

State of Play of Mobile Government Apps on Google Play Store

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Abstract—e-Government mobile applications provide an extension for effective e-government services in today's omniconnected world. They constitute part of m-government platforms. This study explores the usefulness, availability, discoverability and maturity of such applications. While this study impacts theory by addressing a relatively lacking area, it impacts practice more. The outcomes of this study suggest valuable recommendations for practitioners-developers of e-government applications. The methodology followed is to examine a large number of e-government smartphone applications. The focus is on applications available at the Google Play Store. Moreover, the study investigates applications published on government portals of a number of countries. A sample of 15 countries is researched. The results show a diversity in the level of discoverability, development, maturity, and usage of smartphone apps dedicated for use of e-government services. It was found that there are major issues in discovering e-government applications on both the Google Play Store and as-well-as on local government portals. The study found that only a fraction of mobile government applications was published on the Play Store. Only 19% of apps were multilingual, and 43% were developed by third parties including private individuals. Further analysis was made, and important recommendations are suggested in this paper for a better utilization of e-government smartphone applications. These recommendations will result in better discoverability, maturity, and usefulness of e-government applications.

Keywords—Mobile applications, e-government, apps, app store.

I. INTRODUCTION

WITH the vast adoption of mobile smart devices and broadband wireless networks many governments worldwide have responded with mobile government (m-government) strategies. There are many drivers for adopting mobile m-government. Smartphone penetration, spread of mobile applications, and e-government subscriptions are just a few. M-Government is the use of mobile technologies within the government administration to deliver public services to citizens and firms.

Governments seek to become smarter by adopting emerging technologies and innovation. A smart government encourages smart cities, open government and participations mechanisms. Some of the tools used include: mobile government smartphone applications. Privacy and Security, Infrastructure, User needs and preferences, Quality and user-friendly applications, E-government, Acceptance, and Cost were identified as success factors for e-government.

Standalone smartphone applications were found to be the preferred channel for receiving government services for mobile users. It is also recommended to gain feedback from users of such applications in order to meet their expectations. It is suggested to consider m-government as a mere specific area of application but rather support the full spectrum of e-government services.

Smartphones and applications impact citizen participation. Social media the mobile devices penetration among both citizens and politicians increase intensity of dialogs and e-participation. M-Government coupled with ICT tools boosts social capital and civic engagement while smartphones were found to increase civic deviance. eParticipation scenarios include information gathering, opinion polls, posts to political discussions in social media and in standard e-participation platforms, quick feedback forms, and group and event cooperation.

Smartphone Apps could be developed mostly by government, independent agencies, government secretaries or citizens with government resources. Evidence suggests that smartphone applications have the potential to increase transparency, accountability, government efficiency and the economic development. People, -particularly younger generation-, prefer to use smartphones over computers to access Internet services. It is challenging for governments to produce highly mature smartphone applications that meets people's expectations and needs. Focus should be put on designing user-centric smartphone applications. In other words, attention should over quality rather quantity. Smartphone needs to include the most important facets of people's lives. For example, location-based services and context-aware services could vital aspect of government services particularly in Disaster management situations. Such services are helped by the huge penetration rates of smartphones equipped with GPS. However, there are some factors that influence user satisfaction of smartphones. Technical features of smartphones, enthusiasm towards smartphone use, and purpose of smartphone use play important roles on satisfaction levels.

This study investigates e-government smartphone applications for availability, discoverability and maturity. There is a relative lack of similar studies. The aim is to assess the current landscape of apps available mainly on the Google's Play Store. Based on the results, some important guidelines will be presented at the end of the article.

II. RESEARCH METHODOLOGY AND DATA COLLECTION

As mentioned earlier, the study was primarily interested in

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assessing availability, discoverability, accessibility, and maturity of apps dedicated to e-government on the Google Play Store. For the sake of curiosity, the study has also sought to draw a parallel with both Apple's AppStore, and Windows Phone Store. Therefore, it was natural to first look for e-government apps on the Google Play Store. Data collection was conducted in two phases. The first phase was to search the Google's Play Store for e-government apps. This was done to assess discoverability of e-government apps on the Google Play Store. The search keyword "e-government" was used while looking for e-government apps.

Table I shows the yielded apps together with a brief description of each.

