

SURVEY, ANALYSIS AND ISSUES OF ISLAMIC ANDROID APPS

Anum Hameed^{*}, Hafiza Anisa Ahmed^{}, Narmeen Zakaria Bawany^{***}**

^{}Department of Computer Science and Software Engineering, Jinnah University for Women, Karachi, Pakistan, anum.hameed@juw.edu.pk*

*^{**}Department of Computer Science and Software Engineering, Jinnah University for Women, Karachi, Pakistan, hafiza.anisa@juw.edu.pk*

*^{***}Department of Computer Science and Software Engineering, Jinnah University for Women, Karachi, Pakistan, nsb@juw.edu.pk*

Email Correspondence : anum.hameed@juw.edu.pk

Received : 12 March 2019

Accepted : 11 June 2019

Publish : 30 June 2019

Abstract: Mobile devices like Smartphones, tablets and PDAs have become an indispensable part of every person's day to day activities. The growth and propagation of the smartphones has created new opportunities for religious app developers to develop apps that will provide utilities and an easy accessibility to religious information. The purpose of this research is to conduct a survey and to classify Islamic apps that are available on Google Play Store. The user surveys were conducted to evaluate and investigate the usage pattern of the Islamic apps in everyday life of the Muslims. The results identify the need of authentication of the app content that gives rise to many critical issues and myths. Also, it stresses the need for a "Religion" category in Google Play Store. The benefit of this research is twofold, as it focuses on identifying which app features Muslim users are more interested in using and secondly, the Islamic apps/features that need to be developed.

Keywords: Mobile app, Islamic app, Religion, Quran, Muslim, App Developer, Smart Phone.

Introduction

Smartphone ownerships and fast Internet connections such as home broadband connections, 3G, 4G and 5G are increasing immensely every second. More recent statistics about United States conducted by PEW Research Centre has indicated that, about 92% of 18 to 29 years old, 74% of 50 to 64 years old and 42% of 65 and older are Smartphone users. Therefore, this increase has resulted in a rapid growth of mobile apps usage. Statistics show that there are about 2.8 million android apps available on Google Play Store alone whereas Apple's iTunes remained the second largest having 2.2 million available apps.

The time spent on mobile daily is increasing massively every year, whereas a decrease in the usage of other media has also been observed. According to Flurry's analytics, users spend 5 hours a day on Smartphones out of which 90% of user's Smartphone time is spent on apps. (Frey et al., 2017). It says "It's an App World and the Web Just Lives in It". Users use different kinds of apps which includes a major chunk being used for entertainment, to communicate, to stay up to date, to do shopping, and for just about everything else you name it and you get it. (Mazumder et al., 2010).

Consequently, many religious people specifically Muslims and Islamic communities are taking advantage of this opportunity to use mobile apps for preaching and learning Islam. This further aims to provide utilities and an easy accessibility to Islamic information, hence bringing spirituality to the fingertips for today's generation. (Campbell, 2010) (Asadullah et al., 2014) (Mohamed et al., 2016) (Khan & Shambour, 2017). There are thousands of apps available on Google Play Store for different religions which can be downloaded and used by a vast number of users. An analysis was conducted to identify which religious apps are downloaded mostly, Islamic apps were found to have the largest downloads than any other religious apps. When asked in a survey about the reason for the frequent use of Islamic apps, many Muslims answered that they find it more feasible and it also enables them to acquire Islamic information faster than any other source. (Kittler & Mitchell, 2015). The main reason for developing such apps is to provide an ease to Muslims who lead a busy life. Therefore, despite being anywhere these Islamic apps enable them to practice Islam in a more feasible manner.

This research paper presents an extensive survey of about 300 Islamic apps that are available on Google Play Store. The research has been conducted in three different stages: Investigation stage, Classification stage and the last stage is highlighting the major concerns associated with the usage of Islamic apps. In the Investigation stage, 300 apps were downloaded and reviewed based on their number of downloads, ratings and functionalities. This process assisted in figuring out the most popular apps amongst Muslims and other Islamic researchers. In the Classification stage, the reviewed apps have been grouped into different categories according to their common features. This grouping of apps enabled the authors to identify the number of apps under each category. Furthermore, it helped to identify the important categories of Islamic preaching in which there were less or no apps developed. This stage provided a basic foundation and a helping hand to the Islamic app developers to focus on the development of the apps/features needed. The third stage focuses on listing the concerns of the users related to the existing Islamic apps available on Google Play Store and enabling the authors to identify the reasons why many existing apps are not being widely used.

