Faculty of Information and Communication Technology

ONLINE RESERVATION SYSTEM FOR AL-KINDI GENERAL HOSPITAL

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ONLINE RESERVATION SYSTEM FOR AL-KINDI GENERAL HOSPITAL

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DECLARATION

I declare that this master project entitled "Online Reservation System For Al-Kindi General Hospital" is the result of my own research except as cited in the references. This master project has not been accepted for any degree and is not currently submitted in the candidature of any other degree.

Signature   :

Name   : HASAN BDAIR HASHIM

Date   : JANUARY 2015.

APPROVAL

I hereby declare that I have read through this project report and in my opinion this project report is sufficient in terms of scope and quality for the award of the degree of Master of Computer Science (Database Technology).

SIGNATURE   :

NAME   : DR. ASMALA BIN AHMAD

DATE   : JANUARY 2015

DEDICATION

Lovingly, I dedicate this thesis to my beloved wife, Wejdan Abbas Hassan, who supported me in each step all the way, "habeballah". To my precious daughter, Bara Hassan, and son, Mohammad Baker Hassan, who gave me passion and strength with their smile.

ABSTRACT

Recently, increasing number of hospitals has been an obvious trend in many countries. This is mainly because the needs to providing medical services to increasing patients due to various forms of diseases. Such scenario needs careful attentions from the hospital management in order to provide appropriate services to patients. One of the important tasks to ensure efficient health care services is booking for medical appointment. With increasing number of patients, a systematic appointment booking is crucial in order to provide an accurate and fast medical treatment to patients. Conventional way of booking appointment is time consuming since it requires patients to go to the hospital, in which eventually resulting in an increase in cost and effort. To overcome such problem, the appointment booking system can be made online via the Internet. With an internet-based booking system, appointment booking can be done from anywhere and at any time without having to go to hospital, therefore is time- and cost-effective. This study develops a novel online appointment booking system for Al-Kindi Hospital in Iraq. The system is equipped with a data analysis tool which was developed using clustering technique. The tool was tested using real data from a public hospital, in which showing that the patients can be successfully classified based on their medical information recorded from the online appointment booking system.

ABSTRAK

Sejak kebelakangan ini, peningkatan bilangan hospital telah menjadi satu tren yang ketara di kebanyakan negara. Ini adalah disebabkan oleh keperluan untuk mennyediakan perkhidmatan perubatan bagi menampung pertambahan pesakit yang menghidapi pelbagai jenis penyakit. Senario ini memerlukan perhatian yang teliti daripada pihak pengurusan hospital bagi menyediakan perkhidmatan yang sebaik-baiknya kepada pesakit. Salah satu daripada tugasab yang penting untuk memastikan perkhidmatan penjagaan kesihatan yang berkesan ialah penempahan temujanji perubatan. Dengan pertambahan pesakit, satu sistem penempahan yang sistematik adalah sangat penting dalam usaha untuk menyediakan rawatan perubatan yang tepat dan cepat kepada pesakit. Cara konvensional tempahan temujanji adalah memakan masa yang agak panjang memandangkan pesakit dikehendaki untuk datang sendiri ke hospital, yang mana akhirnya mengakibatkan peningkatan kos dan menyusahkan. Untuk mengatasi masalah ini, tempahan temujanji boleh dibuat secara atas talian melalui internet. Dengan sistem tempahan berasaskan internet, tempahan temujanji boleh dilakukan dari sebarang tempat dan sebarang masa tanpa perlu datang ke hospital, oleh itu adalah berkesan dari segi kos dan masa. Kajian ini membangunkan satu sistem tempahan temujanji atas talian yang baru untuk Hospital Al-Kindi di Iraq. Sistem ini dilengkapi dengan kemudahan menganalis data yang telah dibangunkan menggunkan teknik clustering. Kemudahan ini telah diuji menggunakan data sebenar daripada sebuah hospital awam yang mana menunjukkan pesakit berupaya dikelasifikasikan berdasarkan maklumat perubatan yang direkodkan oleh sistem tempahan atas talian tersebut.

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Alhamdulillah, Allah has permitted this thesis to be completed and I mostly hope Allah will accept this thesis as a form of religious charity by me. It would not have been possible for me to write this thesis without the help and support of the generous people around me, to only very few whom are possible to be mentioned here. This thesis would not have been possible without valuable help, support and patience of my honorable supervisor, Dr. Asmala Bin Ahmad. May Allah reward him much more than what all he has done. Not forgotten, all the examiners who had given me the encouragement and support to improve the quality of my study. I sincerely thank my best friends, Sadiq Aziz, Kamel Jawad and Younus Fahd. A warm appreciation is also addressed to Abdul Razzaq Ali, to all of my colleagues and others who have provided assistance at every occasion of my study. Finally, I convey my deepest gratitude and sincere love to my wife, to my beloved sisters and brothers; for their uncountable support, prayers and encouragement. Ya Allah, please I hope you reward them in the world and the hereafter.

