Factors affecting digital government services adoption

العوامل المؤثرة على مستوى تبني الخدمات الحكومية الرقمية

by

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Abstract

We are recently witnessing the fast-evolving digital government that leverages the power of digital data in transforming government services into optimized digital services. Earlier, eGovernment was concerned only with availing government services through online channels.

With this fast move, governments are spending huge amounts on the digitization efforts, however, many governments are still struggling with relatively low public adoption percentages. Public adoption of digital government services reflects the extent of success and efficiency of each government in the provisioning of its digital services.

The purpose of this research is to achieve two main objectives. First, to undertake a systematic review to synthesize the findings from published researches concerning factors affecting citizen adoption of digital government in several countries, in total, 471 articles were identified to be relevant to the topic, of which, 131 were shortlisted, then a final refinement of 28 articles were studied based on the search strategy.

Second, to conduct an empirical analysis to provide insightful findings on United Arab Emirates (UAE)' users behavior towards digital services, through the web analytics of real data captured from government.ae the official portal of the UAE government and the one stop shop for all UAE government information and services. The choice of UAE is justified. The country reached a leading position in the UN eGovernment Survey 2018, in which it is ranked Sixth globally, and first among the Arab countries based on the Online Service Index

Based on the systematic review results and taking into consideration UAE user behavior, the outcome of this research is a set of conclusions and suggestions for boosting digital services public adoption in governments in general with a specific focus on the UAE government.

ملخص

إننا نشهد مؤخرًا تطورا سريعا للحكومات الرقمية التي تعزز قوة البيانات الرقمية في تحويل الخدمات الحكومية إلى خدمات رقمية محسنة. في وقت سابق ، كانت الحكومة الإلكترونية تركز فقط بتقديم الخدمات الحكومية عبر القنوات الإلكترونية. ومع هذه التطورات المتسارعة، تنفق الحكومات مبالغ طائلة على جهود الرقمنة ، ومع ذلك ، لا تزال العديد من الحكومات تواجه نسبا منخفضة لتبني الجمهور للخدمات الرقمية. ويعبر مستوى تبني الجمهور للخدمات الرقمية المقدمة مدى نجاح وكفاءة كل حكومة في عملية التحول الرقمي.

الغرض من هذا البحث هو تحقيق هدفين رئيسيين. أولاً ، إجراء مراجعة منهجية لتجميع نتائج الأبحاث المنشورة المتعلقة بالعوامل المؤثرة على تبني الجمهور للخدمات الرقمية في العديد من البلدان ، حيث تم تحديد 471 مقالة ذات صلة بالموضوع ، منها 131 تم اختيارها في القائمة النهائية ، وتمت الدراسة التفصيلية لـ 28 مقالة بناءً على إستراتيجية البحث.

ثانيًا ، إجراء تحليل تجريبي لتوفير نتائج ثاقبة حول سلوك مستخدمي الإمارات العربية المتحدة تجاه الخدمات الرقمية ، من خلال بيانات تحليلات الويب التي تم التقاطها من بوابة حكومة.امارات ، والتي تعد البوابة الرسمية لحكومة الإمارات العربية المتحدة والنافذة الموحدة للمعلومات والخدمات الحكومية. اختيار دولة الإمارات له ما يبرره. وصلت البلاد إلى مكانة رائدة في استطلاع الأمم المتحدة للحكومة الإلكترونية 2018 ، حيث احتلت المرتبة السادسة عالمياً ، وتصدرت الدول العربية استناداً إلى مؤشر الخدمات الإلكترونية.

استناداً إلى نتائج المراجعة المنهجية مع الأخذ في الإعتبار سلوك مستخدمي الخدمات الرقمية في الإمارات ، فإن نتائج هذا البحث هي مجموعة من الاستنتاجات والاقتراحات لتعزيز تبني الخدمات الرقمية من قبل الجمهور في الحكومات بشكل عام مع التركيز بشكل خاص على الحكومة الرقمية لدولة الإمارات العربية المتحدة

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At the end, I perceive this opportunity as an outstanding milestone in my career, and I would like to make full use of the gained knowledge and skills towards further developments to attain the desired career objectives.

Dedication

I would like to dedicate my dissertation work to my father for his invaluable support and daily prayers, to my lovely son Ahmed who was supporting me in all the hard times with his understanding and encouraging smile, and to my sister Dimah who accompanied me during the whole journey and made it joyful rather than tough.

Special dedication to my soulmate, Hawafreet, who discovered the best out of me, taught me life, and created his better version of me.

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Acronyms

UAE	United Arab Emirates
TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and Use of Technology
TPB	Theory of planned behavior
TRA	Theory of reasoned action
IDT	Innovation diffusion theory
H. H.	His Highness
UN	United Nations
UNESCWA	United Nations Economic and Social Commission for Western Asia
ICT	Information and communication technologies
UNDESA	United Nations Department of Economic and Social Affairs
SDGs	Sustainable Development Goals
e/mServices	Electron and/or Mobile Services
PU	Perceived Usefulness
PEOU	Perceived Ease of Use
UK	United Kingdom
GSB	Government Service Bus
SSO	Single Sign On
GCC	The Gulf Cooperation Council

Introduction

1.1 Overview

Earlier eGovernment was concerned with just providing online services where the latest technologies were the exclusive focus, Digital Government is now introduced, focusing on making full use of digital data, where technology is fully integrated and embedded in government processes.

The adoption of Digital Government Services is still relatively slow in many countries, and the problem is more obvious in developing countries due to infrastructure and transformation barriers. Although several researches in the literature collected usage data in different areas and all reported usage underperforming percentages, but still few researches tackled the factors affecting this phenomenon, (Al-Hujran *et al.*, 2015)(Meftah, Gharleghi and Samadi, 2015).

Gartner, Inc., which is globally recognized as a global research and advisory company that provides insights, advice, and tools for governments states that Digital Governments strategy should not be like the earlier eGovernment strategies which focus only on improving operational efficiency by speeding up business processes while preserving existing service models. In contrast, an effective digital government strategy should make full use of data to achieve the targeted business optimization and improves effectiveness in providing more of user centric services that ensures public adoption, satisfaction and happiness. (Gartner, ID: G00347838, 2018).