In a nutshell, this research will prove to be a comprehensive guideline for Islamic app developers to determine the design functions that are widely being used and will further assist in identifying the apps/features needed to be developed. The main contributions of this study can be summarized as follows:

- Around 300 Islamic apps from Google Play Store have been reviewed.
- Detailed classification of Islamic apps with respect to their features, popularity and utility.
- A comprehensive analysis of the features has been conducted in order to determine the ones widely used. This will provide the basis of requirement analysis for apps/features that are less or not developed.

- The major concerns of users using certain Islamic apps have been identified and addressed during this research process.

Islamic apps analysis

The initial stage involved the evaluation of Islamic apps that were available on Google Play Store; while this step might seem straightforward, it revealed a number of inconsistencies. The outcome of the analysis revealed that Google Play Store while being the largest repository for religious apps does not even have a Religion category. Therefore, the absence of the category made it more difficult for the users and researchers to find their desired Islamic app. (Olmstead et al., 2015).

This in turn steered us to use different keywords and searching strategies reflecting different aspects of Islam. Some of the search keywords that were used for exploring Islamic apps were “Islam”, “Allah”, “Quran”, “Qibla”, “Islamic Prayers”, “Dua”, “Azkar”, “Hadith”, “Asma-ul-Husna”, “Tasbih counters”, “Zakat” and more. It is important to state that while downloading, some apps were discovered which were labelled as Islamic apps but after a closer examination they actually turned out to be cultural apps. Subsequently, different sections were created to record specific pieces of information regarding every downloaded app. These sections included; App ratings, Google Play Store App category, App features, languages and the number of downloads.

Categorization of Islamic apps according to common design features

After a thematic analysis of the data collected from the Investigation stage, the Islamic apps having common features were classified into 5 different categories.

A. Quran

Smartphone apps are a blessing in disguise for Muslims who are unable to carry Quran on the go. These apps have facilitated the Muslims by providing them the entire Quran in e-format. This enables the Muslims to engage in reciting Quran regardless of where they are, hence allowing them to reconnect with their faith. (Syadiah et al., 2016).

After a detailed study of about 50 Quranic apps, 10 apps were found as being the most used and downloaded ones in the Quran category apps. The common features of these apps include; Arabic Quran verses, Pronunciation, Translation, Tajweed, Recitation and Bookmarks along with Juz wise and surah wise searching.

Quran apps are included amongst some of the most downloaded Islamic apps. A survey was conducted asking a group of Muslim users about the reason for using Quran apps. The answers recorded were; ease of use and the fact that a Quran app has more features such as different languages translation including the availability of audio recitation by different Quran reciters. Few people also quoted

that it is easier to find any verse or chapter rather than flicking through the hard copy version of the Quran.

There are about 256 Quran apps in Google Play Store out of which approx. 66 apps are paid while approx. 190 apps are free, with 86 apps having more than 4+ stars rating. Amongst these “Quran for Android” app was found to be the most downloaded one, having 468,117 downloads as shown in Table 1 .

