Electronic Pharmacy System (EPS) : Case Study in Oman

A.Al-Shibli and S.Al-Jaradi

ABSTRACT- **The aim of this paper is to design and implement a web-based application for managing an Electronic Pharmacy (EPS). The proposed system aims to speed up the process of dispensing drugs to patients in a manner that ensures pharmacological safety and high efficiency. It also provides the time and effort exerted by the staff and ensures the accuracy of the patient's internal medical disbursement as well as the control of the disbursed quantities. Besides, the proposed system enables the doctor to see the full medical record of the patient and the types and amounts of medicines that have been described, discharged, and the location of issue. The doctor can also re-prescribe drugs, whether one drug or a group of drugs from the previous record of the patient, which speeds up the work of the doctor and reduce the waiting time of the patient. Moreover, the electronic pharmacy system supports the safety and security of the drug description process by alerting the doctor to any drug interventions such as drug reactions, and permissible doses. It also enables the doctor to document any information about the disease's susceptibility to any medicine or food, which helps to increase the medical care provided to the patient. The proposed system also facilitates the doctor's choice of drugs by using the scientific or commercial name from the stock items in the system only. The proposed system also provides a precise control of the medical stock, as it is not allowed to request medicines outside the approved list or exceed the quantities specified for each department. Moreover, the proposed system includes two main parts, namely pharmacy and health for mothers and children. And the person must first register in the system through fill an application containing information about the subscriber such as name, phone number, email address, etc. After that, the user can enter the system and complete the process of obtaining the drug or information about it before buying. Finally, the proposed system helps customers to dispense medicines quickly and accurately without having to go to the pharmacy site.**

Index Terms— Electronic Pharmacy System (EPS), information and communications technology (ICT), OTC, Healthcare, Oman.

I. INTRODUCTION

Health-care delivery applications need a robust and secure medicine providing system. Stock-outs can have severe negating effects on patient care, especially in the chronic diseases [1].

Electronic Pharmacy System is a term used today to describe the application of information and communication technologies in the health sector. Currently, have noticed a significant growth in the use of computers in the developing world to manage and dispense medicine to patients. Besides, it maintains and analyses patient medical records, including their medication regimens [2].

These systems can be adopted using information and communications technology (ICT). It is process design in order to carry on all the sector activities. Starting with the registration of customers, select the products and storing all information, until the billing. Figure 1, indicate the steps that customer may follow in order to understand how EPS system work.
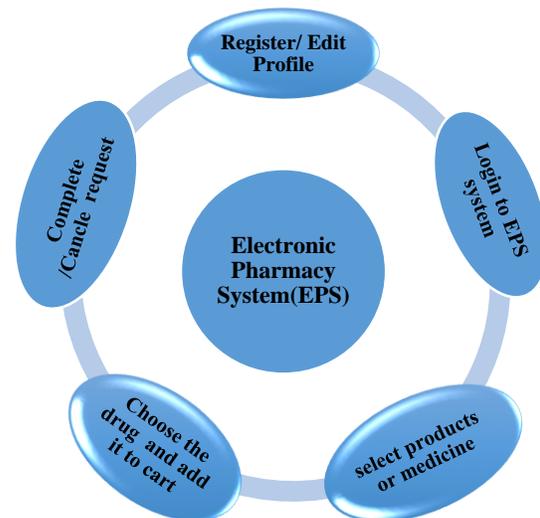

Figure 1 Steps of EPS Application

Implementing the pharmacy application and integrated it with data getting from the existing systems, could help to increase the accuracy and ease of the creation of medical needs and stock management. Besides, it will decrease the number of medical supply stock-outs [3].

Electronic Pharmacy System (EPS) is a web-based application for selling medicine through utilizing the tools and technology to achieve its objectives and executes its work with greater accuracy.

This proposed work is considering as the first online pharmacy in the Sultanate of Oman that sell medicine online. Thus, the customer can use the pharmacy electronically.