For each search result, the real categorization at Play Store was documented. Table II shows the apps retrieved by the Store's search engine together with the categorization of the app as entered by the developer. The purpose was to explore effectiveness and precision of the categorization used versus correct app referencing. Proper categorization assists app discoverability:

As can be immediately seen from Table I, only 11 apps out of 47 were categorized e-government apps. Furthermore, we can see that categorization of the retrieved apps was related to the following:

1. e-Government tag name
2. The specific government authority that provided the service(s) within the app
3. The apps app developer
4. The umbrella (government program) of the app
5. Other categorization (i.e. education, business, tools, life style, news & magazines, social, travel, maps & navigation)
6. A mixture of the above

Many of the apps were named in the local language of the country of origination. This makes apps harder to discover for non-native speakers. The researcher sought to explore how many of the retrieved apps were multilingual. Being multilingual or adding support for an international language affects accessibility. The more the languages an app supports the wider the user base will be not only for multilingual countries but also for visitors and foreigners. Table III shows the languages of the retrieved apps and countries they are coming from. An English translation is provided between brackets for local unilingual app name:

Less than 19% of sample apps were multi-lingual. Looking at the developer of the apps reveals that some of them were developed by the government itself, others were developed by private companies for the government whereas others were developed by motivated individuals.

Table IV lists the developers of the retrieved apps and the type of provider. Generally speaking, people trust the government more than private companies when it comes to their privacy and security.

About 43% of apps above were developed by private developers. The next thing we wanted to look at was

popularity of e-government apps together with how often they are updated and the overall user ranking of the apps. Table V summarizes these findings.

Finally, the last thing we wanted to check was the type of access to each app as shown in Table VI.

The list of apps shown in the tables retrieved with the keyword e-government was found to be just a fraction of the number of apps that are really available on local government portals. They extend e-government services to the mobile space. A deeper inspection of the e-government apps available in each of the countries listed in Table III reveals a far greater number of apps.

Table VII shows the real number of apps per country. Although the primary target of this study was the Google Play Store, data from Apple's Store and Windows Phone store was also investigated for curiosity sake.

III. DATA ANALYSIS

Starting with Table I, one can see that although many e-government apps are available on the Google Play Store yet searching using the keyword "e-government" only retrieved a few of them. Some of the apps retrieved were not actually e-government apps despite being labeled as e-government apps. Private individuals also developed a number of them. Some of the apps retrieved were actually games. Such apps were excluded from Table I.

Categorization of the apps also has some issues. For example, as seen in Table II the app "E Devlet Giriş (e-Government Entry)" was categorized as a "shopping" app in addition to e-government although the services offered is "inquiries" as seen in Table I. Another example is the "MCG" app. It was categorized at the Google Play Store as "Ascendia Technology Solutions Pvt. Ltd" which is actually the name of the developer. Contrasting the services provided by the app as appears in Table I to app categorization as seen in Table II reveals some inconsistencies. App languages and country presented in Table III were not straightforward to identify. This could be a barrier for foreign users or even locals to discover local e-government apps. The type of provider (see Table IV) of the app raises a question mark about authenticity, privacy and safety of using the app.

As seen in Table V, some apps are regularly updated whereas other were not updated since 2012. The average ranking of these apps was found to be 3.88 which is not bad. Some apps, however, received low ranking and bad comments. This should not be the case with e-government apps as they are critical compared to other apps. Table V also shows that many of the apps have very low publicity as manifested by the number of installations. This may be due to the lack of publicity from the side of the government. Upon opening the app, some required a username and a password right away (see Table VI). Others do not provide secure access. The need for secure access depends of course on the type of services provided by the app. The majority of apps to Table VI provide free usage. One app, however, is paid.