Table 1. List of most downloaded Quran apps

1. Category: Quran												
No	Application Name	Category	Features									
			Downloads	Pronunciation	Translation	Searching Criteria	Tajweed	Recitation	Quran Tracker	Memorization	Bookmarks	Tafseer
1	Qibla Connect @Find Direction	Lifestyle	10 M	Y	English and Urdu	by Surah, Juz, Sajdhas & Topics	N	Yes	Y	Y	Y	N
2	Quran for Android	Books & Reference	10 M	N	English and Urdu	by Surah, Juz & Hizb	N	Multiple Qari	N	N	Y	N
3	Al-Quran	Books & Reference	10 M	N	English and Urdu	by Surah, Juz, Hizb & Verses	N	Multiple Qari	N	N	Y	Y
4	Muslim Pro	Lifestyle	10 M	Y	English and Urdu	by Surah & Verses	Y	Multiple Qari	N	Y	Y	N
5	Muslim Assistant	Lifestyle	5 M	N	English and Urdu	by Surah, Juz & Verses	N	Multiple Qari	N	N	Y	N
6	iQuran Lite	Books & Reference	5 M	N	English	by Surah, Juz & Topics	Y	Multiple Qari	N	Y	Y	N
7	Islam: The Noble Quran	Books & Reference	1 M	Y	English and Urdu	by Surah, Juz, Hizb & Sajdhas	N	Multiple Qari	N	N	N	N
8	Holy Quran	Books & Reference	1 M	N	No	by Surah, Juz & Page	N	No	N	N	N	N
9	Quran with Urdu Translation	Education	1 M	Y	English and Urdu	by Surah, Juz & Sajdhas	Y	Multiple Qari	N	Y	Y	Y
10	Holy Quran with Tafseer	Books & Reference	1 M	N	English and Urdu	by Surah & Juz	N	Multiple Qari	Y	N	Y	Y

B. Qibla / Prayer Time

Qibla / Prayer apps not only enable users to identify the correct Qibla direction (direction where Muslims are supposed to perform Salah i.e. towards Mecca by using a compass) but it also helps them to keep track of prayer timings. These apps are the most favorite ones amongst users. They help to find the Qibla direction when a user is at a new place and there are no mosques around. Also Prayer timings reminders according to the location helps the user to know the exact timings of prayers when they are living in areas where there are no signs of mosques around them.(Gunawan et al., 2012).

There are about 250 Qibla / Prayer apps in Google Play store out of which approx. 78 apps are paid while approx. 172 apps are free, with 86 apps having more than 4+ stars rating. Amongst these “Muslim Pro” app was found to be the most downloaded one, having 892,777 downloads (See Table 2).

Due to “Muslim Pro” app popularity, a survey was conducted in which 15 Muslim Pro users were asked the reason for downloading this app. All the users gave the feedback that they found this app to be an “All in One” app having features like Qibla direction, Prayer timings reminders, Quran, daily supplications and much more.(Tayan et al., 2017).

Table 2. List of most downloaded Qibla/Prayer time apps

2. Category: Qibla/Prayer time															
No	Application Name	Category	Features												
			Downloads	Qibla Direction	Prayer Time	Prayer Alarm	Language	Adhan	Salat Tracker	Hijri Calendar	Nearby Mosque	Halal Finder	Daily Ayah	Daily Hadith	Sehr & Iftar Timings
1	Muslim Pro	Lifestyle	10 M	Y	Y	Y	English and Urdu	Y	N	Y	Y	Y	Y	N	Y
2	Al-Moazin Lite	Lifestyle	10 M	Y	Y	Y	English	Y	N	Y	N	N	N	N	N
3	Salatuk (Prayer Time)	Lifestyle	10 M	Y	Y	Y	English	Y	N	N	Y	N	N	N	N
4	Qibla Connect @Find Direction	Lifestyle	10 M	Y	Y	Y	English	Y	Y	Y	Y	Y	Y	N	Y
5	Prayer Times	Tools	5 M	Y	Y	Y	English	N	N	N	N	N	N	N	N
6	Muslim Assistant	Lifestyle	5 M	Y	Y	Y	English	Y	N	N	N	N	N	N	N

7	Visual Qibla	Tools	1 M	Y	N	N	English	N	N	N	N	N	N	N
8	Muslim Azan and Salah Time	Tools	1 M	Y	Y	Y	English	Y	N	N	Y	N	N	N
9	Adhan Alarm and Qibla	Lifestyle	1 M	Y	Y	Y	English	Y	N	N	N	N	N	N
10	Qibla Direction Finder	Tools	1 M	Y	Y	Y	English	N	N	Y	N	N	Y	Y

C. Hadith

In comparison to the Quran apps, Hadith apps are less developed and downloaded. These are mostly downloaded by students and researchers because of authentication. (Kamsin et al., 2015). There are about 256 Hadith apps in Google Play Store out of which approx. 66 apps are paid while approx. 190 apps are free. The common features of these apps include; Hadith explanation, translation, searching, Recitation, adding notes to chapters and bookmarking. Amongst all these رياض الصالحين مع الشرح المبسط (The Gardens of the Righteous) is the most popular one with 17,794 as shown in Table 3. This app is a collection of verses from the Qur'an and Hadith. It contains about 1905 Hadith separated by 372 chapters.