Aaisha Salim Al-Shibli. Lecturer / Sohar University, Faculty of computing and Information Technology, Sultanate of Oman. M.sc in Computer science from SoharUniversity.
AAlshibli@soharuni.edu.om

Safiya Nasser Al- Jaradi. Lecturer / Sohar University, Faculty of computing and Information Technology, Sultanate of Oman. M.sc in Information Technology from Middle East University.
SJaradi@soharuni.edu.om

Electronic Pharmacy System (EPS) aims to reduce the paper work which will provide multiple facilities to the user and less efforts [4].

It enables the patient to do several things such as immediate contact with a specific pharmacy to request their medicine securely and fast. Moreover, the orders could deliver to patient locations over the Sultanate of Oman with fewer fees, which will save efforts, money and time. In addition, patient can use the pharmacy's website to buy any medicine, medical materials, baby and mother care. With Electronic Pharmacy, waiting and standing in queues to receive medicine from the pharmacy it will become thing from the past because the electronic pharmacy will have shortened the time. In addition, it will bring comfortable for patient. It is a user friendly, where aim to help user for accessing the pharmacy easily.

The proposed system reflects the commitment of the web-based application in the delivery of the health care services to all Omani people. However, medicines are divided in two types; the first type is medicines that do not sell without the prescription and instructions from the doctor. These medicines monitored by medical organizations and the Ministry of Health of Oman. The second type of medicines called the OTC. OTC medicines are short term indicates to a set of drugs prescribed without a prescription. Also, known as Over-the-counter or nonprescription medicine. These concepts refer to medicine that the patient can buy without a prescription from the doctor. The system will sell and provide OTC medicine in safe and effective way in comparison with paper-based instructions.

On the other hand, some medications are not cover by electronic pharmacy service because the Ministry of Health of Oman laws requires pharmacies to be out of lack of dangerous medicine as is the case in most countries of the world.

The Electronic Pharmacy system will contribute to the development work of the pharmaceutical sector through provide better services to the public by the laws regulating the work of the pharmaceutical sector.

The new advancement in the area of services and computing offers delivering hosted services over the worldwide using public or private online cloud services [5,6,7]. The idea of cloud computing can be established in many levels of implementation based on the type of problem. The used of new technologies like cloud computing and soft computing in analysis the data of any system can help to understand the behavior of current and future data [8,9,10].

II.   RELATED WORK & EXISTING SYSTEM

There are many applications that are similar to the electronic pharmacies system. These applications are working to facilitate the process of getting a medical product through the use of the website, e-pharmacies are divided into several types, including the hospital pharmacies and health institutions or independent electronic pharmacy. For example, there are many similar applications to the electronic pharmacy in the Arab and the Western world, but our focus was on electronic pharmacies in the Arab world such as Electronic pharmacy system in Dubai hospitals, Adama pharmacy, Fouda Pharmacy and dowa Kuwait online pharmacy. All these websites contain several sections of products, including Hair care, skin care, mother and baby, Medicine Cabinet and many others.

Dubai Health Authority (DHA) applied electronic pharmacy system in Hatta Hospital, which aims to speed up the disbursement of medicines for patients by safety process. It facilitates many processes such as patient record, review as well as providing accuracy in the process of therapeutic description. The UAE in general is working on the establishment of electronic pharmacies in all the Emirates with medications delivery service to the home. The doctor is also working on a review of medications and the duration of its validity and the quantities consumed largely of products to be provided quickly before stocks last [11].

Adama pharmacy located in Saudi Arabia system able to develop a new concept in the area of customer service. In addition, it becomes a pioneer in this domain. So far, everyone commends the high-class level service provided. It includes several sections such as Mother& Baby, Skin care, Hair care, and other. Each section contains several products. This pharmacy is characterized by multiple sections and where carrying a large number of products and medicines. The instruction of how to use this website is straightforward by choosing the appropriate language to facilitate the selecting a product or medication. Then, the patient can log in to the site and select the product from the offered list. Or could use the search tool to choose the product and determines the quantity and enter the place of delivery, and paid using the credit card number [12].