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CHAPTER ONE

INTRODUCTION

In this study, I developed online reservation system at Al-Kindi General Hospital in Iraq. This system can be remotely accessed by users from anywhere, anytime, using internet applications from mobile devices for booking appointments. The development made use SQL server 2008 database and Microsoft visual studio 2008. The mobile devices include laptop computers and mobile phones. Mobile application allows users to use the information technology without being bound to a single location. Mobile application provides users with the flexibility and enables users to access at any time and location. Microsoft Visual Studio is an Integrated Development Environment (IDE) that can be used to develop graphical user interface applications along with Windows Forms applications and web applications for all platforms supported by Microsoft Windows, Windows Mobile, Windows.Net, Framework.Net Compact Framework and Microsoft Silverlight.

This study provides the benefits as listed below:

•   Provide solutions through mobile at anytime anywhere.

•   Provide safe and secure online reservation

•   Reduce effort and time.

1.0   Background of the Study

Nowadays, there have been an increasing number of hospitals and medical complexes in many places of the world. These facilities are meant to provide medical services to people suffering from various diseases. One of the important components in providing medical services is medical appointment reservation. The conventional way of doing this is patients need drop by the hospital to make appointment. This means patients

need to spend time, effort and money to reach the hospital before the appointment can be made. This causes difficulty for old and sick patients in getting medical treatment, particularly when their houses are far away from the hospitals. Internet has been a new form of communication technology available in many parts of the world. Such technology can be very useful to retrieve medical records of patients stored in a database. The issues regarding the appointment booking can be improved if we can utilise the internet to make appointment reservation. Such system is more efficient than the traditional one where the patient no longer need to go to the hospital physically which causes difficulty especially to old and sick people besides also cost-, effort- and time-effective. Patients can make reservation from anywhere and at any time by remotely assessed the internet using mobile devices provided there is a network service available (e.g. broadband, wifi, etc.).

This aims of this study is therefore to develop an online reservation system for use at Al-Kindi Hospital in Iraq. The significant benefits of this system include:

  i.   Speed in appointment reservation for patients through internet.

  ii.   Reduce effort, time and saving cost.

 iii.   Increase the accuracy of appointment reservation.

1.1   Problem Statement

The scalability of Medical Data Store (MDS) is vital aspect of Medical Data Management Systems (MDMS). They are the location data, technical platforms and data formats, organizational behaviour on data processing and culture throughout the population data management. These factors are essential and unless these constraints are violated, the levels required to make good decisions and analysis cannot be achieved at the architectural design of reservation system. In addition, it is a feasible given the time factor for these issues during the integration of different data locations. The information technology (IT) infrastructure in medical organizations does not support the information needs of

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institutional decision makers. There are two main causes of this lack of decision support system. The first concerns that the infrastructure of many computer systems is not designed to support reservation system. The second reason lies in the often poorly integrated IT architecture. Less obvious reason why many facilities are inadequate for decision support has to do with the naturally evolved technology (IT) architecture found in many organizations today (Inmon, 2002; Linthicum, 2000) .

The current medical architecture consists of complex and inefficient processes which are time consuming due to the laborious tasks required. The medical data representation is not the same in different institutions and therefore causing difficulties in managing and retrieving data contents. Therefore, this study aims to represent a medical online reservation system based on a novel architecture in which expected to be a timely solution and more practical for health care requirements. This study is to develop, design and implement a reservation system on the Internet using the database system (SQL Server) with user interfaces (VB.Net).

1.2 Research Questions

This study attempts to answer the following questions:

i. What are the requirements for medical online reservation system?

ii. How to design the proposed system?

iii. How to evaluate the performance of the system?

1.3 Research Objectives

The aims of this study are to determine the requirements of the Internet and design therefore an effective system that can be accessed via the reservation system in hospital; we need to achieve the following objectives:

i.   To investigate the online reservation in terms of time. (Chapter 2).

ii. To improved reservation online (Chapter 3).

iii. To evaluate the performance of the system (Chapter 5).