Table 3. List of most downloaded Hadith apps

3. Category: Hadith												
Features												
No	Application Name	Category	Downloads	Searching Criteria	Recitation	Language	Translation	Explanation	Bookmarks	Daily Hadith	Transcription	
1	رياض الصالحين مع الشرح المبسط	Books & Reference	1 M	by Books and by Chapters	N	Arabic	Arabic	Y	Y	N	N	
2	Hadith Library	Education	500 K	by Books	Y	Arabic	No	N	Y	N	N	
3	40 Hadiths (An-Nawawi)	Books & Reference	500 K	No	Y	English	English	N	Y	N	Y	
4	Hadith Collection	Books & Reference	100 K	by Books and by Topics	N	English	English and Urdu	N	Y	Y	N	
5	Daily Hadith	Lifestyle	100 K	No	N	English	No	N	N	Y	N	

6	Sahih Bukhari-All Hadiths	Books & Reference	100 K	by Topics	N	English and Urdu	English and Urdu	N	Y	Y	N
7	Sahih Muslim Hadiths in Urdu	Books & Reference	100 K	by Topics	N	English and Urdu	English and Urdu	N	Y	Y	N
8	Islam: 40 Hadiths Qudsi	Books & Reference	100 K	No	Y	English	English	N	Y	N	N
9	40 Hadees in Urdu	Books & Reference	100 K	No	N	Urdu	Urdu	N	Y	N	N
10	Hadith Collection (All in one)	Education	50 K	by Books and by Chapters	N	English	English	N	Y	Y	N

D. Zakat

Zakat apps are the least downloaded apps amongst all the categories that were analyzed during research. These apps support Muslims around the world to calculate Zakat for their assets and liabilities as a kind gesture to help the society. (Abdelaziz et al., 2016). There are approx. 205 Zakat apps in Google Play Store out of which approx. 52 apps are paid while approx. 150 apps are free. Out of these “Zakat Calculator” by Appsoft InfoTech is the most popular one as shown in

Table 4. This simple app has the feature of calculating zakat for different assets and liabilities.

Table 4. List of most downloaded Zakat apps

4. Category: Zakat							
No	Application Name	Category	Downloads	Features			
				Zakat Calculator	Language	Different Currency	Zakat Ayaat & Hadiths
1	Muslim Pro	Lifestyle	10 M	by different Assets and Liabilities	English and Urdu	Y	N
2	Islamic Calendar Plus	Tools	1 M	by different Assets and Liabilities	English	Y	N
3	Zakat Calculator by Appsoft InfoTech	Lifestyle	50 K	by different Assets and Liabilities	English	N	N
4	Zakat calculator – الزكاة – إحسب	Education	50 K	by different Assets and Liabilities	Arabic	Y	Y

5	Zakat Calculator by My Qalam	Tools	10 K	by different Assets and Liabilities	English	N	N
6	Zakat Calculator by Android Space	Lifestyle	10 K	by different Assets and Liabilities	English	N	N
7	The Zakat Calculator	Lifestyle	10 K	by different Assets and Liabilities	English	Y	N
8	Zakat Calculator - Charity	Tools	10 K	by different Assets and Liabilities	English	N	N
9	Easy Zakat Calculation	Tools	5 K	by Cash	English	N	N
10	Zakat Assistant	Finance	1 K	by different Assets and Liabilities	English	N	N

E. Supplications

Supplication (Dua and Zikr) is the remembrance of Allah. This is the most imperative aspect of worship and communication between man and God. There are approx. 210 supplication apps in Google Play Store but the amount of downloads is equal to none. These apps include all the essential supplications for Muslims to recite in the morning, evening, while sleeping, travelling and during many other circumstances of life. Some apps also provide supplications with different translations, recitations and pronunciation of Quranic Duas. They also calculate the sunrise and sunset times along with a reminder for morning and evening Azkar. Amongst these “Dua and Azkar” the most downloaded were found to have 4.7 ratings and 1 million downloads as shown in Table 5