Fouda Pharmacy is the First Electronic Interactive Pharmacy in Egypt. This website requires the customer registration as the first step to enter a user name and Password. Then you can use this site to choose a medical product that you want to, after that selecting the product is inserted into the customer data and the card number then sets address. This pharmacy provides medicines only and it does not provide medical or health products (Skin Care - hair Care - mother and baby products) like most of the e-pharmacies. It has a large number of categories and each category have huge number of medicines [13].

Dowa Kuwait Online Pharmacy is an integrated service providing customers with pharmaceutical and healthcare products without the need to go to the pharmacy. It is the first online, high quality pharmaceutical service in the Middle East. It provides valuable online healthcare information in addition to specialized delivery services. In this website, simply place your order online through Dowa and it will have delivered to your doorstep wherever you are. To register in this website, you need an e-mail and password. This web site contains online doctor, Special Offers, multiple Categories, Brands and Products. The process of choosing a product or the medicine similar to what happens in the website of Fouda pharmacy [14]. Each web-based application has specific features that make it the first over other websites regarding saving time and effort. It also has many disadvantages. Table 1 summarized some of advantages and disadvantages of these applications between existing systems.

Logical model in Figure 2 shows simple path for a customer to be followed in order to understand the work of the system.

| Related works	Advantages	Disadvantages
Electronic pharmacy system in Dubai hospitals	-This system will alert the doctor to any pharmacological interventions. -The system enables the doctor writing the prescription electronically to registered patients.	-The people in this city do not use the electronic pharmacy because they do not resort to technology dramatically.
Adama pharmacy website [12]	-can easily, speed and accuracy in completing the orders, search, preview and purchase, save time, effort and money, privacy and complete confidentiality. -browsing in both Arabic and English, and rapid updating of products and requirements.	-This website focuses on income more than on providing good customer service. - Overconfident lead to a lack of attention to competitors.
Fouda Pharmacy [11]	-The possibility to talk with the pharmacist. -If the price of the medicine changes they will send a message to the customer.	-The medicine prices change every time.
Dowa Kuwait Online Pharmacy [13,14]	-guarantees the privacy of its customers (no detailed data from customers is required) [1]. -Access to a wide range of pharmaceutical products.	–
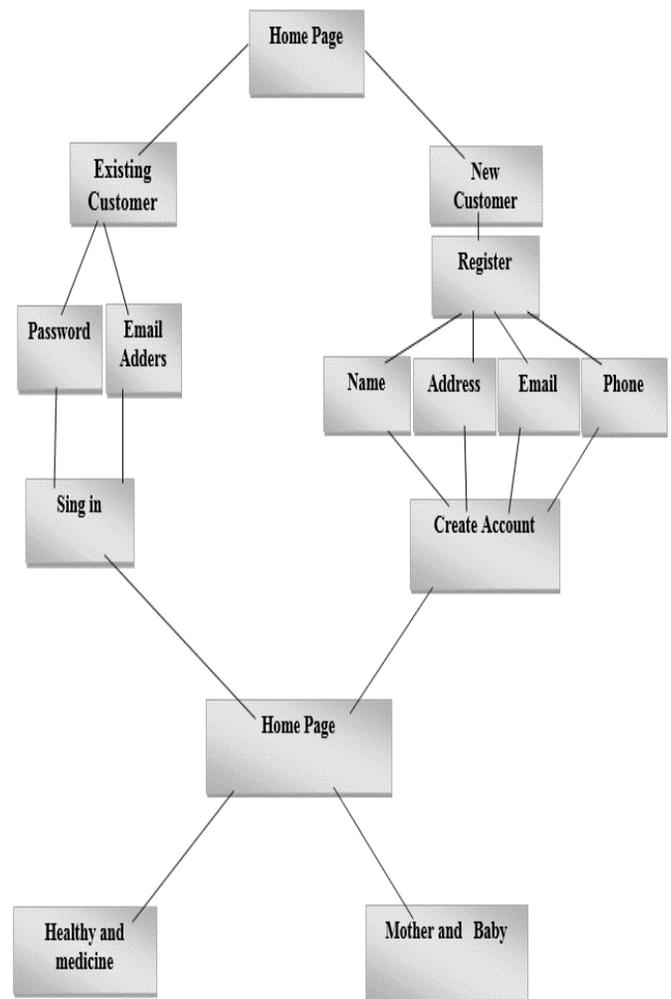
Figure 2 Logical Model Of EPS