United Arab Emirates (UAE), has made a big achievement in the last 5 years, the UAE

government launched the mGovernment initiative in May 2013, with a direction to avail all

government services over the mobile to be accessible 24/7. UAE leadership gave a two years'

time limit for the government to transform all services to e/mServices. In May 2015, the UAE

government announced the transformation of all government services with a percentage of 96.3.

(Government.ae., 2018).

For a successful digital transformation there should be a sustained digital government strategy

that ensures the public adoption of digital services and operations. (Gartner, ID: G00347838,

2018). Hence, Sheikh Mohammed put a new target for UAE government to achieve 80%

adoption percentage for smart services by 2018. (Government.ae., 2018).

This research is aimed to shed the light on a list of suggestions for boosting digital services

public adoption in governments in general with a specific focus on the UAE government.

1.2 Problem Definition

Earlier, eGovernment was defined as the use of information and communication technologies

(ICT), to improve online services in terms of efficiency, cost and quality provided to the public.

Digital Government is about making full use of digital data to provide more efficient,

personalized and user centric digital services. (Rana *et al.*, 2017)

Despite the added values digital services provide to the public, but still the adoption of digital

governments by the public has acceptance problems. (Al-Hujran *et al.*, 2015)(Meftah, Gharleghi

and Samadi, 2015). In addition, the reason behind the acceptance or rejection of the public to any

new information technology (IT) system is a challenge that many researchers tried to solve.(Alhujran, 2009)

Many governments worldwide are still facing the pressing problem of low-level adoption of eGovernment services by citizens (Carter and Bélanger, 2005). Earlier publications used several models to analyze citizen adoption of digital government. In this research, we report on a systematic review of the main factors affecting citizen adoption to digital government services. Our goal is to provide an overview of the research studies and synthesize the findings from existing research on digital government public adoption, in addition, and due to the rapid advancement of the field, we referred not only to academic literature, but also to recent recognized reports specialized in the field.

1.3 Motivations

We are currently witnessing a turning point in the digital world, with a huge amount of data created every day that is extremely different from the data available in the eGovernment earlier, and the rapid growth of emerging technologies. Such turning point might impact public adoption levels. (Gartner, ID G00334525, 2017)

The United Nations (UN) considered the potential of digital innovation in the government as a main driver towards achieving accountability, effectiveness, inclusiveness, openness and trustworthiness of government, which are the main dimensions of the 2030 Agenda for achieving the Sustainable Development Goals, (SDGs), (UN eGovernment Survey, 2018). At the heart of

the 2030 agenda and the seventeen SDGs is the "Leaving No One Behind" notion, which means bridging the gap and allowing higher levels of public adoption.

"Things" such as chatbots, robots, CCTV, fitness monitors, smartwatches, sensors, etc. are data providers of its own, also the huge number of users who collaborate through digital networks and generating huge amount of data, the difference in data is not only concerning quantity, but also quality, structure and source of this. "Things" are starting to be the real providers of government services. According to (Gartner, ID G00334525, 2017), changing the transformation mindset to be data driven rather than focusing on the automation efforts, will facilitate the digital innovation which is revolving around the emerging technologies of Big Data, Artificial Intelligence (AI), Data Science, Blockchain, Robotics, Internet of Things (IoT), Virtual Reality (VR), or Augmented Reality (AR), among others.

This technology advancement, and data-based innovations will result in a more personalized and data centric digital services, and it would be smart enough to conduct a research to highlight the current factors that affects the public adoption for digital services negatively and in addition making a full use of the emerging technologies to enhance the digital services uptake.

Thus, conducting this research at this turning point of time, while focusing on one of the fast evolving countries such as UAE, will highlight the significant factors that might affect citizen adoption to digital services, and will also shed the light on action items that should be taken into consideration while developing or updating the digital agendas and digital strategies with the aim to enhance digital services public adoption.

The researcher who conducted this research is currently working as a senior business analyst in the UAE e-Government for more than 10 years and has the practical experience of developing and implementing several projects as part of the UAE transformation journey towards a fully digital government which will benefit this study.

This research could be useful for three categories of stockholders: 1) Digital Government CIO and domain expert who would like to be up-to-date with factors that might affect digital services adoption, 2) Digital Governments Official/Employee, who is interested in knowing how s/he can make full use of the new trends to ensure effective digitization practices in their organizations, and 3) Private vendor who is interested in understanding the government sector more thoroughly to be able to drive new businesses towards achieving effective digital government implementations.

1.4 Objective of the research

The purpose of this research is to:

- Undertake a systematic review to synthesize the findings from recognized published researches concerning factors affecting citizen adoption of digital government in several countries
- Conduct an empirical analysis to provide insightful findings on United Arab Emirates' users behavior towards digital services, through the web analytics data captured from government.ae, the official portal of the UAE government and the one stop shop for all UAE government information and services.

- Draw a conclusion of a set of suggestions for enhancing the government digitization effectiveness by boosting digital services public adoption in governments in general with a specific focus on the UAE government.

1.5 Research Questions

The research aim can be attained by obtaining answers to the following research questions:

- RQ1: What are the factors that affect digital services adoption?

- RQ2: How to enhance government digital services customer adoption?

- RQ3: What is the effect of emerging technologies on government efficiency?

1.6 Methodology

First, the research includes conducting a literature review to provide a solid background on digital government concepts, the digital government in the Arab region and UAE. Also it gives a background on the models used to assess the factors affecting the acceptance of digital government.

Second, a systematic review will be conducted to answer the aforementioned research questions. Third, follow a quantitative approach by conducting an empirical analysis through a case study on the official portal of the UAE government, i.e. government.ae, to assess citizens' behavior towards the acceptance of digital services. Government.ae web analytics gives a reasonably good indication for UAE citizen behavior towards government digital services; with the aim to provide more efficient future suggestions that can support the digital transformation journey of the UAE Government.

1.7 Dissertation Outline

The chapters of this dissertation are structured as following:

Chapter 1: Introduces the research by giving an overview of the topic, identifying the problem, tackling the research motivations, the research objective and identifying the research questions including the methodology of the research

Chapter 2: Presents a general background on governments digital transformation and the factors affecting digital services adoption, including the models used to assess the public acceptance towards digital services.