Table 5. List of most downloaded Supplication apps

5. Category: Supplications											
No	Application Name	Category	Downloads	Features							
				Searching Criteria	Pronunciation	Translation	Recitation	Tasbeeh	Bookmarks	Tafseer	Benefits
1	Qibla Connect @Find Direction	Lifestyle	10 M	by Topics	Y	English	Y	Y	N	N	N
2	Muslim Pro	Lifestyle	10 M	by Topics	Y	English and Urdu	N	Y	Y	N	N

3	Muslim Assistant	Lifestyle	5 M	by Topics	Y	English	N	Y	N	N	N
4	Quran with Urdu Translation	Education	1 M	Duas from Quran	Y	English and Urdu	Y	N	Y	N	N
5	Islamic Calendar Plus	Tools	1 M	by Topics and from Quran	Y	English	Y	Y	Y	Y	N
6	Dua and Azkar	Books & Reference	1 M	by Topics, from Quran and Hajj/Umrah Duas	Y	English	Y	N	Y	N	Y
7	100 Dua of Islam and Sunnah	Lifestyle	500 K	by Topics	N	No	Y	N	N	N	N
8	Muslim Dua Now-Dua & Azkar	Books & Reference	500 K	by Topics and from Quran	Y	English and Urdu	Y	Y	Y	N	N
9	Daily Dua and Azkar mp3	Education	500 K	by Topics	N	No	Y	N	N	N	N
10	Dua and Zikr(Hisnul Muslim)	Books & Reference	500 K	by Topics	Y	English	Y	N	Y	N	N

“Dua and Azkar” app provides all types of Duas along with English meanings and pronunciations, Zikr for evenings and mornings along with a quick search for daily Duas and Quranic Duas starting with “Rabbana”.

Most popular Islamic apps among users

As a further step, the intention of Muslims for using different Islamic apps/features were analyzed in more detail. A questionnaire survey was conducted in which a group of 300 Muslim smart phone users were asked to select the features/apps they are already using or are interested to download, the features are listed in the 5 categories that were identified earlier. Overall it was identified that Muslim users were mostly using apps like Quran with translation and recitation, information about prayer timings, Azan and compass showing direction towards Mecca (Qibla) and a few of them were also using apps having Tasbih counters, daily supplications and Islamic e-books as shown in Figure 1. (Talib et al., 2015).