III. DATA GATHERING AND SYSTEM ANALYSIS

The data collections and analysis is considered as important stage for system design and implementation [15]. Figure 3 shows the use case of Online Ordering System. There are two types of actors, Admin and Customer. In this system, the user is asked to register for first-time only, then Login information will be entered by admin and the user. After that, the user can login to the website and brows the available categories such as Mother& Baby and Pharmacy& Health. Then he can choose the products or view orders. admin can Edit categories such as, add new items and services. Also, he can add announcements, update categories and check orders.
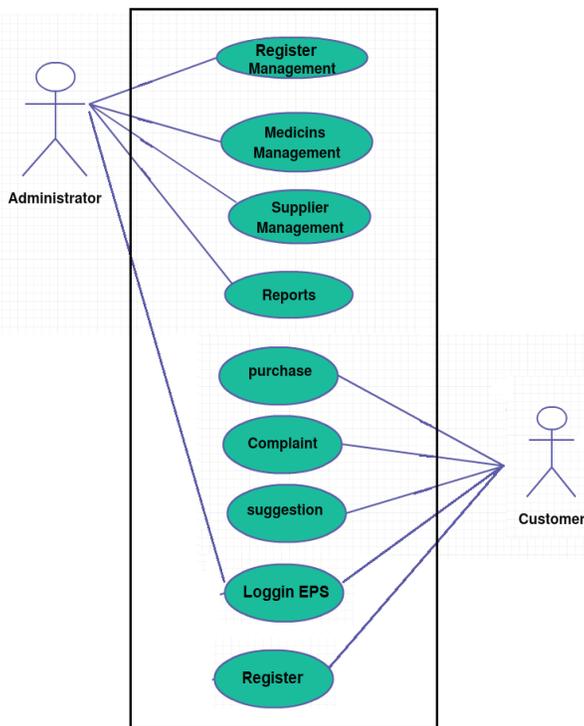
Figure 3 Use case Diagram

IV. IMPLEMENTATION

The main page of the electronic pharmacy system is shown in Figure 3. The Home page contains several services like Pharmacy & Health page, Mother & Baby page, about us page, registration page, login page and Contact us page. In this page the user can select any categories that he\she want or they can search about any items. Also, it contains a logo of electronic pharmacy system which called "NARGES Pharmacy ".

The following are demonstration of the EPS implementation. Figure 4 shows the Pharmacy & Health page.

Figure 4 EPS Main screen

Figure 5 Pharmacy & Health page

Figure 5 shows the pharmacy and health page contains many different medicines that people need in their lives when they sick or other different needs as well as there is information about the commodity and price, such medicines (medicines for colds and chest diseases, fever and some ointments for allergies, dermatitis and some cosmetics and hair care and skin. And many more). Also, this page contains a search icon that enables the user to easily search for the type of medication that the customer needs and immediately the system will show the medication that the customer needs.
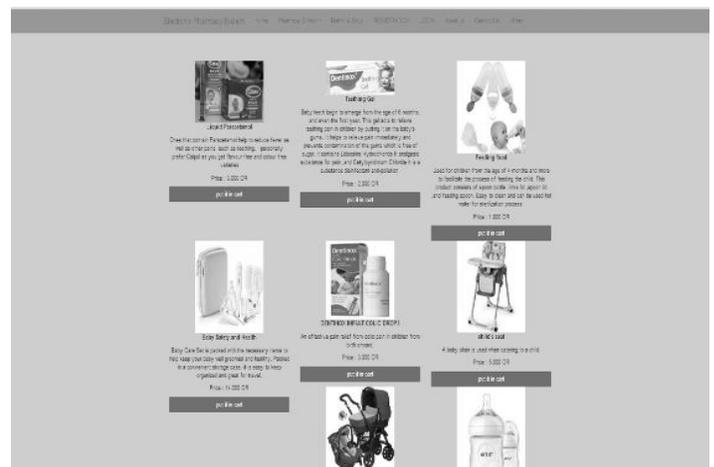