TABLE I
YIELDED APPS WITH KEYWORD "E-GOVERNMENT" WITH BRIEF DESCRIPTION OF EACH

App Name	Description	App Services
Bahrain eGovernment Forum	The application contains all the key events that will take place at the Bahrain International eGovernment Forum & Bahrain IT Expo	Information Provision
Saudi e-Government Mobile App	Saudi e-Government National Portal	Information Provision, Polls
e-Devlet Kapısı (e-Government Portal)	This app provides access to most frequently used services and information on the Turkish government portal, user service profile, update personal information and access municipal services and information.	e-Services and Information
eTraffic	Shows user's traffic records (fines), allows update personal records, vehicle and license registration renewals and fuel station locators	e-Services and Information
e-Devlet Anahtar	Creates disposable passwords for the main e-government application	Authentication
Elektron Hükümet Portalı (e-Government Portal)	Provides information and e-services to individual, corporate, citizen and foreigners in Azerbaijan	Information and e-Services
E Devlet Giriş (e-Government Entry)	Public participation app. It includes inquiries for court, criminal records, social security, party membership, military status...etc.	Inquiries
(Payment Service) שירות התשלומים	App allows online payments to the government such as registration and license renewal fees, fines...etc.	Online payments
Jordanian الضمان الاجتماعي الأردني (Social Security)	Shows basic pensioner information including payroll records and the ability to stop subscription.	Pension Information and ability to stop pension
E-Devletim (e-Government)	Allows queries for e-government input, criminal records, exams results, land registry, traffic policy...etc.	Information
100 - חירום (Emergency 100)	One click rapid police emergency response with location identification	Emergency response service
E Devlet Şifresi Alma (e-Government Password)	Allows to reset password of the e-government portal	Reset password service
(Mobile CITS) التعريف الجمركية	Allows reviewing customs tariffs in Jordan	Information
National Scholars Portal	Provides (40) academic and financial services of government scholarships	Services and Information
E-Nabız (e-Puls)	Provides e-Health information to patients or their relatives	Information
MCG	Facilitation of e-Government services access in India	e-Government Access
PNCmóvil (PNC Mobile)	The app allows the citizen to review police records and vehicles. In addition, it allows reporting stolen and suspicious vehicles in real-time	Information and e-Services
Tel Aviv International Airport	The app assists passengers while planning their flight, pre-flight and after arrival through up-to-date airport schedules and services, public transportation, packaging occupancy...etc.	Information
MOJ (Ministry of العدل الأردنية - Justice)	The app allows issue non-conviction certificate in addition to address inquiries about civil and criminal lawsuits records against the user, rental payments records of the user in the court records, clerical guarantees and agencies. It also allows online rental payments as ordained the court.	Information, e-Payment
(Bids) مناقصات	The app allow searching of Saudi government e-Procurement bids	Information retrieval
Tatkal Passport Seva (Instant passport service)	The app allows the Indian users to check status of passport issuance application, calculate passport issuance fees, and provides other relevant information (e.g. passport act 1967, passport rules 1980)	Information
E-Sheba (ই-সেবা সমূহ) (e-Services)	The provides links to e-government websites offering 150+ services	Links to e-government services
Digital India Conclave 2015	App provides information about the "Digital India" program	Information
Red Color צבע אדום - התרעות בזמן אמת (- Real Time Alerts)	App provides real time alerts as they are sounded in the user's area in Israel	Alerts
Aptitude 2016	App trains candidates who want to prepare for government exams such as (SBI PO, SBI Clerk IBPS PO, IBPS Clerk...etc.) in India	Training
Sisu (Unified Selection System)	Allows registered users to solicit information about higher education vacancies in Brazil.	Information
e-Darussalam	The app is set enhance client centricity of e-government in Brunei through extending e-government services to the mobile platform, form auto-filling, customizing user interface for better experience, maintaining a set of common social media identities.	e-Services
Electricity and Water Services	The app enables the user to review and pay water and electricity bills, view payment history, receive notifications of standing bills, submit meter readings, report high consumption, update contact details, go eBill.	e-Services
MyEG Mobile V1	The app allows reviewing and paying PDRM/JPJ summons.	e-Services
GovEmployee	Allows registered government employees to view and update their information, view their salary slips, request salary and service certificates and employee attendance times. In addition, it allows users to apply for government jobs.	e-Services
DAWLATI for Lebanese E-Gov.	The app presents information about each of the transactions of the Lebanese government including short description of the transaction, needed supporting documents, steps, and needed stamps.	Information
MP Mobile	The app constitutes a new platform of the State that brings together various G2C services offered by several Departments /Agencies / Corporations / Universities of Govt. of Madhya Pradesh as well as B2C services.	Information and e-Services
DISHA - NDLM	The provides educational material for training non-IT citizens in order to become IT literate for purposes of making them participate in the democratic and development process	Information
SSC CGL Exams 2017	The app provides training for the SSC governmental exam in India	Information
CSC e-Governance News (India)	The app provides news about e-governance in India	Information
Aptitude (IBPS) Tips and Trick	The app prepares the candidates for the Indian government and banking exams	Information