Chapter 3: Describes the systematic review approach we used to select and review the articles we used in our research, also it shows the results of the systematic review according to the review strategy

Chapter 4: In this chapter, the case study shows an empirical analysis on users' behaviors towards UAE digital services conducted on government.ae

Chapter 5: This chapter discusses research outcome in extensive details

Chapter 6: This chapter represents the conclusion reached, the limitations of the research conducted and the outcome recommendations, moreover, the expected future work is highlighted

2 Chapter Two:
Literature Review

2.1 Overview

This literature review is aimed to cover a comprehensive background about this research topic, which is public adoption towards digital services. First, some concepts is initially defined, such as the eGovernment, the mGovernment, and the digital government. Then, it highlights the current situation of the digital government in the Arab region, including the UAE and the challenges concerning the public adoption. Next, it goes into more details of the public adoption concept. Finally, it describes in details the models used to assess the level of public acceptance towards adopting the digital government.

2.2 Digital transformation

Digital transformation is the efforts needed to transform the provided government services to be user-driven, where users are part of the digital services creation process. Public co-creation of services ensures that the public demands and needs are met, and the created services are user centric. Transforming towards a Digital Government required an intermediate period of eGovernment and mGovernment.

2.2.1   e-Government
eGovernments make greater use of digital technologies, particularly the Internet, to achieve better government

The United Nations Division for Public Economics and Public Administration (UNDPEPA) defines eGovernment as "Utilizing the Internet and the World Wide Web for delivering government information and services to citizens". (Publicadministration.un.org, 2018)

eGovernment is also defined as "The use of information and communication technologies (ICT), to improve online services in terms of efficiency, cost and quality provided to the public. (Rana et al., 2017).

An updated definition is: "The use of ICT tools and applications to enhance government transparency and accountability in public administration by improving public services delivery, access to information and services and public governance" (Alomari, 2018)

2.2.2 m-Government

mGovernment, also known as smart government and mobile Government, is defined as "… a new delivery channel for governments to provide timely information and services ubiquitously to residents, businesses and other government departments through mobile devices." (Alomari, 2018).

2.2.3 Digital Government

Digital Government is about making full use of digital data to provide more efficient, personalized and user centric digital services. (Rana et al., 2017)

Gartner defines digital government as "Governments designed and operated to take advantage of digital data in optimizing, transforming and creating government services".

We are now witnessing the booming transition towards digital government which is a long process that must take into consideration the innovation and emerging technology as the building blocks for a successful digital government transformation.

2.2.3.1 Digital Government Maturity

Digital government maturity focuses on using data effectively and innovatively to redesign and deliver government services.

Gartner introduced a Digital Government Maturity Model that can help to manage the progress and plan for the digital government transformation programs also can help to easily communicate the real digitization image to decision makers specially when it comes to prioritizing projects or planning budgets.

Gartner Digital Government Maturity Model consists of 5 levels: Initial, Developing, Defined, Managed, and Optimizing.

Each maturity level is assessed across seven dimensions that are represented by a critical capability as per figure 1.

Maturity Level	E-Government 01 Initial	Open 02 Developing	Data-Centric 03 Defined	Fully Digital 04 Managed	Smart 05 Optimizing
Value Focus	Compliance	Transparency	Constituent Value	Insight-Driven Transformation	Sustainability
Service Model	Reactive	Intermediated	Proactive	Embedded	Predictive
Platform	IT-Centric	Customer-Centric	Data-Centric	Thing-Centric	Ecosystem-Centric
Ecosystem	Government-Centric	Service Co-creation	Aware	Engaged	Evolving
Leadership	Technology	Data	Business	Information	Innovation
Technology Focus	SOA	API Management	Open Any Data	Modularity	Intelligence
Key Metrics	% Services Online	No. of Open Datasets	% Improvement in Outcomes, KPIs	% New and Retired Services	No. of New Service Delivery Models

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Figure 1 Gartner's Digital Government Maturity Model

The United Nations, (UN) launched their digital government framework in their preparations to
conduct their bi-yearly eGovernment Survey for 193-member states worldwide
The framework is based on the Sustainable Development Goals (SDGs), and covers several
Domains and Themes with the aim to be user centric and enhance public adoption to government
digital services

Figure 2 United Nations Digital Government Framework

2.3 Digital transformation in the Arab Region

Early in the year 2000, Arab countries stepped their first steps towards offering eGovernment
information and services to the public. In 2001 the UN started their eGovernment readiness
evaluation activities by conducting the first Benchmarking for 193-member states worldwide,
their 2001edition of the report highlighted that none of the Arab region countries had a single
one stop shop for the online government services. In addition, the scores of the Arab countries in

complying with the eGovernment readiness criteria was very low, on top of the list came the

United Arab Emirates with relatively low score.

2001 Global E-gov Leaders	
USA	3.11
Australia	2.60
New Zealand	2.59
Singapore	2.58
Norway	2.55
Canada	2.52
UK	2.52
Netherlands	2.51
Denmark	2.47
Germany	2.46

Index – Middle East

Country	Index
United Arab Emirs	2.17
Kuwait	2.12
Bahrain	2.04
Lebanon	2.00
Saudi Arabia	1.86
Qatar	1.81
REGIONAL INDEX	1.76
Jordan	1.75
Egypt	1.73
Oman	1.64
Libya	1.57
Morocco	1.47
Tunisia	1.36
Yemen	1.30
Algeria	1.27

Figure 3 UN eGovernment Survey Global leaders & Arab region sample results in 2001