1.4 Research Scope and limitation

This research takes into account the ethical issues and privacy in which was obtained by official approval from the Al-Kindi General Hospital to access the relevant databases for use in the system of booking appointments for patients and medical privacy. All of the data are extracted individually from the database before the development of this system takes place. The scopes of the study are:

i.   This study deals with development of reservation system via the Internet to assist hospital management.

ii. This study will later attempt to classify patients according to disease (diabetes, heart disease, asthma, cancer, hepatitis, kidney failure, cardiac arrest, and catheter) using Microsoft Clustering algorithm in which will be used in rescheduling patient reservation accordingly.

iii. This study makes use Microsoft SQL Server 2008 and VB.Net.

1.5 Significant and Research Contribution

The design of an online reservation system in study will help in decision-making tasks by doctors and hospital management. The system provides medical services to use the information stored in the database hospital. This system is different from existing systems because it contains a specific record for each patient. These data can be displayed by a specialist doctor that is assigned in order to determine the medical appointment for patients. The patients can know the appointment date and time by logging in the system. The utmost importance characteristic that makes this system different from other systems

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is that a new page has been added in the second tier (Section 3.1.2). The second tier allows the doctor to display necessary data from the database. These data are extracted from the patient data. The system enables patients to visit hospital at a lowest cost, effort and time.

CHAPTER TWO

LITERATURE REVIEW

This chapter provides a detailed description of the previous works related existing hospital reservation system. Related issues will be identified and discussed towards achieving the objectives of this study.

2.0 Introduction

This section reviews previous works related to the conventional medical booking system and current booking systems that made use the web pages on the Internet. This includes the algorithms and data used by these systems. Finally, this section discusses the applications of booking appointments and managing medical data for patients enrolled in the database of Al-Kindi General Hospital using Internet applications and provides a brief overview of such application on mobile devices. This includes the types, advantages and disadvantages. The last subsection focuses on the design of the purposed system which uses the Structured Query Language (SQL Server 2008) as the database and the Visual Basic (VB.Net) as the programming language.

2.1 Development of Hospital Management Software

SobogunGod (2012) developed a system for management of small private hospitals. The development model used by SobogunGod (2012) is given in Figure 2.1.

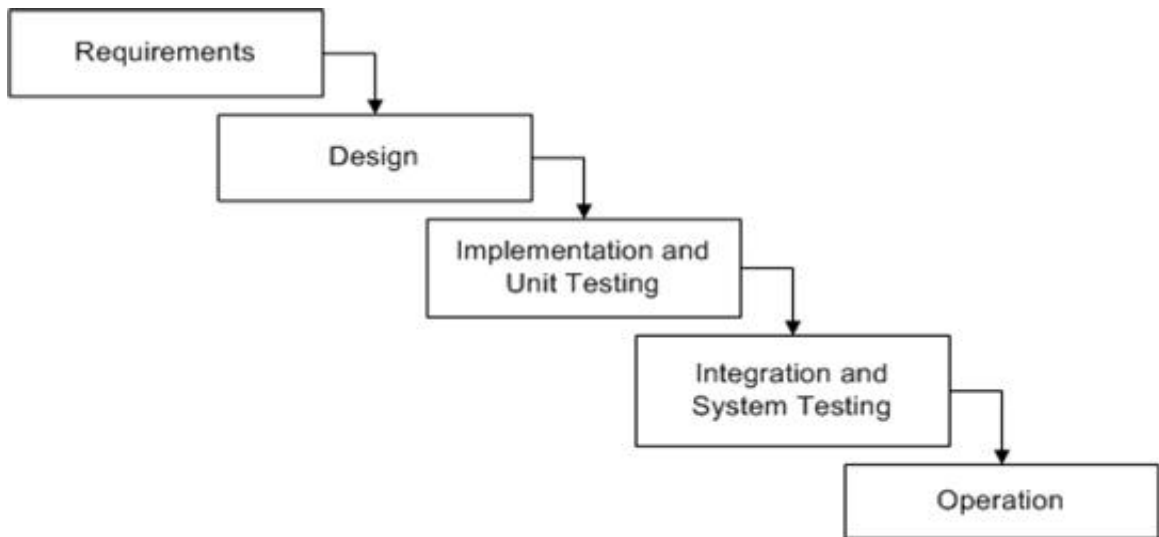Figure 2.1: Development model implemented by SobogunGod (2012)