App Name	Description	App Services
eGov	eGov application facilitate to user all government and non-government electronic services for Jordan , Saudi Arabia , UAE , Oman , Qatar , Bahrain , Kuwait and Egypt	Links to e-government services
Sri Lankan Sites	The app provides contact information of Sri Lankan web sites fully searchable by keywords, organization category or service name	Links to e-government services
Free Jobs News Government jobs	Free Job News is Exam preparation / Government job notifications app for all State jobs, Railway jobs, Engineering jobs, Banking Jobs, Teaching jobs, Defense jobs and SSC jobs and news update as current affairs in India	Information
All Government Job	Covers all jobs and alerts from latest Employment News from govt. of India. The app also covers all the bank jobs and PO vacancies across India.	Information
India	The app claims to provide more than 2000 pages of information on India but in reality it links to pages of the national portal of India (india.gov.in)	Information
CSC e-Governance News (India)	The app links to the Weekly Newsletter of CSC e-Governance Services India Limited	News
Sgk Haberleri - Ssk Haberleri (Sgk News - Ssk News)	The app provides new and alerts for pension and retirement. It also calculates pensions.	News and Information
Enem 2017	The app provides information on the National Secondary Education Examination (Enem) 2017.	Information
Sorgulamalar (Queries)	The app provides access to public inquires of the Turkish portal	Links to e-government services
E Devlet Şifremi Unuttum (E-Government Password Forget)	The assists recovering forgotten e-government password	Information
General Authority of Customs	The app is one-stop integrated customs e-government service in Qatar. It enables electronic information interchange between various stakeholders in trading community including traders, shippers, clearing agents, courier companies, other government agencies and Qatar's Customs Authority.	e-Services

TABLE II
APP CATEGORIZATION

App Name	Google App Categorization	App Name	Google App Categorization
Bahrain eGovernment Forum	Information & eGovernment Authority, Business	Aptitude 2016	Iplayinfotech, Education
Saudi e-Government Mobile App	e-Government Program, Business	Sisu (Unified Selection System)	Ministério da Educação - Governo Federal Education
e-Devlet Kapısı (e-Government Portal)	e-Government, Business	e-Darussalam	E-Government National Centre, Business
eTraffic	Information & eGovernment Authority Maps & Navigation	Electricity and Water Services	Information & eGovernment Authority Finance
e-Devlet Anahtar	e-Government	MyEG Mobile V1	MYEG Services Bhd, Social
Elektron Hökumət Portalı (e-Government Portal)	Data Processing Center Productivity	GovEmployee	Information & eGovernment Authority, Business
E Devlet Giriş (e-Government Entry)	Inquiry Service, Shopping	DAWLATI for Lebanese E-Gov.	OMSAR, Social
(Payment Service) שירות התשלומים	GOV.IL ISRAEL GOVERNMENT, Productivity	MP Mobile	MPOnline Limited, Communication
Jordanian الضمان الإجتماعي الأردني (Social Security)	Jordan eGov Program, Business	DISHA - NDLM	CSC e-Government Services India Limited, Education
E-Devletim (e-Government)	SNC Information, Business	SSC CGL Exams 2017	Hindi Applications Education
100 - חירום (Emergency 100)	Israel Police, Tools	CSC e-Governance News (India)	metalwiheh News & Magazines
E Devlet Şifresi Alma (e-Government Password)	Inquiry Service, Tools	Aptitude (IBPS) Tips and Trick	Jitendra Sharma, Education
(Mobile CITS) التعريف الجمركية	Jordan Customs, Business	eGov	Imad Hussein, Business
National Scholars Portal	Ministry of Higher Education United Arab Emirates, Education	Sri Lankan Sites	PKWapps.info, Business
E-Nabız (e-Puls)	T.C. Ministry of Health & Fitness	Free Jobs News Government jobs	ParasTechnologies, Education
MCG	Ascendia Technology Solutions Pvt. Ltd	All Government Job	Indian Appz, Education
PNCmóvil (PNC Mobile)	PNC Guatemala, Communication	India	Its MILLION \$, Social
Tel Aviv International Airport	Israel Airports Authority, Travel & Local	CSC e-Governance News (India)	metalwiheh, News & Magazines
MOJ (Ministry of - وزارة العدل الاردنية - Justice)	Jordan eGov Program, Business	Sgk Haberleri - Ssk Haberleri (Sgk News - Ssk News)	Hedanin Teknology, Lifestyle
(Bids) مناقصات	Saudi Company for Exchange of Information	Enem 2017	Innovative Works Systems, Education
Tatkal Passport Seva (Instant passport service)	Infoworld, Social	Sorgulamalar (Queries)	YAZILIMSOFT, Tools
E-Sheba (ই-সেবা সমূহ) (e-Services)	Boss Devs, News & Magazines	E Devlet Şifremi Unuttum (E-Government Password Forget)	Sorgulama Servisi, Tools
Digital India Conclave 2015	Creator9 Studios	General Authority of Customs	General Authority of Customs
Red Color - צבע אדום - התרעות בזמן אמת (Real Time Alerts)	Elad Nava, News & Magazines		