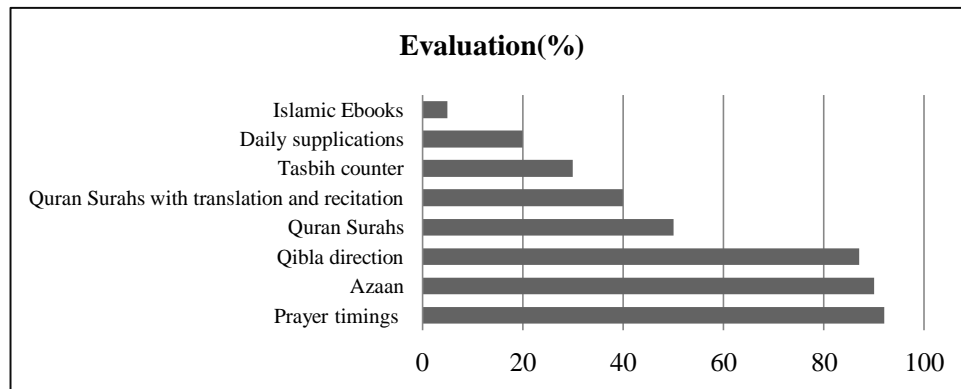


Figure 1. Relative frequency of Islamic apps mostly being used

Islamic apps / features needed to be developed

A. Communication app with trusted Islamic Scholars

Islam administrates a Muslim's life in all its aspects. In Islam it is mandatory for Muslims to lead their lives according to Quran and Sunnah. Keeping the same in mind, Muslims have to seek guidance and advice from an expert in Islamic law (mufti) to resolve minor issues to major problems that occur during their daily lives. (Talib et al., 2015) (Syadiah et al., 2016). However, for common Muslims, especially for Muslim women it sometimes becomes difficult to approach those muftis and recognized scholars. Also, authenticity of Islamic information is always a concern for Muslims. Any information available online cannot be trusted without verification as many people tend to circulate malicious content to defame Islam. Many researches have reported the lack of reliability and authenticity of Islamic Content available online. (Ishak et al., 2011) (Mahmud et al., 2012) (Bawany & Shaikh, 2016). Therefore, there is a need for an app that provides a central hub for communication between Muslims and the recognized Islamic clerics and scholars belonging to different Islamic institutions and sects. This will facilitate Muslims in seeking advice from trusted scholars without travelling anywhere.

B. Multilingual Islamic apps

During the analysis phase many apps were found having great features but their download statistics showed that the apps eventually failed to reach out to most of its targeted users. The main reason behind this problem was the language of the apps. For example, Hadith is considered as one of the most important aspects of Islamic beliefs. However, these apps had downloads lesser than many other apps. To find out the reasons, a survey was carried out with 25 Students of Islamic Learning Department of Jinnah University for Women Karachi. Students were asked whether they use any hadith app and if not then why? 24 out of 25

students replied that they don't use any app for hadith. Amongst few answers, 40% students answered that the hadith apps mostly lack hadith explanations and those with explanations are entirely in Arabic language. For example, the most popular Hadith app رياض الصالحين مع الشرح المبسط (The Gardens of the Righteous) with almost every feature regarding hadiths in it, is entirely in Arabic language. Similarly, apps for Zakat were mostly found to be in just English. About 80% of Islamic apps that were analyzed covered mostly just 3 native languages across the globe; English, Arabic and Urdu. Therefore, it calls for a thorough market research to localize these apps in more native languages.

C. Authenticating Hadiths and Quran Verse translation service

Recently it has become a social trend among Muslims to send and receive forward messages through mobile messengers containing Hadith and Quran verses including verse translations. These kind of messages are mostly forwarded without any verification and authenticity of the contents. It is good to spread and share such information, but there are also people who misuse this social culture by spreading altered Quran verse translations. Additionally, people also share many self-created and fabricated Hadiths. This kind of alteration in Islamic contents is considered as a great sin in Islam. Quran verses however, can easily be verified by searching them in the Quran as it is available almost everywhere, but Hadith and Quran verses translations verification is how ever a tedious task. Therefore, a mobile app/feature that could verify the authenticity of certain Hadiths and Quran verses translations instantly on mobile is required on a high priority basis. (I. A. Khan, 2010) (Ismail M.A., 2015) (Siddiqui & Shaikh, 2016). (Syadiah et al., 2016).

Issues identified in current Islamic apps

The following issues were identified during the detailed investigation and analysis of different Islamic apps.

A. Absence of "Religion" category

Basic issue that was identified at the very initial stage of app analysis and investigation was the absence of a specific "Religion" category in the existing Google Play Store classification structure.(Campbell et al., 2014). This created a significant challenge for app developers by limiting them to place their apps in the closest options available according to their apps design and intentions, but those categories did not do justice and failed to be the accurate placement for most Islamic or any other religious apps. Therefore, this lack of Religious app categorization not only affected the developers but it also caused significant problems for the users and researchers while searching for a particular Islamic app. During the app searching process, the researches were required to use 7 to 8 different keywords to find apps possessing similar features and functionality in more than one category. For instance, Quran apps having similar design features

were found in Education, Books and Reference, Lifestyle and Music and Audio categories of Google Play Store.

B. Content authentication

Another potential and a highly sensitive issue that was identified during the survey of Islamic apps on Google Play Store was the App contents authentication, credibility and reliability. For Muslims, these aspects are the primary concerns while using Islamic apps. In Google Play Store there are very few developers who share the originality and authenticity verification of the contents of various Islamic apps. (Campbell et al., 2014) (Syadiah et al., 2016). Furthermore, the continuous increase in the development of such apps has raised a question that whether the Muslims or other researchers using these apps are aware of any means of checking the rightfulness of the contents of the apps.