The UN eGovernment Survey is launched every two years, and the latest version is 2018 edition

which was launched in July 2018

Source: ITU
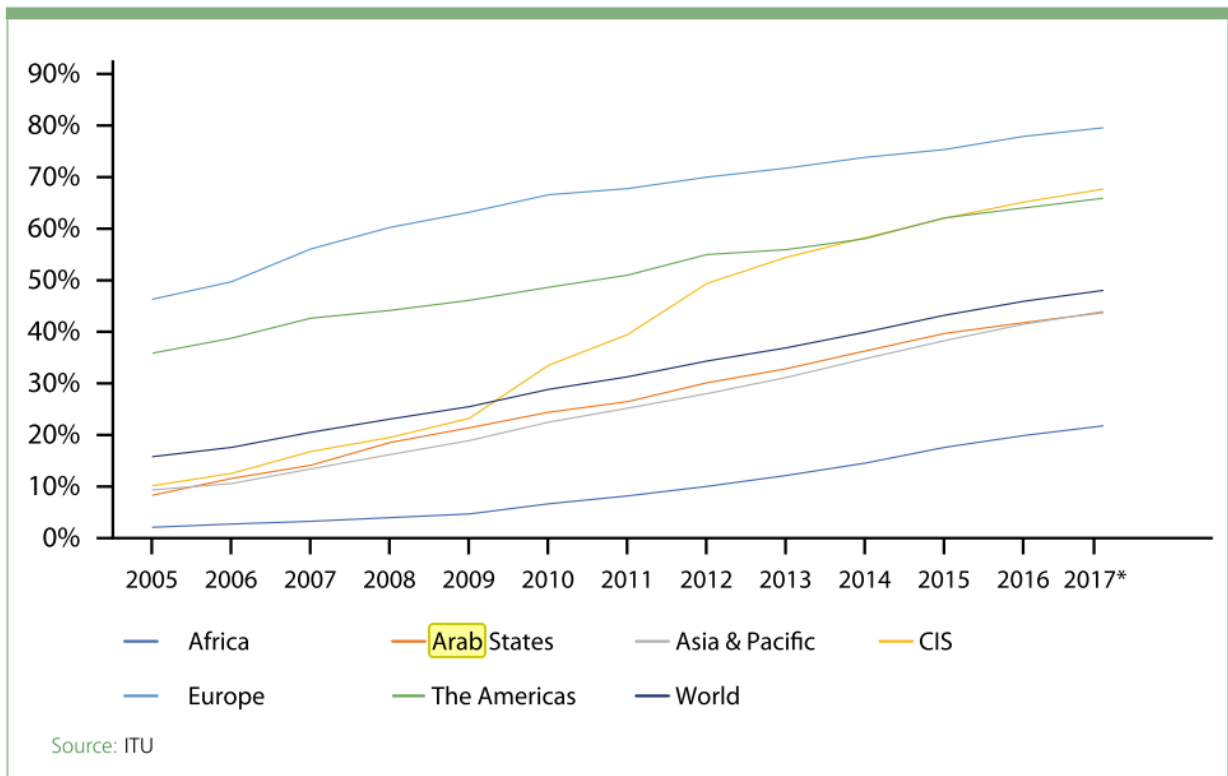
Figure 4 Individuals using the Internet - UN eGovernment Survey 2018

2018 edition of the UN report shows that individuals using the internet is increasing everywhere including the Arab world. Though, it shows that the percentage in the Arab world is relatively less than other regions.

As per 2018 edition of the UN report, although many Arab countries are still struggling to reach the leaders list in the UN eGovernment Survey, but several Arab countries have made it to the leaders list. on top of all Arab countries, by reaching the sixth position globally in the smart online services index and the second in the Telecommunication Infrastructure Index (TII).
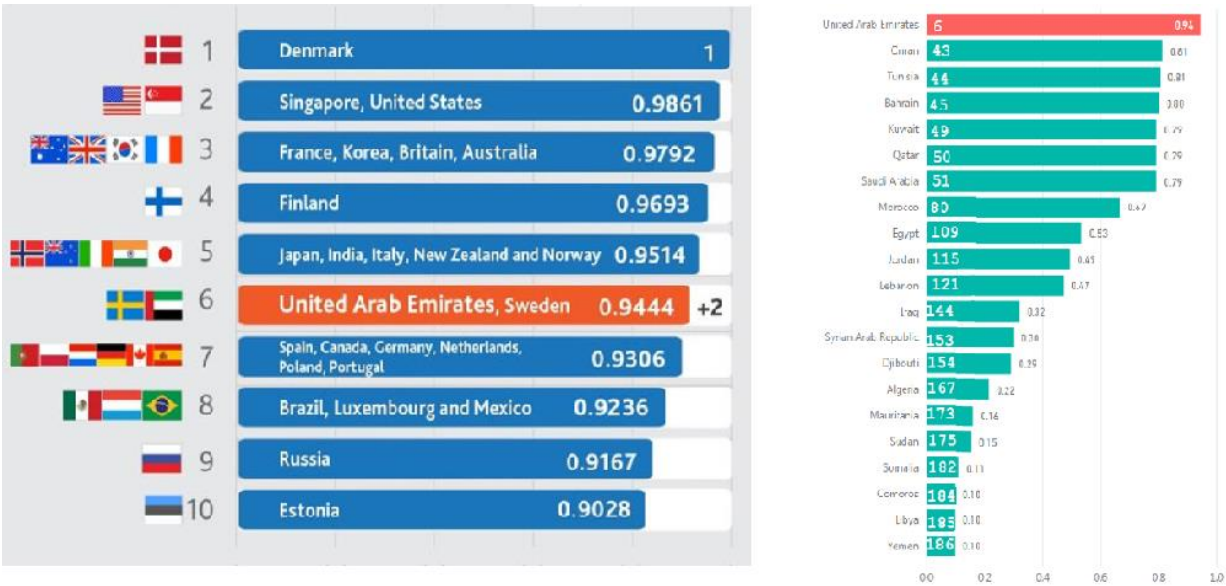
Figure 5: UN eGovernment Survey Global leaders & Arab region sample results in 2018

According to the Survey, the UAE is in the same rank as of Sweden, outpacing Spain, Canada, Germany, the Netherlands, Estonia, Portugal and Russia in the Online Services Index. At the regional level, the UAE has reached the topmost position in the Gulf, Arab and West Asia.