The management system was used for booking appointments by patients whose name already in the hospital database. Microsoft visual studio 2010 and Microsoft SQL server management studio were used in developing the user interface of the system. The entity data model used is shown in Figure 2.2.
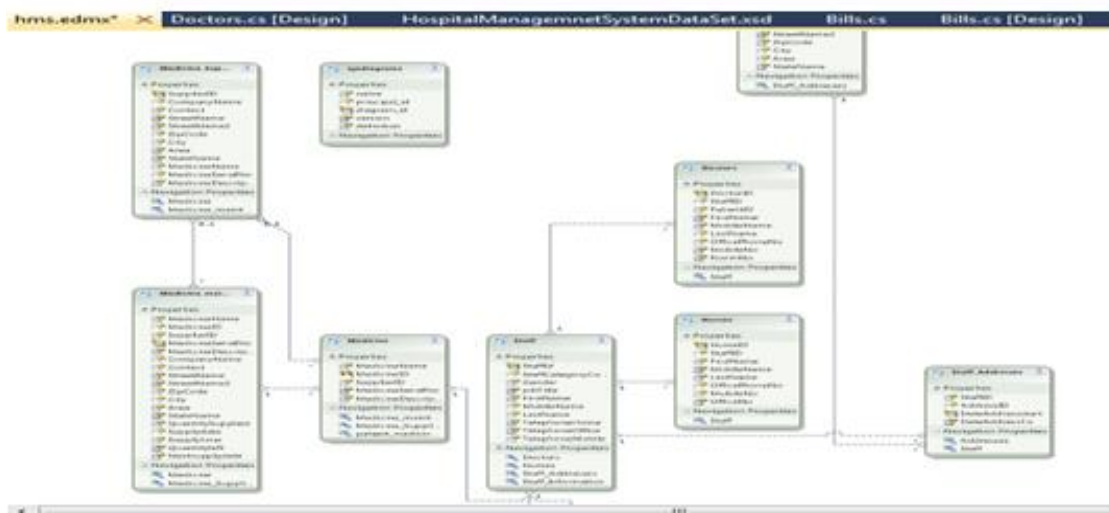

Figure 2.2: Entity data model SobogunGod (2012)

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The disadvantages of the software are the risk assessment may not be necessary when re-engineering or updating the developed program. Highly specific expertise is required to assess the risk analysis but it may be difficult to find an expert for such assignment. Furthermore, this model can be very costly and the success of the software implementation is much depending on the risk analysis phase besides it does not work well for smaller projects.

2.2 A descriptive Study of Online Appointment System Services of Hospitals

Bexci, M. S., and Subramani, R. 2013, investigated online appointment system services provided by hospital websites to study the effectiveness of information and communication technology in India. The objectives of their research were to study the online appointment services in hospitals, and build an improved online appointment system suitable for the current needs of the hospitals. The advantages and disadvantages of the Internet based online appointment booking as shown in Table 2.1.

Table 2.1: Internet based Online Appointment Booking – Web Portal and Hospital/Clinic Website (Subramani and Bexci, 2013)

Methods	Features	Advantage	Disadvantage
Internet (Web Portals)	Creates, one point for the allocation of access to any group of health care providers for patients enrolled in the portal make appointments online with various care providers in a two-way channel of communication between patients and a group of health care providers for patients booking appointments by logging in and selecting from a list of options. Displays appointments available by the provider,	Convenient, 24 hour, self-service options Patients book appointments at nearest hospital/clinic Efficient use of resources and possibility for patients to choose services of specialists from different health care institutions System helps automate patient reminders, which, again,	Common web portals are not available in all countries, Lack of information about common web portals, The success depends upon the common web developers

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	the time slot day of the week.	reduces the time pressures on practice administrative staff Outsourcing appointment patients to call in and schedule appointments in vacant time slots	
Internet (Hospital/Clinic Website)	Provides patients with more specific information on the respective hospital's websites, Online appointment system through dedicated web page can be integrated with a hospital/clinic website.	Hospital website are more reliable than web portals Hospitals employ dedicated staff for follow-up Assistance from hospitals is an added assurance	All hospitals/clinics do not have a website Lack of information about the availability of the service to the patients or users Not an option for most patients Internet access, skill, preferred language required for online activities

This study aimed to obtain information used in the hospital's website that provide online appointment service for patients. Advantages of new model provide an efficient communication tool that facilitates provisioning of comprehensive healthcare delivery through its various modules. Implementation of this new model will also help to facilitate healthcare delivery through inter-networked hospitals.

2.3   The Automation of Hospital with Decision Making Ability

Kedar et al. (2012) discussed on the automation of hospital with decision making ability in India. The aims of their study were to use classification, assembly and association rules to identify the symptoms and diagnose diseases. This system focused on the simple and effective methodology for medical diagnosis using special rules. The rules were integrated with some constructive algorithm to decide in each diagnostic from IVR and SMS technologies. Algorithm that is used was Naïve Bayes Classifier technique which is particularly robust when the dimensionality of the inputs is high. It provides new ways of exploring and understanding data. In computer science and data mining, Apriori is a classic algorithm for learning association rules. The purpose of the Apriori Algorithm is to find associations between different sets of data. The goal of this system is to help in managing small scale clinics and hospitals .The server of the system working 24/7 without any human involvement. This adds value in terms of direct cut in cost and better utilization of resources.