As the installed Islamic apps were investigated thoroughly, it was found that there were many apps having fake contents or information that can mislead the users. For example, while investigating Quran and Hadith apps, many apps were identified in which translations were tempered and altered hence, misleading Muslims and other Islamic researchers. Additionally, there were many other Islamic apps that were providing fake information regarding Islam. The most alarming situation at this point of time is that majority of Islamic app users are unaware of such fake apps. During the research process, a survey of 40 individuals was conducted in which 85% of users used a certain type of Quran app; about 75% of those had not reviewed the originality and authentication of the contents of that app. About 10% of them were aware of the existence of fake Islamic apps whereas 90% of the users responded that they didn't know how to explore and investigate apps for checking its originality and authenticity. Therefore, there is a critical need for an Islamic app content monitoring framework that would examine the contents of certain apps continuously to make sure that they are authentic and have not been altered. (Kamsin et al., 2015).

C. Myths regarding Islamic app usage

Although it appears that there is a huge market niche for Islamic apps and there are many Islamic app users. However, there also exists a large group of users who believe it is disrespect to download and use religious contents on mobile phones for many reasons. The main reason according to them is that it is mandatory to do Wuddu (ablution) before touching and reading Quran and also sacred content. Keeping the same in mind, smartphones usually being inside the pockets leads to touching the apps without Wuddu which is disrespectful and religiously forbidden. However, these are just myths and a number of contemporary Islamic scholars belonging to different sects have allowed and showed an optimistic attitude towards the usage of these Islamic apps.

Conclusion and Future Works

It is believed that this is the first survey of its kind and the authors did not come across any such study during the research process. This paper provides an insight into the issues regarding the usage of different Islamic apps. In this research a detailed investigation of existing Islamic apps available on Google Play Store was conducted. The first problem that was encountered during the investigation process was the absence of a “Religion category” and its corresponding sub categories in the classification of Google Play Store. This caused difficulties for developers for placing their apps into accurate categories, as the existing Google Play Store categorization did not accurately reflect the focus of Islamic apps. It also made the searching process more time consuming and complex as apps having similar features were placed in different categories; for instance, Quran recitation apps were found in education, books and audio categories. In order to overcome this limitation a fine categorization of Islamic apps based on common design features has been laid down. This categorization of apps not only will provide researchers to analyze and use apps having common design functions but it will also help the developers to identify the features/apps that are widely used by Muslim users along with features that are required to be developed. This suggests further potential based and interesting research work that will focus on the relationship of Islamic app developers and app users and their common and differing motivations related to apps use. This study also identifies the concerns associated with the use of Islamic apps. For example, in the survey that was conducted to identify the widely used and needed apps/features it was found that despite the ease that Quran apps provide, users are reluctant to use them due to the authenticity issue. Some users considered it as a disrespect to keep Quran app in mobile with other media.

Although a major potential concern regarding app content authenticity has been highlighted in this paper, but the need for providing an authentication framework still exists. Therefore in the future work, the focus will be on proposing and implementing a framework for Islamic content (initially Quran verses and Hadith) authentication. Also, in future, it is aimed to extend this study for IOS and Windows phone apps.

References

- Abdelaziz, M., Abdelaziz, M., & Zayed, A. H. (2016). ZCMGenerator: Framework for Generating Zakat Calculation Models based on the MDA Approach. *International Journal of Scientific & Engineering Research*, 7(9), 291–300.
- Asadullah, A., Yerima, B., & Yusuf, A. O. (2014). The Ethics of Information and Communication Technology : An Islamic Overview. *International Journal of Information and Communication Technology Research*, 4(2), 45–49.

