicated QR barcode readers or smart phones through a high resolution camera. The QR code consists of black modules arranged in a square pattern on a white background. The information usually encoded in the QR code is text, alphanumeric numbers, URL or other data [1]. Figure1 shows the structure of QR code. Moreover; QR code has a number of features such as large capacity data encoding, dirt and damage resistant, high speed reading, small print out size, 360 degree reading and structural flexibility of application [3].

Figure 1: Structure of QR code

The rest of the paper is organized as follows; related work will be described in section 2, methodology of the proposed System will be illustrated in section 3. Proposed system prototype design will be illustrated in section 4. Results will be discussed in section 5. Finally, the conclusion is presented in section 6.

1. Related works

Foodics is a cloud-based management system for the hospitality and cafeterias business, working on the iPad as ”Foodics”, in the form of ”SaaS - Software as a service”, which includes POS software, an Electronic menu works directly through the iPad, as well as a kitchen management system, another inventory management, suppliers and staff management, an online application management program, Call center, a program to manage customer loyalty points. Foodics system designed to hike revenues and track everything inside your business, with customisable features that cater to the requirements of your restaurant [4]. Figure 2 shows the Foodics system.
Telr is an integrated platform for e-commerce solutions, providing critical services for business development for all e-merchants, whatever their size. Their e-payment portal is also of interest and care in terms of their functionality and payment processes, and the APIs open their doors to a wide variety of business models and patterns, including analytical reports, e-store, e-payments and customized payment pages [5]. Figure 3 shows Telr e-payment portal.

Moyasar (ميسّر) is an arabic word that refers to both simplicity and usability. In essence, it means anything that is easy to do, use, or grasp. Moyasar aims to provide ePayment solutions with superior user experience and provides ePayment solutions that greatly match the current needs of your online store, yet its solutions are flexible enough to suite the user needs as the online store grows. Figure 4 show the Moyasar home page.
The technological revolution influenced everything [6-25], even the methods of E-Payment and Transactions applications for the real world issues. Today, the use of Artificial Intelligence (AI) algorithms is expansive, particularly in providing solutions to challenging problems including pattern recognition and retrieval of information [21, 26-42], image segmentation [6, 7, 17, 43-48], analysis of medical image [49-53], Learning Management System [54-79], nurse rostering problem [80], Healthcare Monitoring system [20, 81], as well as prediction of river flow [82-84]. Accordingly, utilizing the AI algorithms and web technology, countless scholars have created as well as implemented E-Payment and Transactions applications systems to solve issues on various fields [85, 86].

2. Methodology

The process of system analysis aims to study an existing system to entirely design a new system. System analysis is performed to achieve mainly two aims namely:

- To understand the process or the system clearly. This will assist in the new system design.
- System analysis will help to identify the problems in the existing system; therefore this will help to know the inefficiency reasons.

The Unified Modeling Language (UML) is visualization for the system design, it represents graphical notations which help to describe and design software systems, principally software systems constructed utilizing the object-oriented style [23, 24, 76, 87-89]. The UML was utilized mainly to design the proposed system. The Use-Case diagram and the Class diagram are addressed below.

2.1 Use Case Diagram

The Use-Case Model depicts system requirements. Use-case captures the communication between system, users and other stakeholders in order to achieve the intended goal of the system. It shows the interaction between the system and external entities [23, 24, 76, 87-89]. The Actors are external entities who represent roles. They could be external hardware, human users or other systems. In this case the actors are the Student, Salesman and Banker. Figure 5 shows the use case diagram for the proposed system.

![Use case diagram for the proposed system](image)

Figure 5: Use case diagram for the proposed system

2.2 Entity Relationship (ER) Diagram

The ER Diagram, a kind of flowchart demonstrates the way that entities such as concepts, objects, or people are related within a system to each other. ER Diagrams are commonly utilized to debug or design relational databases in the education and
research, business information systems and software engineering. ER diagrams are associated to Data Structure Diagrams (DSDs), which concentrates on the elements relationships within entities rather than the relationships between entities themselves \[14, 15, 18, 19, 90\]. In addition, ER diagrams are commonly employed along with data flow diagrams (DFDs), which delineate the information flow for systems or processes. Figure 6 shows the ER diagram for the proposed system.

![ER Diagram for the proposed system](image)

**Figure -6:** ER diagram for the proposed system

3. Proposed System Prototype Design

This study focused on creating an application for smart phones with android system. The main aim of the proposed system is an alternative method is proposed which uses application of E-Payment and Transactions using QR Codes. The figures below are examples of the implemented interfaces.

![Login Interface](image)

**Figure -7:** Login interface
Create New Account

Rahaf@hotmail.com

********

Rahaf Ahmad

0565652587

SIGN UP

**Figure -8:** Registration interface

Welcome Rahaf Ahmad
Your Balance 0

BUY

RECHARGE

CONVERSION

**Figure -9:** Student main interface

**Figure -10:** Scan QR interface
4. Results and Discussion

The proposed system has been tested in order to measure its usability, where the proposed system was tested by operating using android studio. Twenty students evaluated the system prototype from Imam Abdulrahman Bin Faisal University (IAU). After given a brief explanations about how to use the system, the students have been tested the proposed system and answer the survey questionnaire (contains 10 questions measured by 5-point Likert Scale). The aim of the proposed survey is to measure the user satisfaction about the proposed system and prove its usability. The results obtained shows a high percentage of the students approve that the proposed system is usable, useful and achieved the main project target (see table 1).

Table 1: The results of data collected from the 20 students

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5. Conclusion

QR codes are used in this context for e-payment system in online shopping. It provides customer data privacy and prevents misuse of customer’s personal and banking data at merchant’s side. The Proposed system will be easy to use, economical and does not require any special training. With phone camera feature in it, the user can scan the QR code of the item to be purchased and money can be transferred. This work proposed alternative method which uses application of E-Payment and Transactions using QR Codes. The proposed work was analysed using the Unified Modeling Language (UML) and focused on creating an application for smart phones with android system.
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