



Issues with our hospitals queue management information systems

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Abstract

Hospital patients' emotions are influenced by their experiences. Examining the possible impacts of a queue management system on patient satisfaction in emergency hospital waiting areas was the aim of the current study. Process engineering or plain queue management techniques like demand control, queue prioritization, or staffing the emergency department are generally used to address the problem of emergency room congestion (ED). Standing in line is a necessary and inevitable part of daily life. But you can do something pleasurable with the time you waste standing in lines. E-queue aspires to reinvent the experience of standing in line by offering a practical, thorough, and pleasurable replacement. A thorough queue management system that tracks people in lines and provides real-time data on the amount of time patients must wait to see their doctors or nurses is one method of resolving this issue. Thus, patients can make better use of the time they would otherwise squander waiting in line by using e-Queue. Numerous queuing-related concerns were taken into consideration while analyzing the current queuing systems. In order to give patients important queuing information, E-Queue combines the usage of a smartphone application, a cloud-based database, and information sharing over the internet. In addition, it offers hospitals the chance to effectively control their wait times.

Keywords: Drawbacks, Queue, Hospitals, Patients, Emergency Department, Management

INTRODUCTION

Around a century ago, queueing theory was created in Denmark as a result of Erlang research. Despite the length of time since the original mathematical assertion, queueing mathematics has not significantly changed ^[1]. Because "sometimes the psychology of queueing is more important than the statistics of the delay itself," queueing psychology has taken primacy ^[2]. On a daily level, queues can be bothersome owing to how one feels when waiting in them as well as how lengthy the wait is. For instance, research suggests that when we have a general idea of how long the wait would be, we are far more patient ^[3]. Furthermore, it is thought that time passes more quickly while something is being done rather than when waiting ^[2]. Long wait times in hospital emergency rooms have a number of negative effects, including crowding, patients leaving out of frustration without receiving care, patients' and their relatives' irrational behavior, stress on both staff and patients, and many others ^[17]. As a result, many people are growing increasingly concerned about them. Hospital management information systems, which consist of a number of integrated modules, frequently support both clinical and non-clinical operations in hospitals (HMIS). The service areas that make up the interfaces for transaction management in HMIS include patient registration counters, bill payment counters, laboratory test requisitions, sample or report collection counters, pharmacy counters, as well as patient waiting areas for out-patient visits and appointments. Effective approaches are needed in these settings to manage high patient loads, especially in tertiary care facilities. As a result of the increasing accessibility of mobile devices and ubiquitous technologies, a smart and effective queue management system (QMS) is increasingly crucial for enhancing patient experience and optimizing performance metrics

for hospitals for effective healthcare service delivery ^[4]. Queuing has historically not changed, even though many parts of public service, particularly in a developing country like Nigeria, have seen technical and efficiency gains. In the past, one had to advance one at a time while standing in line. The reality is that people must wait in line for as long as they need the services, regardless of whether the problem is a lack of staff or facilities or a hospital's capacity is insufficient for the population it serves, despite the fact that numerous solutions, including queue priority and numbered tickets, have been implemented in developed countries over the years. Particularly in an emergency room, long queues put an unnecessary and unpleasant pressure on both patients and medical staff. Patients receive care of inferior quality, have worse health outcomes, and are less satisfied when resources are limited relative to the demand for services. They are linked to a poor opinion of hospital stays. In Nigeria, where I was born, a system has been put in place to deal with and handle these concerns.



Figure_1: A Simple Queue Management System

LITERATURE REVIEW

A queue management system for patients is proposed by Hedau et al. ^[5], in which notifications are given to the patient and an Android app interfaces with interfaces to schedule appointments with doctors. The OPD/doctor visiting area wait times are intended to be decreased by this technique. Their app also offers hospital navigation instructions. Android smartphones take the place of traditional token dispensers and token calling hardware at counters in Aizan et al "walk-away "queue's management system ^[6]'s proposal for a service-based paradigm for token manufacturing and administration. Alerts are issued to users a predetermined period of time before the token is anticipated to be called because the user's cell phone is received at the time of token production. The advantages and use cases of a smart queue management system at a well-known hospital in Delhi, India, are listed by Sahney ^[7]. Batbagon et al ^[8] Queue system uses a web-based QMS application augmented by Android apps, along with supplemental services like report production and data analytics for optimizing queue generation at service locations, to achieve comparable goals and functionality. A GSM-based queue management system that merges a PC-based system with a microcontroller has been presented by Arun et al. ^[9]. Internet of Things ^[10, 11] and wireless technology-based strategies have also been put forth. The advantages of using a queue management system in improving hospital performance metrics such patient length of stay ^[12], waiting time for in-patient surgeries ^[13], triaging in emergency departments ^[14, 15], and decision support ^[16] have also been described in literature. This study describes an operational hospital management information system that can be simply equipped with a mobile-augmented smart queue management system (HMIS). It uses clever algorithms for token generation and allocation and offers a variety of interfaces for token generation and consumption on mobile devices integrated with hospital service counters. A single patient token can be used for efficient queue management across numerous hospital service areas, which enhance the patient experience and aids in tracking and optimizing important performance metrics for the hospital administration. We outline the system's architectural and functional design along