Figure 6 Mother & Baby page

Figure 6 shows the mother and baby page contains many special needs of the mother and baby as well as contain various medicines. Also, it contains information concerning the price of the medicine or product. These drugs are medicines (fever in children, bathing fluids, sanitary napkins, bottles of milk and food, and other miscellaneous medicines). Also, this page contains a search icon that enables the user to easily search for the type of medication that the customer needs and immediately the system will show the medication that the customer needs.
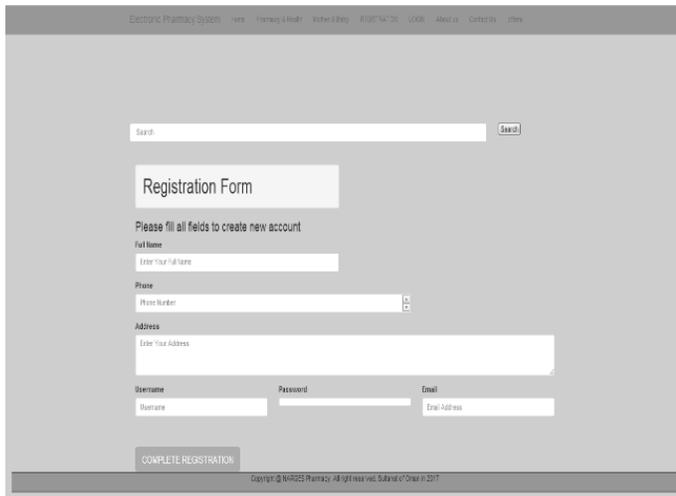
Figure 7 Registration page

Figure 7 shows the registration page. It is for new customers to create a new account. The customer should fill all information that include full name and phone, address, username, password and email. The password should not less than 5 letters. The customer should save the username and password because he/she will be using it to login to the online pharmacy system. After the customer finish filling all information, click complete registration button.
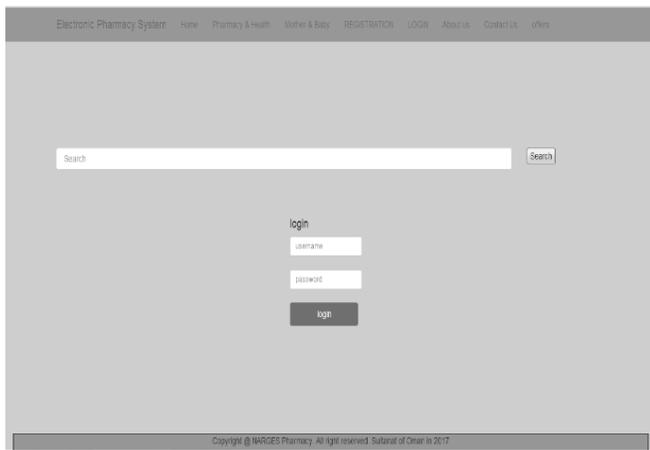

Figure 8 Login page

Figure 6 shows the users login page that he needs to write a username and password then click login button to enter the online pharmacy system. Then he can buy any items that need. However, if the customer enter his/her account correctly will be able login to the system. If the customer entered invalid account more than three times, the system will have blocked the user. Also in this page, the admin can log in to the system.