The UAE achieved this after five years of launching the smart government initiatives, when he gathered more than 1000 federal government officials and directed them to transform all government services on smart devices and gave a deadline of 24 months for implementation.

eGovernment is one of the most important Action Lines of the World Summit on Information Society (WSIS). The United Nations Economic and Social Commission for Western Asia (ESCWA), managed to create a matrix that relate the WSIS action lines and the Sustainable Development Goals (SDGs). (Itu.int., 2018)

SUSTAINABLE DEVELOPMENT GOALS \ WSIS ACTION LINES LINKAGES

	C1	C2	C3	C4	C5	C6	e-gov	e-bus	e-lea	e-hea	e-emp	e-env	e-agr	e-sci	C8	C9	C10	C11
SDG 1																		
SDG 2																		
SDG 3																		
SDG 4																		
SDG 5																		
SDG 6																		
SDG 7																		
SDG 8																		
SDG 9																		
SDG 10																		
SDG 11																		
SDG 12																		
SDG 13																		
SDG 14																		
SDG 15																		
SDG 16																		
SDG 17																		

Figure 6: Linking WSIS Action Lines with Sustainable Development Goals

During 2017, ESCWA launched a report on Smart Government Digital Transformation and provided a preliminary vision on the way the Arab region can accelerate the transformation process in seven main areas by 2030, which included Bridging Divide, Digital Strategies, Infrastructure, Cybersecurity, ICT Sector, e-Government and e-Applications.

2.4 Challenges of digital transformation and public adoption

Despite of the outstanding progress in digital transformation, there are still many challenges that

governments are facing throughout their digital transformation journey. We are going to discuss

those challenges in the rest of this section.

2.4.1   Digital divide

At early stages, "digital divide" was known to be the lack of access to the Internet connectivity

or the hardware, such as computers, phone, and mobile devices. Nowadays, after the technology

progress, access capability has improved, and was enhanced to accommodate the smart devices

and mobile phones.

Nowadays we are facing new sorts of digital divides, new divides includes the quality of

connectivity and devices, also the digital literacy where some people are not well educated to use

those devices. (Nations, 2018)

May

Divide	Description
Access	It starts with access or the lack thereof: although Internet penetration has increased, it continues to be a key barrier as more people globally remain offline rather than online
Affordability	The gap between rich and poor affects affordability of ICTs and serves as an important difference in adoption within countries as much as between them
Age	Older people are generally using ICTs to a lesser extent than younger populations, despite the notion that they could benefit from online social and health services
Bandwidth	International bandwidth and the capacity to transmit and receive information over networks varies greatly between countries but also within them, limiting potential useful endeavours
Content	Relevant content in local language(s) is important to stimulate adoption
Disability	Those with disabilities face additional hurdles to use ICTs if websites are not compliant with web accessibility guidelines
Education	Like social divides, education and literacy rates are fundamental challenges to bridge digital divides
Gender	There is a small but persistent difference in online usage between men and women
Migration	Migrants may not possess the same levels of digital skills as the population in their new country and if they do, may be subject to content and language divides
Location	Rural and remote areas are often at a disadvantage in terms of speed and quality of services as compared to their urban counterparts
Mobile	Mobile devices provide opportunities to bridge the access gap but can also introduce new forms of divides in terms of technology, speed and usage
Speed	The gap between basic and broadband access is creating a new divide as speed is important to reap the full benefits of a digital society
Useful usage	What people do with their access is a key difference in whether users take full advantage of ICTs, such as e-government services

Note: The above table is intended to be illustrative and not exhaustive

Figure 7 : A selection of newly emerging digital divides – UN eGovernment Survey 2018

2.4.2 A perceived lack of benefit

Low levels of public adoption come also from the lack of perceived value. The 2013 edition of

the report published by National Telecommunications and Information Administration in the

United States, stated that almost half of the public users who are reluctant to use online services

or the internet in general say that they are just not interested. Another more recent report done in

Brazil reveals that 60% of the public show low interest of skills to access online services.

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China is another example, where farmers are facing language issues for instructions on using online services, the same problem arises in India, where the country has more than 26 different languages, availing online content that covers this big number of languages is a serious challenge (Nations, 2018).

Figure 8 shows the relation between the percentage of online users in English to the percentage of available English content
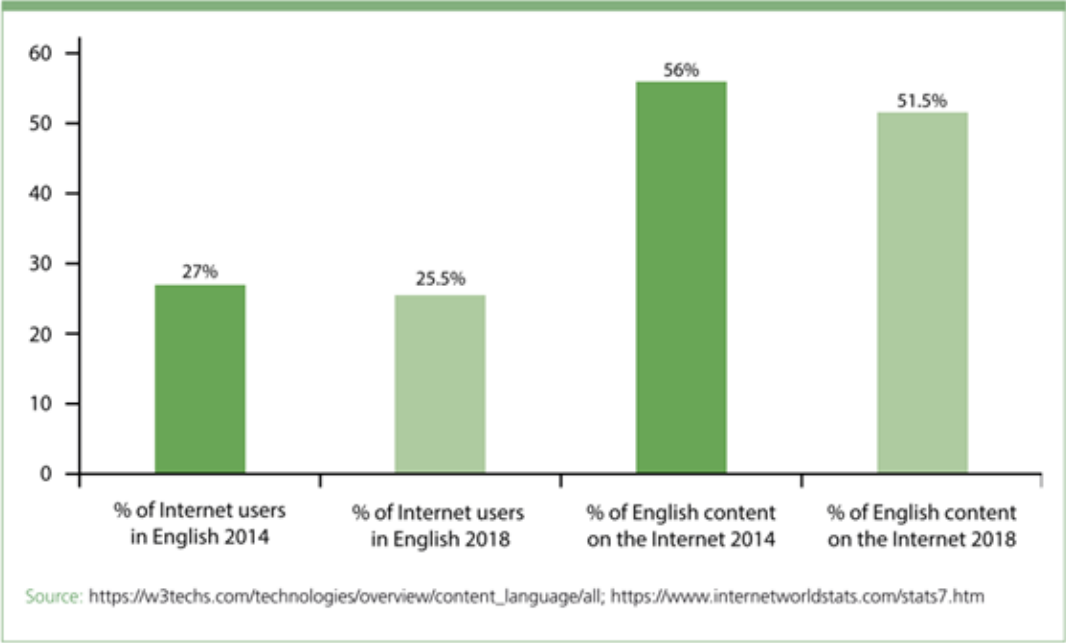
Figure 8 English language dominance – UN eGovernment Survey 2018

2.5 Digital transformation in the UAE

The UAE launched the Smart Government initiative with the aim of availing government services to people 24/7 and wherever they are. The objective was to provide the public with a virtual and smart customer service centers into their mobile device, based on the belief that public adoption will increase when the government is more proactive and reaches the public wherever they are without any initiation from the public side.

