Mobile Enabled Aviation Personnel Licensing System for Ethiopian Civil Aviation Authority

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Abstract

According to various literatures, mobile applications are one of the most convenient and fastest ways of making communication for licensing application with a licensing authority. A standardized mobile enabled licensing system which has integration with existing examination system is very important for the aviation crew and authority as well. But, Ethiopian Civil Aviation Authority (ECAA) is currently handling the licensing process through manual based system which is dependent on paper and humans.

The main objective of this paper is to design and develop a mobile enabled aviation licensing system for Ethiopian Civil Aviation Authority. Developing this system is very important to make the authority as well as the country competitive in the aviation industry over the world and also will make the aviation crew to use their time appropriately and effectively.

Keywords: Mobile Enabled Aviation Personnel Licensing System; Responsive Design; Integration

1. Introduction

Ethiopia is working to become a competitive and leading aviation group in Africa by providing safe, market driven and customer focused passenger and cargo transport, aviation training, flight catering, MRO (Maintenance, Repair and Operating) and ground services by 2025 [1]. It is implementing strategies which help to achieve its goal. Building the capacity of aviation personnel with new technology is one of the crucial pillars. Developing the capacity of aviation personnel ranges from teaching to licensing.

The International Civil Aviation Organization (ICAO) is a UN specialized agency, established by States in 1944 to manage the administration and governance of the convention on International Civil Aviation. ICAO works with the convention's 191 member states and industry groups to reach consensus on international Civil Aviation Standards and Recommended Practices (SARPs) and policies in support of a safe, efficient, secure, economically sustainable and environmentally responsible civil aviation sector. These SARPs and policies are used by ICAO member states to ensure that their local civil aviation operations and regulations conform to global norms, which in turn permits more than 100,000 daily flights in aviation's global network to operate safely and reliably in every region of the world [2].

Standards and Recommended Practices for personnel licensing were first adopted by the council on 14 April 1948 pursuant to the provisions of Article 37 of the Convention on International Civil Aviation (Chicago 1944) and designated as annex to the convention. They became effective on 15 September 1948 [3].

ECAA is authorized, under parliamentary legislation, as the State's regulatory authority and, as such, is empowered to grant, renew, suspend, revoke and cancel personnel licenses or permits granted to individuals that give those individuals various privileges in the Ethiopian civil aviation system [4].

Civil aviation authorities throughout the world have implemented an automated licensing system in

one or other ways by outsourcing automation or by developing the system in house.

Personnel licensing system is a set of integrated tools, optimized to meet efficient handling of license request, and automatic processes like registering a new application request, managing existing applications, managing the status of the application, handling of application and producing a printable license and informative reports. It allows all team members to work in a collaborative manner.

One promising area of mobile application is to offer aviation crew convenient and fast way of requesting for a license. Aviation personnel licensing system supports mobility of users so that it becomes convenient and widely used by crew.

Most of the time the crew, especially pilots, are out of office on duty. Because of this, they don't have time for computer access. Hence, a mobile application as a licensing application method can be used by the crew.

This paper intends to design and develop a mobile enabled licensing management system for ECAA.

2. Related Work

There are various approaches for mobile application development and the choice of the client architecture for any mobile application depends on the demands of the application and business considerations [5]. For instance, when the application should not target only one platform and needs to reach the widest audience, mobile web application approach is appropriate as it is designed to run on a mobile web browser. HTML5 is the most popular and promising technology for 'Write once Run anywhere'. As a result, in this paper we use HTML5 as the technology of choice for developing mobile web applications.

Responsive web design emerged to make a web application usable by different screen size devices using various techniques including CSS3 and HTML5 technologies. Basically there are two basic responsive web design techniques. The first one is "flexible grid". The idea is to create a layout where

all elements are based on the calculated percentage width and so all elements in the layout are resizable in relation to one another. Another essential part of responsive web design technique is "media queries". There would be no real responsive web design without media queries. Media queries allow getting the user screen's size to apply the CSS styles that can provide the best user experience to the visitor. It is introduced in CSS3. It extends the functionality of media types by allowing more precise labeling of style sheets. In this paper, we adopt both flexible grid and media query techniques of responsive web design.

Data integration is the combination of technical and business processes used to combine data from disparate sources into meaningful and valuable information. The process of data integration is about taking data from many disparate sources (such as files, databases, etc.) and combining them to provide a unified view of the data for business intelligence.