Figure 9 Admin page

Figure 9 shows the Admin Login Page. In this page, the admin can Add items or see the orders for the customer.
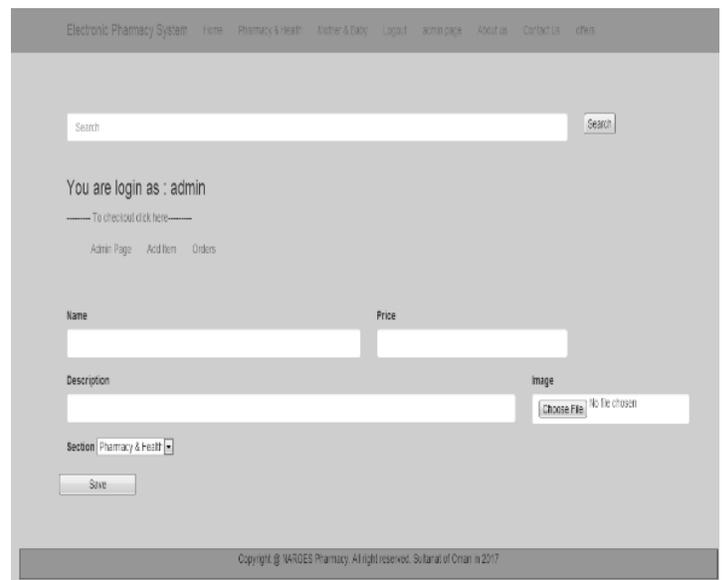

Figure 10 Add items page

Figure 10 shows the admin can add item. The admin put the name of the product, price and Description. Then, the admin chooses the image of the product from the photo gallery and selects the section of that product if it is pharmacy& health or mother &baby.

Figure 11 shows the Order Page which appear only for Admin. In order Page, when the Admin want to check out if the customer paid or not. This page contains the order id, customer Name, address email and if the customer paid or not.
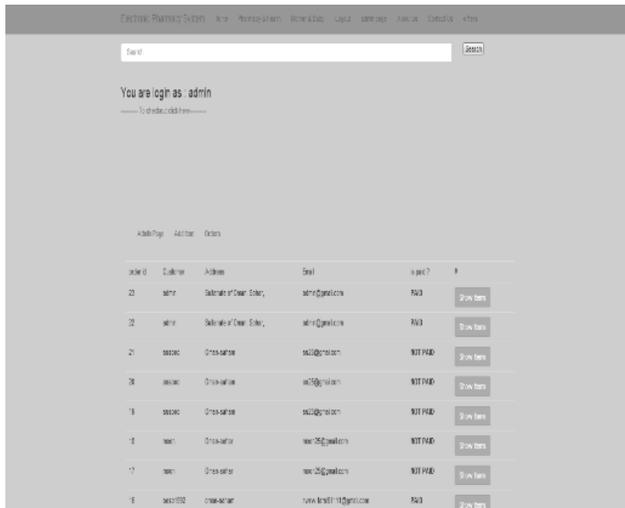
Figure 11 Orders page
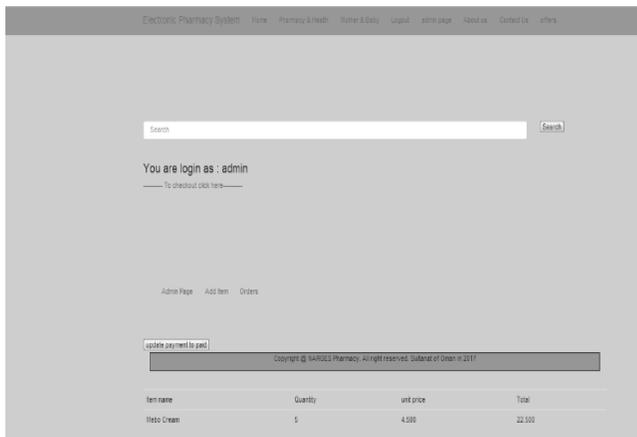

Figure 13 Quantity page

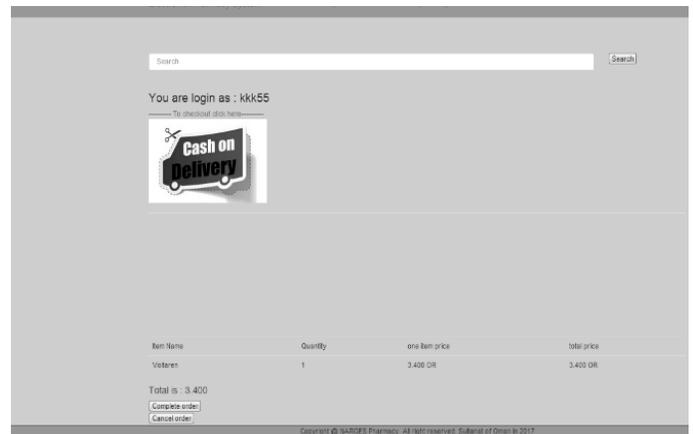
Figure 12 Update payment page

Figure 14 Complete or cancel order page

Figure 12 shows the update payment page that the user can check out the order. In this Page, when the Admin see if the customer pays the money of item, the admin must click update payment to paid button. This page contains the item Name, quantity, unit price, total and update payment to paid button.