The UAE mGovernment initiative came to take part in achieving the UAE Vision 2021 that foresees high quality of life built on world-class public infrastructure, government services and a rich recreational environment.

2.5.1 UAE mGovernment initiative

A list of projects was introduced to support the smart transformation in the UAE, all of them were also meant to encourage the public to believe in the government and use the digital services:

2.5.1.1 Federal Network (FedNet)

The Federal Network (FedNet) is a network that connects the information systems on a national level, currently 42 federal entities are already connected, also a secure line is connecting the federal network with the local network in the 7 emirates of the UAE. FedNet ensures security, efficiency and high-speed internet services. It ensures reliable and secure exchange of data while providing efficiency, quality and security through electronic channels. (Government.ae, 2018).

2.5.1.2 Centre of Digital Innovation (CoDI)

The Centre of Digital Innovation (CoDI) was created with the aim to provide UAE government entities with services that support their mobile application development process. To achieve this, CoDI signed a service level agreement with major names such as Apple, Blackberry, Android and Microsoft to help government entities with a shared service that provide cutting-edge technologies and best practices.

CoDI services included consultations, trainings, mobile applications testing and an Idea creation and Innovation Center. CoDI extended its services provisioning to accommodate not only UAE government entities, but also educational institutions and even the private sector within the GCC (Government.ae, 2018).

2.5.1.3 UAE Government App Store

The UAE Government Apps is a mobile application that serves an app store for all the UAE government mobile applications; currently over 100 UAE official government application is included in this app, and it is available on both Apple Store and Google Play. The App Store provides cognitive services where it provides personalized features and services based on the user's location. The UAE Government App Store is a one of the quick wins of the UAE Mobile Government Initiative and it was the reason behind positioning the UAE to be the first country to launch its official government app store to the public (Government.ae, 2018).

2.5.1.4 One App

One App is an application that hosts more than 4000 federal and local UAE government services. The one app works on intuitive basis and is personalized to provide services and notifications based on user preferences. (Government.ae, 2018).

2.5.1.5 The National CRM

A smart government cannot do without a National Customer Relations Management (CRM), a unified call center for all UAE Government services. It provides several services to the public, including citizens, residents and visitors. The National CRM complements the other channels for public communication with the UAE Government. (Government.ae, 2018).

2.5.1.6 SmartPass

Single Sign On is mandatory for a smart government implementation, SmartPass is UAE SSO solution through which the public can access all UAE government informationand services through one username and password. Each individual can use his UAE national ID to get a unique identification number to facilitate easy access to all electronic transactions on a national level with the federal and local entities in a secure manner. SmartPass was also integrated to special kiosks available at public places allover UAE. (Government.ae, 2018).

The Government Service Bus (GSB), is a UAE national level centralized interconnectivity platform for all digital Government services. It unifies and facilitates the procedures needed to access eServices. In addition, the GSB improves the efficiency and quality of integration of government services while ensuring high security measures. (Government.ae, 2018).

2.6 Models for technology adoption

2.6.1 Innovation diffusion theory (IDT)

Innovation diffusion theory (IDT) was originally used in sociology, education, anthropology, communication; and marketing, then it was introduced to the technology innovation field. According to (Rogers, 2002), IDT is meant to address user adoption of new innovation technologies.

The author also introduced the following definition to diffusion and innovation:

- Diffusion: "the process by which an innovation is communicated through certain channels over time among the members of social systems".
- Innovation: "an idea, practice, or object that is perceived as new by an individual or another unit of adoption".

(Rogers, 2002) elaborated on the need for any innovation adopters to learn about the innovation before they start using it. This learning process is called "the adoption process" (Wani and Ali, 2015)

The adoption Process consists of five steps:

1. Awareness / Knowledge: the individual starts to know about the existence of a new idea but still no complete information about it.

2. Interest / Persuasion: the individual starts to get involved with the new idea and he searches for more information about it.

3. Evaluation / Decision: the individual decides if he will try the new innovation or not.

4. Trial / Implementation: the individual here tests the new innovation on a small scale just to determine if it is value to him.

5. Adoption / Confirmation: the final step to decide if he is willing to confirm accepting the innovation or not.
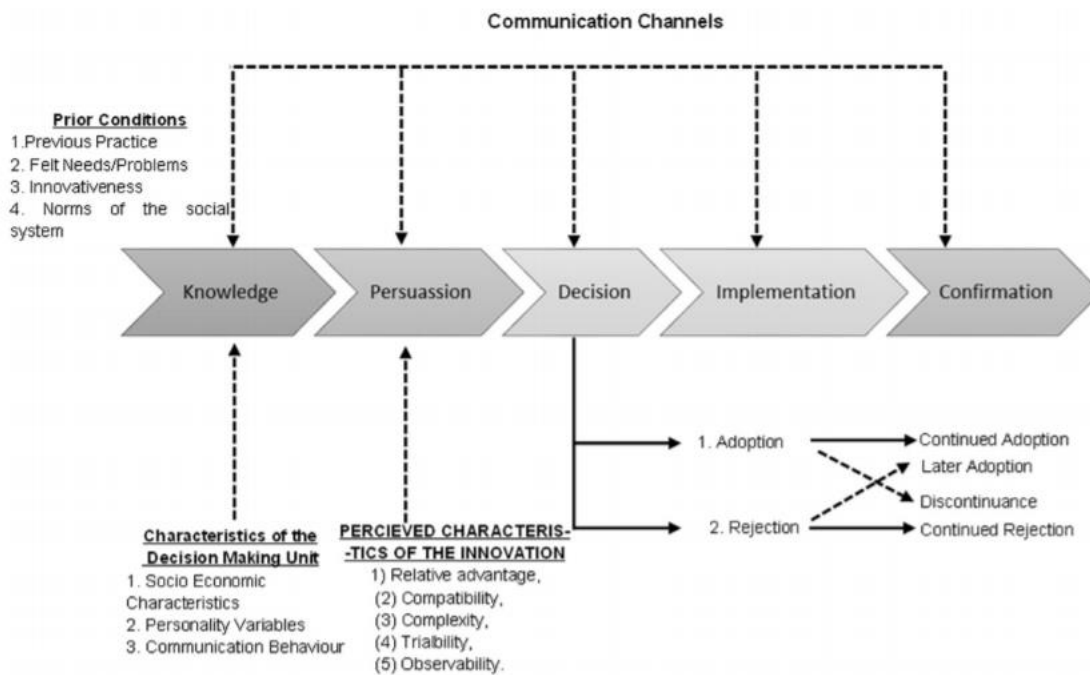
Figure 3. A Model of Five Stages in the Innovation-Decision Process (Source: Diffusion of Innovations, Third Edition by Everett M. Rogers, 1983, Pg-165)