with an example of how it was used to monitor the productivity of service counter employees during a pilot project ^[4]. The hospital is in conformity with Electronic Health Record (EHR) standards and has a functioning HMIS ^[18, 19] with several modules ^[20, 21, 22, 23]. In order to organize queuing systems, this research aims to create an automated queue management system that can assess the queue's status and decide which client to service first. This study focuses primarily on the bank's queuing system, various methods to queuing algorithms that banks employ to service customers, and the typical wait time. By utilizing two distinct queue control systems that have evolved, this queuing architecture model can transition between various scheduling algorithms based on the testing result, which is the average waiting time. The Intel Galileo Microcontroller, which is software compatible with the Arduino software development environment, regulates a number of processes. In order to assess the systems' performance, many testing scenarios have been used ^[24]. The current study's goal was to determine how using a queue management system in emergency care waiting areas affected patient satisfaction ^[25]. A comprehensive framework for managing queues dynamically from both the supply and demand perspectives is provided by this work. To be more precise, we present dynamic resource adjustment policies and intelligent dynamic patient prioritizing algorithms to control supply and demand. Using our paradigm, decision-makers can choose supply- and demand-side tactics to meet the demands of their ED. Through simulation, we can demonstrate that such a framework reduces patients' length of stay in the ED without limiting demand ^[26]. A centralized queue control system that can be applied to many hospital departments was developed in this study. The system makes use of Little's Law, the Haversine Model, the Poisson distribution, and the Kendall Notation. It is a web-based system that was created to function on the Internet since it concentrates on outpatients and takes into account the fact that different departments in the majority of non-tertiary hospitals may be located in various structures or locations. The system was developed using Microsoft SQL and ASP.NET. Data gathered from non-tertiary hospitals in Benue State, Nigeria, was used to evaluate it. As a result, there were fewer patients in the hospital at any given moment, and there was some difference between some patients' actual arrival times and their estimated arrival times. The technique avoids crowds, improves hospital organization, and saves time for the patients. At the same time, there is also a major reduction in the burden on the hospital infrastructure. Both patients and medical staff benefit from enhanced service delivery and a safer atmosphere ^[27]. The purpose of this study is to create a queue assessment model to assess the flow of walk-in outpatients in a busy public hospital in a developing economy in the absence of appointment systems and to build a dynamic framework devoted to the practical application of the proposed model for continuous monitoring of the queue system ^[28]. The nurse caller device is used as a special communication device between the patients and the doctor or nurse within the hospital area as a means of speeding the doctor or nurse's time response in providing immediate care to the patients. The usage of the wireless nurse caller device facilitates and organizes communication between the parties. The microcontroller ATmega8 serves as both the sender and receiver when a Bluetooth module, the MH-10, is added. A microcontroller called an ATmega8 processes the data, producing characters on the LCD, turning on the LED, and sounding the buzzer to summon the doctor or nurse ^[29,31].

DEFICIENCIES OF THE QUEUE MANAGEMENT INFORMATION SYSTEM

1. High initial outlay

The initial outlay is comparatively more expensive. That's another major factor in why companies are so hesitant to choose a queue management system. The queue management system has a number of software and hardware components, which raises the project cost. Most of the time, the hardware is more expensive. Customer announcement systems, numerous digital signage, interactive kiosks or ticket vending devices, counter plates or counter displays, networks, etc. These all-hardware components are slightly more expensive but durable, have a longer lifecycle, and are covered by a warranty.

2. Routine maintenance

Regular maintenance is necessary because there are so many hardware parts involved. In Dubai and the rest of the UAE, it is customary for anyone purchasing a queue management system to also sign up for an annual maintenance contract. This affects the overall cost as well. To fix network-related issues, maintenance is typically needed on a regular basis. Less frequently, maintenance is needed on the interactive kiosk or ticket dispenser. Additionally, it has to have its paper rolls regularly refilled in order to print tickets. Because of this, frequent maintenance is necessary.

3. Hosting locally versus using the cloud

Additionally, queue management software is included with the queue management system. This needs a server to host it. Businesses typically prefer to host the software in their own data centers, which is expensive and necessitates ongoing management and maintenance. The firm will have to sign up for the annual maintenance services in the event of online hosting or cloud-based solutions, which also raises the overall cost of a queuing solution. In either case, extra money and ongoing upkeep are needed.

4. Cost-prohibitive software system integration

The majority of the time, the cost of integrating queue management software with other business resources and enterprise solutions is minimal. However, in some circumstances where modification is necessary, the firms may be obliged to pay more to all parties. For instance, if the queue management system needs to integrate with the ERP or customer loyalty program for the purpose of enabling a specific function, either a middleware must be constructed to synchronize the two

systems or changes must be made on both sides. In any case, the business will incur additional expenses related to the system integration.

5. Only Slight and Expensive Hardware Upgrades

Although software upgrades and customizations are significantly less expensive, hardware upgrades, customizations, or alterations are slightly more expensive. For the system to function practically, it can only have a certain amount of hardware parts. Consider the scenario where a customer or visitor needs to scan their Emirates ID card in order to sign up. However, you later realize that in addition to or instead of the Emirates ID card, you also need facial recognition. To create this functionality, the interactive kiosk must be modified or customized. Most of the time, after a kiosk design has been designed, it is very tough to change it. Businesses typically decide to buy a new kiosk model. In addition to raising the price, it also uses the outdated kiosks pointlessly. This makes hardware modification and updates difficult and costly [30].

CONCLUSION

Both the hospital management information system and the queue management system have been carefully evaluated in this study. Their contributions have benefitted hospitals as well as economic sectors. Additionally, their shortcomings and numerous forms have been explored.

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