Direct access data integration is perceived to be a key enabling technology for the exchange of information and is the defacto data integration standard [6].

In this paper we have seen two licensing systems who meet the licensing standard and recommendations of ICAO. The solutions is aimed to bridge the communication gap between the civil aviation authority and the crew and to provide crew a platform through which they can get their licensing request in a timely and transparent manner. Additionally, it is also shown that the basic purpose behind a licensing management mechanism is to provide a platform to the crew to log their application and also enable the operators to make a decision on the need of skilled human resources.

CAAi (Civil Aviation Authority), an e-Licensing management solution developed by civil aviation of the United Kingdom [7], is a web-based system and adaptive for mobile devices. Even if CAAi uses email for notification it has shortcomings as compared to checking the status of the application within the system.

CAASL (Civil Aviation Authority of Sri-Lanka) [8] is a web based system but is not adaptive for mobile devices. The functionality provided by CAASL is not integrated with the examination system. This will make the licensing system time taking and prone to error.

From CAAi licensing management solution, we adopt the mobile adaptive feature and integration part with examination system and from CAASL we adopt the feature of reminding expiry date of license.

The common drawback of the two licensing systems is that they look great on the desktop screen but not true medium on small size screens. This is because the applications are device specific and not adaptive to various device capabilities.

Moreover, one of the systems lacks integration with the existing system which used to share resources of the existing system such as examination result of the crew and prevent the new system from being isolated and standalone.

This paper tries to improve limitations mentioned in the above mentioned solutions by developing a mobile-first responsive web application which is platform independent and adaptive for every screen size of devices like smart phone, tablet, notebook or any size desktop monitor. The system has a Data level integration with the existing system of the company which is a key to obtain accurate and exact information of the crew examination result to respond to the licensing request of the crew. Moreover, the system conforms well to the ECAA unique requirements, workflow and procedures as it is developed after careful requirement analysis.

3. The Proposed Solution

To improve the current personnel licensing system, a responsive system which supports different devices and simplifies both the application and licensing process is proposed.

3.1 Architectural Representation

The system is implemented using a three tiered architecture as shown in Figure 1.

3.2 Deployment View

As shown in Figure 2, the database server contains database of aviation personnel and the web application server contains the new M-APLS system.

The system has two types of users: external users that use the system wherever they are (aviation crew) and internal users using a company network to access the application in the application servers (personnel licensing officer, director and administrator). External users will get access through Internet using a browser. For security, there will be a firewall between the web server and the Internet.
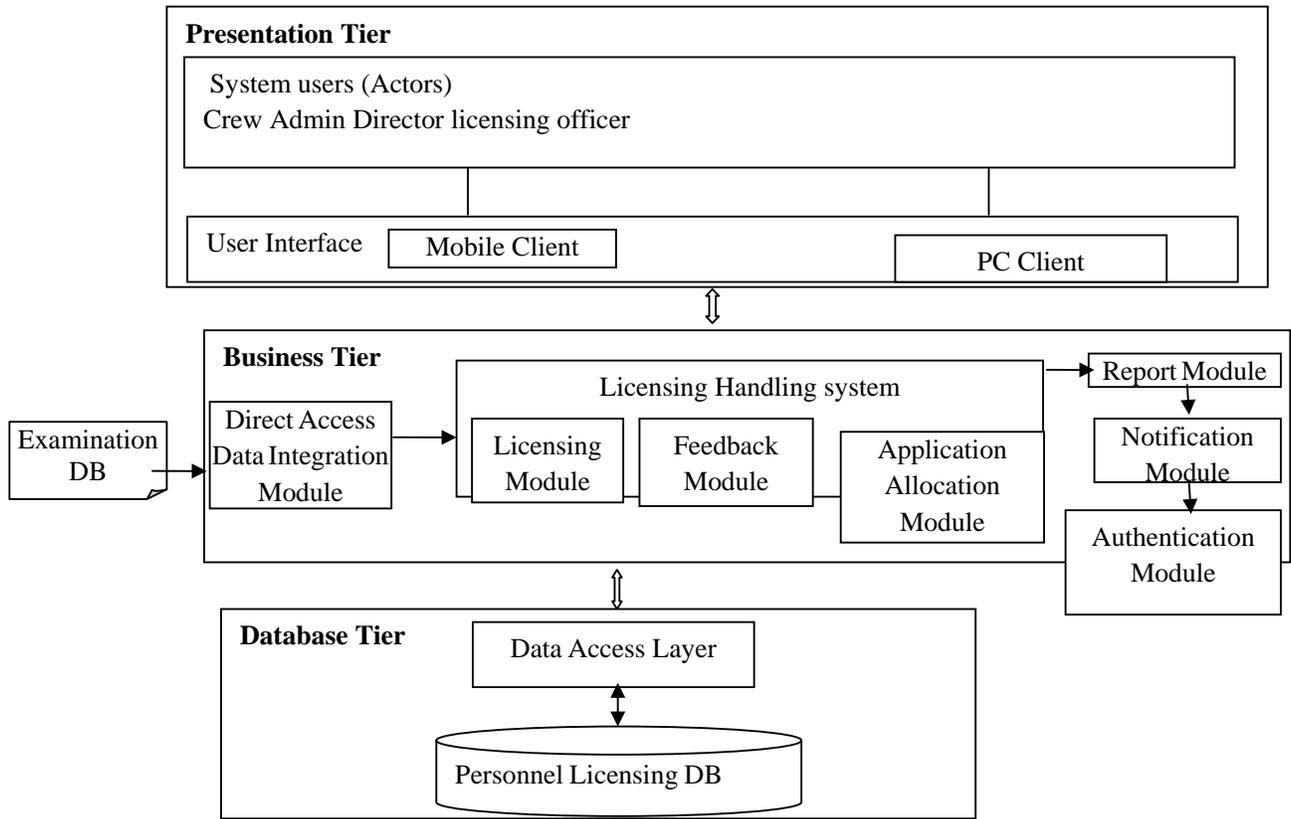
Presentation Tier