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Figure 9 : Innovation Decision Process

The individual's decision on whether to use an innovation according to Rogers (1995) is affected by innovation's relative advantage; compatibility; complexity; trialability and observability. (Rogers, 2002) defined those attributes as follows:

- Relative advantage: to what extent an innovation is confirmed to be better than its predecessor.

- Compatibility: to what extent an innovation is confirmed to be consistent with past experiences, and needs, of possible adopters.

- Complexity: to what extent an innovation is perceived as difficult to use and understand

- Trialability: to what extent an individual can test the innovation before use.

- Observability: to what extent the result of an innovation is visible to others.

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2.6.2   Theory of reasoned action (TRA)

The theory of reasoned action (TRA) is one of the most well-known models which were deployed successfully to explain public behavior towards using technology across a number of settings. TRA states that, as per the below figure, an individual's behavior can be predicted based on his behavioral intention which, is determined by the person's attitudes and subjective norm (Alhujran, 2009).

(Ajzen & Fishbein, 1977) as shown in *Figure 4.1.*
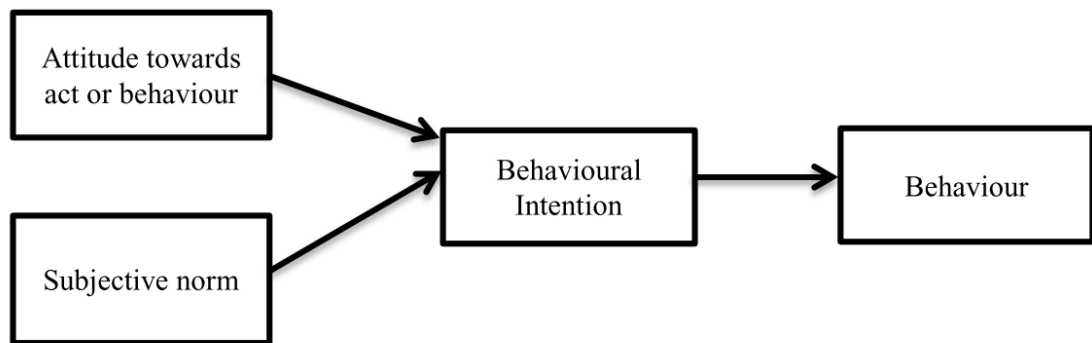
Figure 4.1: Theory of Reasoned Action (TRA) .(*Source: Ajzen and Fishbein,1980*)

Figure 10: Theory of reasoned action (TRA)

Behavioral intention can be defined as the willingness of an individual's intention to perform a certain behavior

Subjective norm is defined as the expectation of the others reaction towards the behavior.

In other words, if an individual believes that other people who are of interest to his will react positively towards certain action he will do it. While if he beliefs that those important people will react negatively most probably he will not proceed with the action.

2.6.3   Theory of planned behavior (TPB)

To overcome the limitation of TRA, the TRA was extended by adding another perception which is the perceived behavioral control (PBC). This version of the extended model of TRA is called the theory of planned behavior (TPB). TPB is marked as one of the best influential models in predicting and behavior(Khalil and Nadi, 2012).

Several researches applied TPB to various domains, and confirmed the TPB ability to provide effective prediction of the acceptance of new information technology (Khalil and Nadi, 2012).

Theory of planned behaviour (adapted from Ajzen, 1991, p. 182).
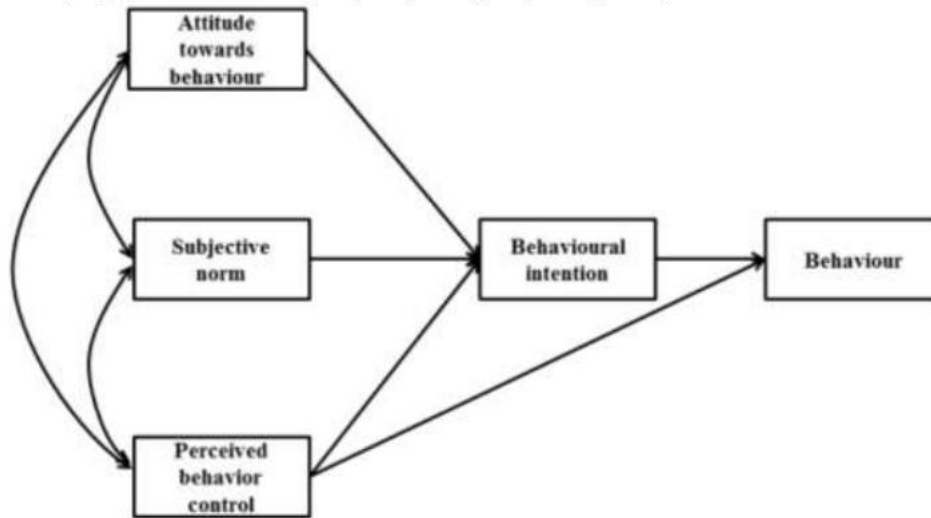
Figure 11: Theory of planned behavior

The new construct PBC was defined as the "perception of ease or difficulty of performing the

behavior of interest"(Alhujran, 2009)

According to TPB, public behaviors are affected by the public intentions to perform the

behavior, and public intentions are affected by attitudes towards behavior, subjective norms, and

perceived behavioral control.

As per the above figure, the second version of TPB, Ajzen and Madden (1986) discussed the

possibility that perceived behavioral control can directly affect the performed behavior.