TABLE III
APP LANGUAGE AND COUNTRY

App Name	Languages Supported	Country
Bahrain eGovernment Forum	English	Bahrain
Saudi e-Government Mobile App	Arabic	Saudi Arabia
e-Devlet Kapısı (e-Government Portal)	Turkish	Turkey
eTraffic	English	Bahrain
e-Devlet Anahtar	Turkish	Turkey
Elektron Hökumət Portalı (e-Government Portal)	Azerbaijani	Azerbaijan
E Devlet Giriş (e-Government Entry)	Turkish	Turkey
שירות התשלומים (Payment Service)	Hebrew	Israel
الضمان الاجتماعي الأردني (Jordanian Social Security)	Arabic	Jordan
E-Devletim (e-Government)	Turkish	Turkey
100 - חירום (Emergency 100)	Hebrew	Israel
E Devlet Şifresi Alma (e-Government Password)	Turkish	Turkey
التعريف الجمركية (Mobile CITS)	Arabic	Jordan
National Scholars Portal	Arabic	United Arab Emirates
E-Nabız (e-Puls)	Turkish	Turkey
MCG	English	India
PNCmóvil (PNC Mobile)	Guatemalan	Guatemala
Tel Aviv International Airport	English, Hebrew	Israel
وزارة العدل الأردنية - مناقصات (Bids)	Arabic	Saudi Arabia
Tatkal Passport Seva (Instant passport service)	Hindi	India
E-Sheba (ই-সেবা সেবা) (e-Services)	Bengali	India
Digital India Conclave 2015	English	India
צבע אדום - התרעות בזמן אמת (Red Color - Real Time Alerts)	Hebrew	Israel
Aptitude 2016	English	India
Sisu (Unified Selection System)	Portuguese	Brazil
e-Darussalam	English	Brunei
Electricity and Water Services	English, Arabic	Bahrain
MyEG Mobile V1	English, Bahasa	Malaysia
GovEmployee	English, Arabic	Bahrain
DAWLATI for Lebanese E-Gov.	Arabic, English	Lebanon
MP Mobile	English, Hindi	India
DISHA - NDLM	English, Hindi, Bengali	India
SSC CGL Exams 2017	English	India
CSC e-Governance News (India)	English	India
Aptitude (IBPS) Tips and Trick	English, Hindi	India
eGov	Arabic	Jordan, Saudi Arabia, UAE, Oman, Qatar, Bahrain, Kuwait and Egypt
Sri Lankan Sites	English	Sri Lanka
Free Jobs News Government jobs	English	India
All Government Job	English	India
India	English	India
CSC e-Governance News (India)	English	India
Sgk Haberleri - Ssk Haberleri (Sgk News - Ssk News)	Turkish	Turkey
Enem 2017	Portuguese	Brazil
Sorgulamalar (Queries)	Turkish	Turkey
E Devlet Şifremi Unuttum (E-Government Password Forget)	Turkish	Turkish Part of Cyprus
General Authority of Customs	Arabic, English	Qatar