Figure 13 shows the Quantity page. After the customer select the items that he/she want will display the quantity page. In this page, the customers can enter any quantity that need it of any items then click add it to cart button.

Figure 14 shows the Complete or cancel order page. After the customers put the quantity for the items and click add it to cart button, this page will display Complete or cancel page. In this page, the customers can see their order, the quantity, the price, and the total of price. Then the customers can complete order or cancel it from click on complete button or cancel button.

Figure 15 shows the Block screen. The blocked screen shown after the system have blocked the user because the customer enters invalid account more than three times.
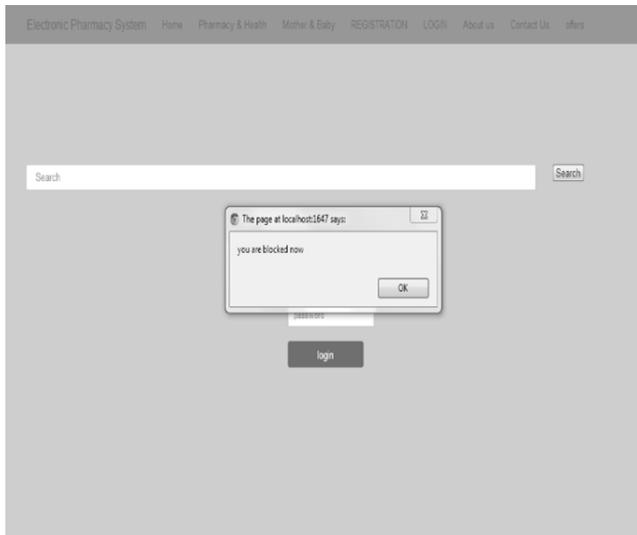
Figure 15 Block Screen

V. CONCLUSION & FUTURE

The current work is proposed an online pharmacy system that help to reduce the effort and short time for getting a medicine. The following are some contributions of proposed EPS system.

1. One of the most important procedures in the future, will work to expand the pharmacy to include more sections and not limited to only two (mother &baby / health and pharmacy).
2. We will also develop and improve the design of the pharmacy to be new, attractive and consistent in colors and images, lines and satisfy customers.
3. One of the most important measures we will be working on in the future is to provide pharmacy products to various Arab and non-Arab countries. Not only to Oman and the areas where they are located, we will initially deliver to the GCC. Then foreign countries by transportation and shipping.
4. We will further promote more for the products in the pharmacy by do advertisements in the internet, newspapers, television, by SMS and social networking sites.
5. As well as the most important plans agreed in the future linking pharmacy in various hospitals in the Sultanate so that the client is satisfied with the medicines and confident that all medicines are good.
6. Among future plans the work of the application on the phone helps the customer to enter and browse the pharmacy.
7. If the user forgets his/her password, what the site did.

CONCLUSTIONS

The Electronic Pharmacy System (EPS) aims to reducing paper work & provide multiple facilities to user with less

efforts and Accessing the Portal according to choice of user. With Electronic Pharmacy, waiting and standing in queues to receive medicine from the pharmacy it will become thing from the past. Moreover, customer's orders will have delivered to their homes or any place in Oman so this will save time, efforts and money of customer. In addition, the proposed system will make patient very comfortable to get the medicine easily and in short time. The EPS users will be able to get medicines directly from pharmacies without troubling. One of the most future work is to implement the EPS based cloud computing and mobile services [16,17].

The using of mobile computing will help to reduces the communicating time and offer fast services.