2.3.1   IVR

Interactive Voice Response (IVR) is an automated telephony system that interacts with callers and gathers information and provides the required information to the caller. IVR system accepts a combination of voice or input from the keyboard and provides appropriate responses. User is moved to different states according to his/her answer to the questions that being asked by the system .Touch tone IVR systems are used where a menu is read for the user and he/she uses the buttons on the phone keypad to interact with the system according to the read menu Figure 2.3.
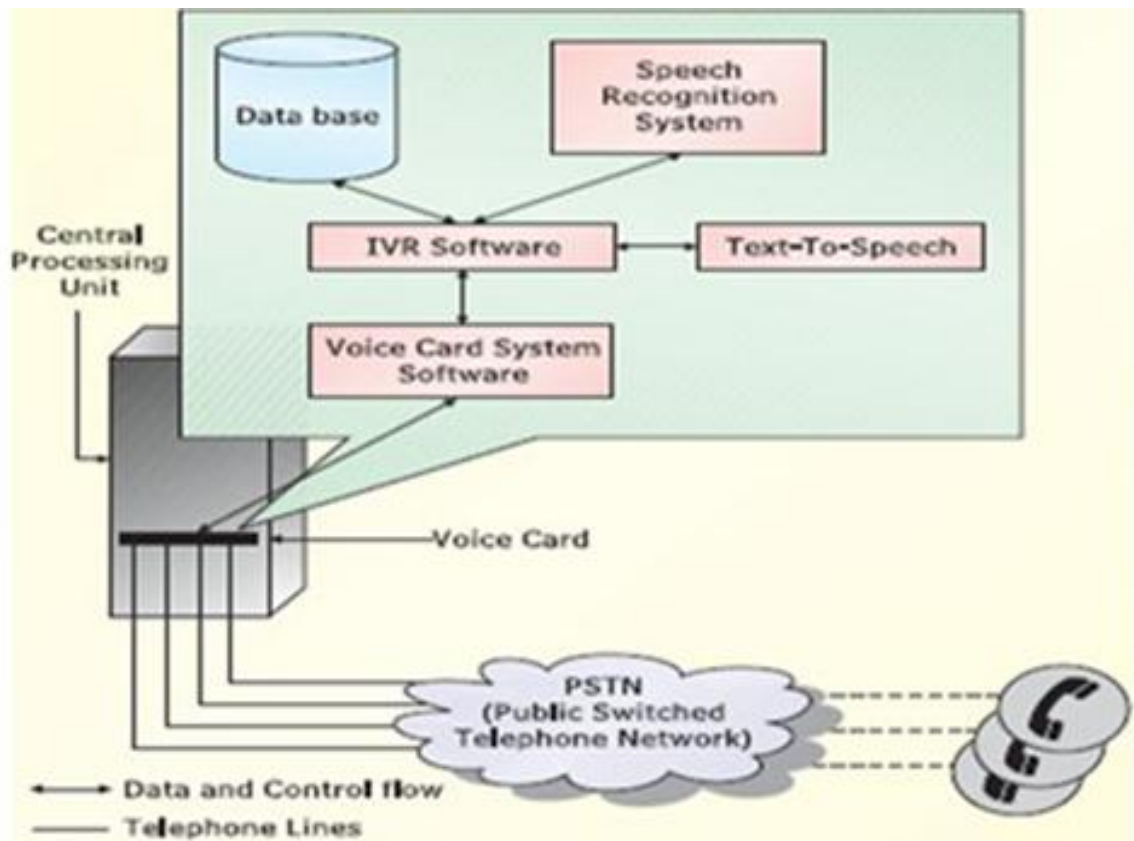
Figure 2.3: Block diagram IVR system Seema (2012)

Doctor is able to view his next scheduled appointments, also he can access and generate the patient's diagnosis reports. After the generation of patient's diagnosis report, the server sends it on the registered mobile number of the patient. For booking new appointment through IVR, patient call the hospital then transferred to the server. Server automatically directs the call and guides the caller. By calling on hospital phone, doctor can cancel his appointment.

2.3.2 SMS

The engine used is based on a Java API library, which can be used to send and/or receive SMS messages through GSM modem or mobile phone. Patient or doctor sends message through the server. Server processes it, and takes the required action, for this

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