TABLE IV
APPS DEVELOPERS

App Name	Developer	Type of Provider
Bahrain eGovernment Forum	Information & eGovernment Authority	Government
Saudi e-Government Mobile App	e-Government Program (Yesser)	Government
e-Devlet Kapısı (e-Government Portal)	T.C. Maritime transport and Communications Ministry	Government
eTraffic	Ministry of Interior - General Directorate of Traffic (GDT), National Oil & Gas Authority (NOGA) and Information and eGovernment Authority (iGA)	Government
e-Devlet Anahtar	T.C. Ministry of Transport, Maritime Affairs and Communications	Government
Elektron Hükümet Portalı (e-Government Portal)	Data Processing Center	Government
E Devlet Giriş (e-Government Entry)	Inquiry Service	Government
(Payment Service) שירות התשלומים	Israeli Government ICT staff Ministry of Finance.	Government
(Jordanian Social Security) الضمان الإجتماعي الأردني	Jordan eGov Program	Government
E-Devletim (e-Government)	SNC Information	Government
100 - 100 (Emergency) חירום - 100	Israeli Police	Government
E Devlet Şifresi Alma (e-Government Password)	Inquiry Service	Government
(Mobile CITS) التعريف الجمركية	General Tariffs Administration in Jordan	Government
National Scholars Portal	Ministry of Higher Education United Arab Emirates	Government
E-Nabız (e-Puls)	T.C. Ministry of Health	Government
MCG	Ascendia Technology Solutions Pvt. Ltd	Private
PNCmóvil (PNC Mobile)	General Directorate of the National Civil Police of Guatemala	Government
Tel Aviv International Airport	Israel Airports Authority	Government
MOJ (Ministry of Justice) - وزارة العدل الأردنية	Jordan eGov Program	Government
(Bids) مناقصات	Saudi Company for Exchange of Information	Private
Tatkal Passport Seva (Instant passport service)	Infoworld	Private
E-Sheba (ই-সেবা স্মার্ট) (e-Services)	Boss Devs	Private
Digital India Conclave 2015	Creator9 Studios	Private
Red Color - Real (צבע אדום - החרצות בזמן אמתי) (Time Alerts)	Elad Nava	Private
Aptitude 2016	Iplayinfotech	Private
Sisu (Unified Selection System)	Federal Government - Ministry of Education	Government
e-Darussalam	E-Government National Centre	Government
Electricity and Water Services	Information & eGovernment Authority Finance	Government
MyEG Mobile V1	MYEG Services Bhd	Private
GovEmployee	Information & eGovernment Authority	Government
DAWLATI for Lebanese E-Gov.	OMSAR (Office of the Minister of State for Administrative Reform)	Government
MP Mobile	MPOnline Limited	Government
DISHA - NDLM	CSC e-Government Services India Limited	Private
SSC CGL Exams 2017	Hindi Applications	Private
CSC e-Governance News (India)	metalwihen	Private
Aptitude (IBPS) Tips and Trick	Jitendra Sharma	Private
eGov	Imad Hussein	Private
Sri Lankan Sites	PKWapps.info	Private
Free Jobs News Government jobs	ParasTechnologies	Private
All Government Job	Indian Appz	Private
India	Its MILLION \$	Private
CSC e-Governance News (India)	metalwihen	Private
Sgk Haberleri - Ssk Haberleri (Sgk News - Ssk News)	Hedanin Teknology	Private
Enem 2017	Innovative Works Systems	Private
Sorgulamalar (Queries)	YAZILIMSOFT	Private
E Devlet Şifresi Unuttum (E-Government Password Forget)	Sorgulama Servisi	NA
General Authority of Customs	General Customs Authority	Government