System users (Actors)
Crew Admin Director licensing officer

User Interface | Mobile Client | PC Client

Business Tier

Examination DB

Direct Access Data Integration Module

Licensing Handling system

Licensing Module | Feedback Module | Application Allocation Module

Report Module

Notification Module

Authentication Module

Database Tier

Data Access Layer

Personnel Licensing DB

Figure 1: System Logical View

Internet

External User (Crew)

Employee (PLO, Director, Administrator)

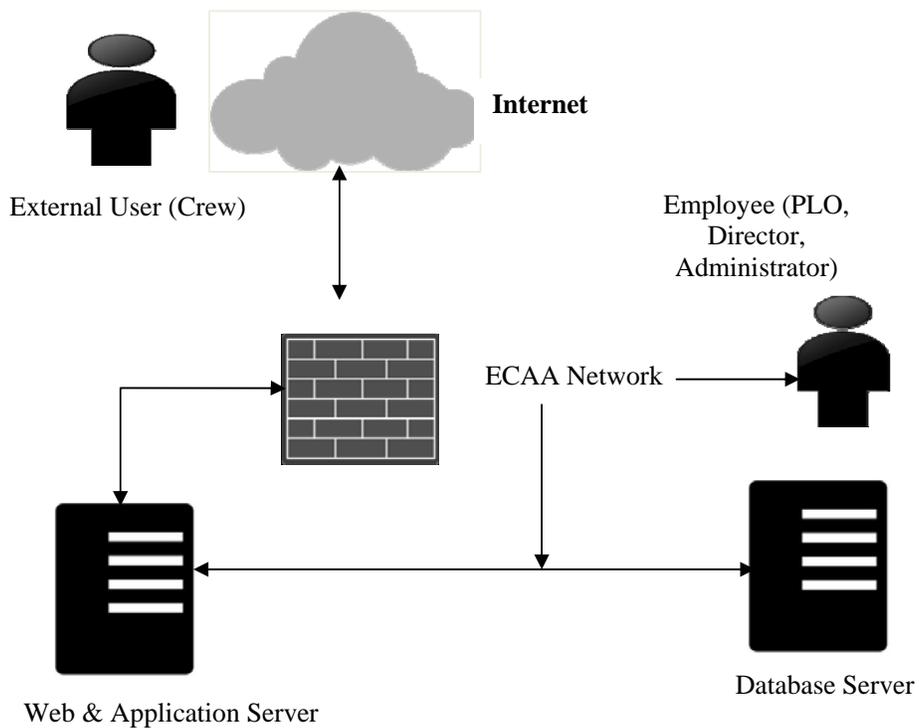ECAA Network

Web & Application Server

Database Server

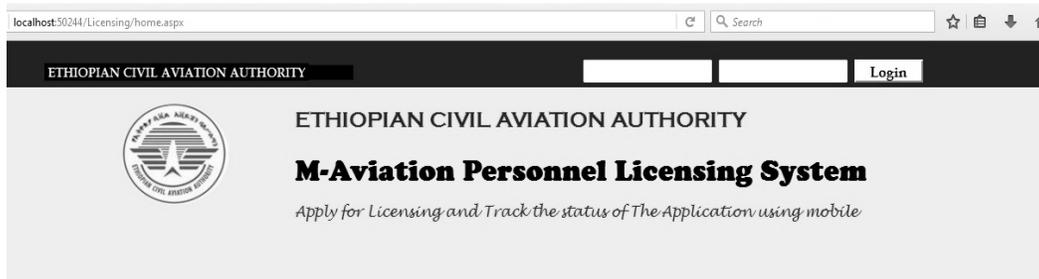*Figure 2*: System Deployment Diagram

Figure 3: Home Page on a Desktop Browser

4. Prototype

To realize the feasibility and validity of the proposed solution, attributes and methods of the identified solutions are converted to a source code.

Figure 3 shows the home page of the application on a desktop browser. The page also allows users to log into the system using a valid username and password.

Basically, crew are supposed to use their mobile devices to access the application so that the system is designed as mobile-first responsive web application which prioritizes the need of mobile context while creating user experiences. As shown in Figure 4, the home page is displayed on a mobile browser, but it appears differently than a desktop browser. When the page is displayed on medium/large screen sizes, it has two or more columns, whereas it is always displayed with single column while the screen/browser size is small. However, responsive web design is not only meant adapting the page contents to the screen sizes. One of the main goals of responsive design is simplifying page elements for mobile use. In order to achieve this, the system uses lower bandwidth images and avoids non-essential elements to mobile devices.
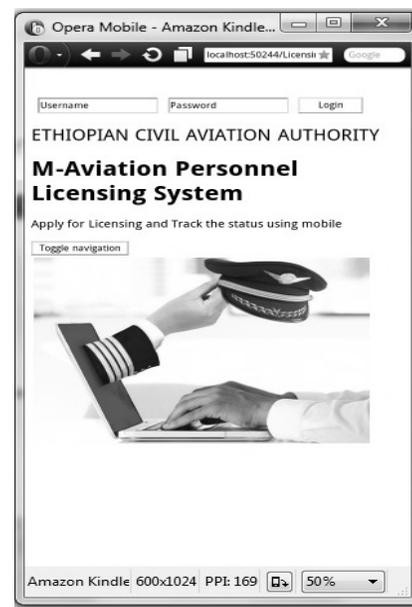