- Bawany, N. Z., & Shaikh, Z. A. (2016). Document Authentication Framework. *FAST-NU Research Journal*, 2(1).
- Campbell, H. (2010). *When Religion Meets New Media* (1st ed.).
- Campbell, H. A., Altenhofen, B., Bellar, W., James Cho, K., & Professor, A. (2014). There's a religious app for that! A framework for studying religious mobile applications. *Mobile Media & Communication*, 2(2), 154–172. <https://doi.org/10.1177/2050157914520846>
- Frey, R. M., Xu, R., Ammendola, C., Moling, O., Giglio, G., & Ilic, A. (2017). Mobile recommendations based on interest prediction from consumer's installed apps—insights from a large-scale field study. *Information Systems*, 71, 152–163. <https://doi.org/10.1016/j.is.2017.08.006>
- Gunawan, T., Kartiwi, M., & Omar, A. (2012). Development of Web Application for Muslim Traveller with Emphasis on Social Networking. *ICCIT Conference*, 381–386.
- Ishak, M. S., Siti Zobidah, O., Bolong, J., Abu Hassan, M., & Abd. Ghani, Z. (2011). Internet's Islamic Information Credibility Scale (IIICS). *Ullum Islamyyah*, 6.
- Ismail M.A. (2015). Fabricated information on social media: A Case Study of Twitter. *Conference: 4th International Conference on Computer Science & Computational Mathematics (ICCSCM 2015)*, 1–5. Langkawi, Malaysia.
- Kamsin, A., Gani, A., Suliaman, I., Jaafar, S., Sabri, A. Q. M., Idris, M. Y. I., & Razak, Z. (2015). Program for Developing the Novel Quran and Hadith Authentication System. *International Journal on Islamic Applications in Computer Science and Technology*, 3(1), 8–17. <https://doi=10.1.1.725.9707>
- Khan, E. A., & Shambour, M. K. Y. (2017). An analytical study of mobile applications for Hajj and Umrah services. *Applied Computing and Informatics*, 14(1), 37–47. <https://doi.org/10.1016/j.aci.2017.05.004>
- Khan, I. A. (2010). *Authentication of Hadith: Redefining the Criteria* (1st ed.; Dr. Anas S. al-Shaikh-Al & Shiraz Khan, eds.). International Institute of Islamic Thought.
- Kittler, J., & Mitchell, J. C. (2015). Cross-Cultural Design Applications in Mobile Interaction, Education, Health, Transport and Cultural Heritage. In P. L. P. Rau (Ed.), *7th International Conference, CCD 2* (1st ed., p. 419). <https://doi.org/10.1007/978-3-319-20934-0>
- Mahmud, M., Tap, A. O. M., Hussein, I., & Aliyu, M. (2012). Content Evaluation Of Islamic Websites. *2012 Southeast Asian Network Of Ergonomics Societies Conference (Seanes)*, (June 2014), 21–30.
- Mazumder, T. A., Student, M. S., Light, F., Networking, S., & Players, V. (2010). Mobile Application and Its Global Impact 1. *International Journal of Engineering & Technology*, 10(06), 72–78.
- Mohamed, N., Mantoro, T., Media, A., & Mahmud, M. (2016). Critical Socio-Technical Issues Surrounding Mobile Computing. In M. M. Teddy Mantoro, Media Ayu (Ed.), *IGI Global*. <https://doi.org/10.4018/978-1-4666-9438-5>
- Olmstead, K., Rainie, L., Page, D., & Manager, S. C. (2015). *Apps Permission in the Google Play Store*.
- Siddiqui, A. A., & Shaikh, Z. A. (2016). A Survey of Semantic Computing: General and Islamic Domain Applications. *Mehran University Research Journal of Engineering & Technology*, 35(2), 253–264.

- Syadiah, N. W. S., Nurul, F. A. B., Mokhairi, M., Wan, M. W. I., Azilawati, R., & Norhafizi, Y. (2016). a Framework for Designing Mobile Quranic Memorization Tool Using Multimedia. *Journal of Theoretical and Applied Information Technology*, 92(1), 20–17.
- Talib, S., Mahmud, M., Abd Rahman, E. S., Suraya, A., & Abubakar, A. (2015). Mobile Quran App Security Vulnerabilities. *Proceedings of the 5th International Conference on Computing and Informatics, ICOCI 2015*, (198), 447–455.
- Tayan, O., Ibrahim, M., & Al-Oufi, K. (2017). Design and Architecture of a Location and Time-based Mobile-Learning System: A Case-Study for Interactive Islamic Content. *International Journal of Advanced Computer Science and Applications*, 8(3), 302–308.
<https://doi.org/10.14569/IJACSA.2017.080342>