TABLE V
POPULARITY, UPDATABILITY AND OVERALL RANKING OF THE RETRIEVED APPS

App Name	Installs	Current Version	Year Last Updated	Overall Rank
Bahrain eGovernment Forum	5000-10000	1.4	2015	4.1
Saudi e-Government Mobile App	100000-500000	1.0.1	2013	4.1
e-Devlet Kapısı (e-Government Portal)	5000000-10000000	Varies with device	2017	4.3
eTraffic	100000-500000	2.2.0	2017	4.2
e-Devlet Anahtar	10000-50000	2016.10.1001	2016	3.7
Elektron Hükümet Portalı (e-Government Portal)	5000-10000	1.0.4	2016	4.1
E Devlet Giriş (e-Government Entry)	50000-100000	1.0	2016	3.8
(Payment Service) שירות התשלומים	5000-10000	2.1	2016	3.6
(Jordanian Social Security) الضمان الاجتماعي الأردني	50000-100000	1.0.5	2016	3.6
E-Devletim (e-Government)	100000-500000	3.0.4	2017	3.9
100 - חירום (Emergency 100)	10000-50000	1.0	2016	4.1
E Devlet Şifresi Alma (e-Government Password)	5000-10000	1.0	2016	4.0
(Mobile CITS) التعريف الجمركية	10000-50000	1.2	2015	1.7
National Scholars Portal	5000-10000	4.1	2016	3.9
E-Nabız (e-Puls)	100000-500000	2.2.1	2017	3.7
MCG	5000-10000	1.0.43	2016	3.7
PNCmóvil (PNC Mobile)	10000-50000	1.0	2016	3.5
Tel Aviv International Airport	100000-500000	1.9	2017	4.3
MOJ (Ministry of Justice) - وزارة العدل الأردنية	50000-100000	2.1	2017	3.8
(Bids) مناقصات	1000-5000	1.0	2016	4.8
Tatkal Passport Seva (Instant passport service)	1000-5000	NA	2016	4.4
E-Sheba (ই-সেবা স্মার্ট) (e-Services)	10000-50000	1.0	2015	4.5
Digital India Conclave 2015	1000-5000	0.0.2	2015	4.3
(Red Color - Real Time Alerts) צבע אדום - התרעות בזמן אמת	100000-500000	1.0.9.1	2016	4.7
Aptitude 2016	1000-5000	11	2016	4.3
Sisu (Unified Selection System)	500000-1000000	4.1.2	2017	4.1
e-Darussalam	1000-5000	1.0	2015	3.3
Electricity and Water Services	50000-100000	2.6	2016	4.1
MyEG Mobile V1	100000-500000	1.1.1	2016	3.7
GovEmployee	10000-50000	2.1.0	2017	4.3
DAWLATI for Lebanese E-Gov.	1000-5000	1.1	2013	3
MP Mobile	100000-500000	25	2017	4.1
DISHA - NDLM	10000-50000	A. 5	2015	4.4
SSC CGL Exams 2017	50000-100000	1.4	2016	3.9
CSC e-Governance News (India)	10000-50000	4	2015	4.1
Aptitude (IBPS) Tips and Trick	1000-5000	1.6	2016	4.2
eGov	1000-5000	1.0	2012	2.3
Sri Lankan Sites	1000-5000	3.0	2016	4.1
Free Jobs News Government jobs	100000-500000	1.0.50	2017	4.1
All Government Job	10000-50000	1.9	2016	3.9
India	50000-100000	0.90	2104	4.4
CSC e-Governance News (India)	10000-50000	4.0	2015	4.1
Sgk Haberleri - Ssk Haberleri (Sgk News - Ssk News)	1000-5000	1.0.0	2016	3
Enem 2017	5000-10000	1.6	2017	4.2
Sorgulamalar (Queries)	10000-50000	1.0	2014	3
E Devlet Şifremi Unuttum (E-Government Password Forget)	1000-5000	1.0	2016	3.7
General Authority of Customs	1000-5000	2.0.4	2017	4.2