Figure 4: Home Page in a Mobile Browser

5. Conclusion and Future Works

Aviation personnel licensing system is a set of integrated tools optimized to meet efficient handling of licensing requests and automate the process of licensing request. Aviation companies who are audited by the International Civil Aviation Authority should create a suitable system. Mobile applications are one of the most convenient and fast way for applications, especially for aviation crew.

The main objective of this paper is to design and develop a mobile enabled aviation licensing system for Ethiopian Civil Aviation Authority. Developing the system is very important to make the Authority as well as the country competitive in the aviation industry and also will make the aviation crew to use their time appropriately and effectively. To achieve the objective, interview, direct observation and document review are used for data collection. As an analysis and design approach, object oriented methodology was chosen and UML was used. Moreover, HTML5 with ASP.Net C# programming language have been used to develop the system.

The developed system supports various devices' screen resolution in both portrait and landscape format. The system also has a data level integration with existing examination system of the Authority in order to retrieve the examination and rating result of aviation personnel.

When the proposed system is implemented, the Authority will be a beneficiary of a mobile enabled licensing system, and this will have a significant contribution to the country's aviation industry.

It would be interesting to do further work to enhance the functionality of the system. One major task that can be done is making the examination system of the authority mobile enabled, so that the examination and licensing will be consolidated and give the service online.

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