VI. REFERENCES

[1]. Kumar, S., & Bano, S. (2017). Comparison and Analysis of Health Care Delivery Systems: Pakistan versus Bangladesh. Journal of Hospital & Medical Management.
[2]. Shortliffe, E. H., & Blois, M. S. (2006). The computer meets medicine and biology: emergence of a discipline. Biomedical Informatics, 3-45.
[3]. Fung, K. W., Kayaalp, M., Callaghan, F., & McDonald, C. J. (2013). Comparison of electronic pharmacy prescription records with manually collected medication histories in an emergency department. Annals of emergency medicine, 62(3), 205-211.
[4]. Ferrández, O., Urbina, O., Grau, S., Mateu-de-Antonio, J., Marin-Casino, M., Portabella, J., & Salas, E. (2017). Computerized pharmacy surveillance and alert system for drug-related problems. Journal of clinical pharmacy and therapeutics, 42(2), 201-208.
[5]. Yousif, Jabar H., and Nebras N. Alattar (2017). "Cloud Management System based Air Quality." International Journal of Computation and Applied Sciences (IJOCAAS). 2(2), pp145-152, Volume 3, Issue 1.
[6]. Majid O. Al-Shezawi, Jabar H. Yousif, Ibtisam A. AL-Balushi (2017). "Automatic Attendance Registration System based Mobile Cloud Computing", International Journal of Computation and Applied Sciences (IJOCAAS). 2(3), Pp116-122, August, ISSN 2399-4509.
[7]. Ibtisam A. AL-Balushi, Jabar H. Yousif, Majid O. Al-Shezawi (2017). "Car Accident Notification based on Mobile Cloud Computing", International Journal of Computation and Applied Sciences (IJOCAAS). 2(2), Pp46-50, April, ISSN 2399-4509.
[8]. Jabar H Yousif (2015) "Classification of Mental Disorders Figures based on Soft Computing Methods". International Journal of Computer Applications 117(2):5-11, May.
[9]. Jabar H Yousif. (2013)." Natural Language Processing based Soft Computing Techniques", International Journal of Computer Applications 77(8):43-49, September. Published by Foundation of Computer Science, New York, USA. DOI: 10.5120/13418-1089.
[10]. Jabar H. Yousif, (2011). "INFORMATION TECHNOLOGY DEVELOPMENT", LAP LAMBERT Academic Publishing, Germany ISBN 9783844316704.
[11]. fouda.com. (2013). fouda. Retrieved October 25, 2016, from http://www.fouda.com/
[12]. http://adamapharmacy.com/. (2016). adama pharmacy. Retrieved October 24, 2016, from http://adamapharmacy.com/en/?sl=ar
[13]. http://dowa.co/. (2016). Dowa Kuwait Online Pharmacy. Retrieved October 30, 2016, from http://dowa.co/
[14]. http://dowa.co/t-aboutus.aspx. (2016). About us. Retrieved November 17, 2016, from http://dowa.co/t-aboutus.aspx.
[15]. Peersman, G. (2014). Overview: Data Collection and Analysis Methods in Impact Evaluation, Methodological Briefs: Impact Evaluation 10, UNICEF Office of Research, Florence.
[16]. Zhiqiang, G., Lingsong, H., Hang, T., & Cong, L. (2015, November). A cloud computing based mobile healthcare service

system. In Smart Instrumentation, Measurement and Applications (ICSIMA), 2015 IEEE 3rd International Conference on (pp. 1-6). IEEE.

[17]. Priyanka VP and Ashok BK (2016). E-pharmacies Regulation in India: Bringing New Dimensions to Pharma, Pharmaceutical Regulatory Affairs , 5(2)5: 175. DOI: 10.4172/2167-7689.1000175.

First A. Author Aaisha Salim Al-Shibli. Lecturer / Sohar University, Faculty of computing and Information Technology, Sultanate of Oman. M.sc in Computer science from Sohar University.

Second B. Author Safiya Nasser Al-Jaradi. Lecturer / Sohar University, Faculty of computing and Information Technology, Sultanate of Oman. M.sc in Information Technology from Middle East University.