TABLE VI
TYPE OF ACCESS AND USAGE OF RETRIEVED APPS

APP NAME	PROVIDES SECURE ACCESS	USAGE
Bahrain eGovernment Forum	No	Free
Saudi e-Government Mobile App	No	Free
e-Devlet Kapısı (e-Government Portal)	Yes (user number and password)	Free
eTraffic	Yes (eKey and password)	Free
e-Devlet Anahtar	Yes (disposable password)	Free
Elektron Hükümet Portalı (e-Government Portal)	Yes (username and password)	Free
E Devlet Giriş (e-Government Entry)	Yes (e-signature, password, mobile signature, Internet banking password, or e-ID card)	Free
שירות התשלומים (Payment Service)	SSL, Credit Card Verification	Free
الضمان الإجتماعي الأردني (Jordanian Social Security)	Yes (password)	Free
E-Devletim (e-Government)	No	Free
100 - חירום (Emergency 100)	No	Free
E Devlet Şifresi Alma (e-Government Password)	Yes (ID number and security code)	Free
التعريف الممركية (Mobile CITS)	Yes (username and password valid for one year)	Paid (JD 15 yearly)
National Scholars Portal	Yes (username and password)	Free
E-Nabız (e-Puls)	Yes (username and password)	Free
MCG	Yes (username and password for e-Government services websites)	Free
PNCmóvil (PNC Mobile)	Yes (pin code, username)	Free
Tel Aviv International Airport	No	Free
MOJ (Ministry of Justice) - وزارة العدل الأردنية	Yes (username and password)	Free
منافسات (Bids)	No	Free
Tatkal Passport Seva (Instant passport service)	No	Free
E-Sheba (ই-সেবা স্মার্ট) (e-Services)	No	Free
Digital India Conclave 2015	No	Free
צבע אדום - התרעות בזמן אמת (Red Color - Real Time Alerts)	No	Free
Aptitude 2016	No	Free
Sisu (Unified Selection System)	Yes (username and password)	Free
e-Darussalam	Yes (ID number and password)	Free
Electricity and Water Services	Yes (personal number and password)	Free
MyEG Mobile V1	Yes (username and password)	Free
GovEmployee	Yes (username and password)	Free
DAWLATI for Lebanese E-Gov.	No	Free
MP Mobile	Yes (username and password)	Free
DISHA - NDLM	No	Free
SSC CGL Exams 2017	No	Free
CSC e-Governance News (India)	No	Free
Aptitude (IBPS) Tips and Trick	No	Free
eGov	No	Free
Sri Lankan Sites	No	Free
Free Jobs News Government jobs	Yes (Need to create account or use google account)	Free
All Government Job	No	Free
India	No	Free
CSC e-Governance News (India)	No	Free
Sgk Haberleri - Ssk Haberleri (Sgk News - Ssk News)	No	Free
Enem 2017	No	Free
Sorgulamalar (Queries)	No	Free
E Devlet Şifremi Unuttum (E-Government Password Forget)	No	Free
General Authority of Customs	Yes (username and password)	Free

One can see from Table VII that some of the sample countries did not publish their e-government apps on the Google Play Store (Egypt and India). Many countries from the list did not list their apps on the e-government portal which would have provided easier access. Many apps were distributed on separate sites of the government, particularly websites of the individual ministries. Referring to Table VII again, some countries focus more on the Android platform

while others focus more on the iOS platform. Obviously, Windows Phone platform is abandoned by most sample countries.

In some countries, a common development platform was put in place. In others, however, different government bodies (mostly ministries or localities) develop their applications using their own resources, standards, and design themes. Although this can induce innovation, islands of innovation can

ensue.

TABLE VII
REAL NUMBER OF E-GOVERNMENT APPS AVAILABLE FROM SAMPLE COUNTRIES

Country	Android Apps	Available on Play Store	iOS	Windows Mobile	Source
UAE	177	Yes	190	0	
Jordan	21	Yes	16	0	
Egypt	0	No	0	1	
Turkey	1	Yes	1	0	
India	747	No	0	0	
Malaysia	168	Yes	128	83	
Saudi Arabia	5	Yes	5	1 (No longer available)	,
Bahrain	22	Yes	25	0	
Brazil	607	No	56	55	
Lebanon	4	Yes	3	0	,
Qatar	109	Yes	115	0	
Brunei	13	Yes	13	0	
Sri Lanka	4		0	0	
Guatemala	2	Yes	1	0	,
Israel	10	Yes	12	0	,

IV. CONCLUSIONS AND RECOMMENDATIONS

This paper explored a topic with severe lack of attention by researchers. It investigated availability, discoverability, accessibility, and maturity e-government mobile apps on the Google Play Store and e-government portals. The researcher identified some serious issues in each of these areas. To overcome some of the shortcomings identified earlier, the researcher suggests the following:

- E-government apps should be tagged properly with the keyword "e-government".
- E-government apps should be categorized by the type of service they provide.
- Languages supported by the app and the country should be clearly indicated. This should also be linked better to localized search.
- Genuine e-government apps must be clearly indicated for authenticity. Identity theft and other issues are at stake if this is not taken into consideration.
- E-government apps on the Google Play Store should be regularly updated.
- Quality assurance of e-government apps is particularly important.
- Governments should invest more publicity and promotion of e-government apps on the Google Play Store.
- Free usage of apps helps to promote their usage.
- Listing the e-government apps on one location (typically the e-government portal) makes them more discoverable. Links on localized sites add more exposure.
- Having a common development platform and centers of excellence can facilitate and encourage broader advancement.
- To leave no users behind, governments need to focus on both Android and iOS platforms for developing apps.
- Multilingual apps are encouraged as this entails more accessibility

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