(Alhujran, 2009)

2.6.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) in Figure 12 consists of

eight technology acceptance models:

1   The theory of reasoned action

2   The technology acceptance model

3   The motivational model

4   The theory of planned behavior

5   A model combining the theory of planned behavior and the technology acceptance model

6   The model of PC utilization

7   The innovation diffusion theory

8   The social cognitive theory.

In (Venkatesh et al., 2016), the authors discussed that UTAUT can provide a mechanism for managers to assess the possibility of new technology adoption in an organizational.

UTAUT (adapted from Venkatesh, et al., 2003).
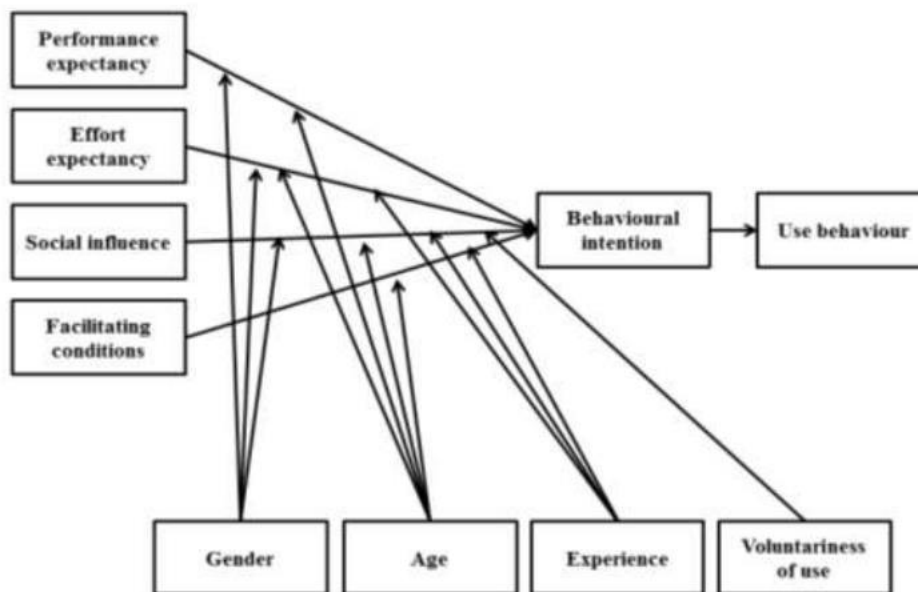
Figure 12: Unified Theory of Acceptance and Use of Technology (UTAUT)

According to UTAUT, the core determinants of users' acceptance and usage behavior are:

- Performance expectancy: "the degree to which an individual believes that using the system will help him or her to attain gains in job performance"

- Effort expectancy: "the degree of ease associated with the use of the system"

- Social influence: "the degree to which an individual perceives that important others believe he or she should use the new system"

25

- Facilitating conditions: "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system"

UTAUT implies that gender, prior experience, age, and voluntariness manage the correlation in the model. (Alhujran, 2009)

2.6.5   Technology acceptance model (TAM)

TAM is an adaptation and technology- oriented contextualization of the social psychological TRA (Khalil and Nadi, 2012). The majority of the researches on TAM have been conducted on organization employees' perceptions of technology, not on the perceptions of the public, which are the main focus of this research.

TAM model (adapted from Davis, 1986, 1989).
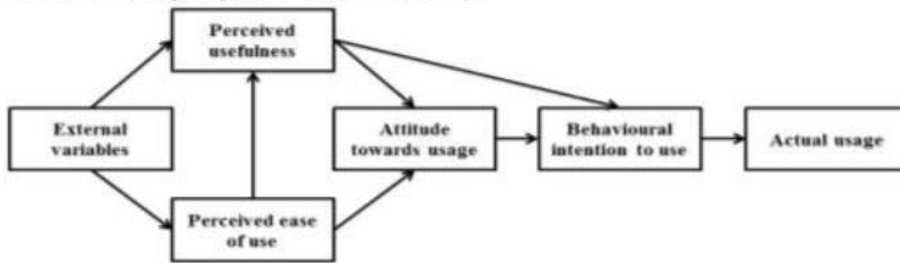
Figure 13: Technology Acceptance Model (TAM)

 Some researchers argued that TAM failed to provide valuable information on users' feedback on a system. Others criticized that TAM should've incorporated the social and organizational factors which are known to be on top of the factors for determining technology acceptance.

3 Chapter Three:
Systematic Review

3.1 Planning the review

The systematic review is an integral component in our research methodology. It starts by introducing a simple protocol, which includes several components such as research questions, the search strategy, and also the inclusion-exclusion criteria for the publications to be surveyed.

The ultimate objective of this systematic review is to identify the main factors affecting public digital services adoption, shed the light on ways to enhance the public adoption of the digital government, and study the impact of emerging technologies on public digital services adoption. The following sections are structured as follows. Section 3.2, describes the systematic review approach used to select and review the articles we used in our research. Section 3.3 shows the results of the systematic review to answer our research questions. Section 3.4, summarizes the conclusions based on the outcome of this systematic review.

3.2 Identification of research

Systematic review has a major advantage over any other research methodology. The systematic review helps in reaching unbiased conclusions with evidences, which distinguishes systematic reviews from traditional ones.

The first step is deciding on the search keywords. Generic search terms were used to identify as many related articles as possible. Table 1 shows the list of the used search keywords

Digital government	Government digital/ e/ m/ mobile services adoption
Smart Government	Customer/citizen adoption
Mobile Government	Digital transformation
Electronic Government	Service Innovation
eGovernment / e-Government / e-gov/ egov	Emerging technologies
Government digital services	usage
Online government	Automation

Table 1: Search Keywords

Then the next step is to decide on the search target database, in this research, "Google scholar" database is used as the main source of publications. In addition, and due to the nature of this research, and the rapid changes in the field of digital government, Gartner database was included, where it always contains up-to-date articles being the world's leading ICT research and advisory company. Another database was also used which is the United Nations Department of Economic and Social Affairs, "UNDESA", publications, specially the "UN eGovernment Survey" Reports.

Taking into consideration that the ICT sector fast advancements, another search criterion was to focus on articles published in the year 2010 onwards, while giving more focus to most recent ones, especially in the adoption part, however some definitions were researched on older publications for more robustness.

The initial research based on the above keywords resulted in 471 relevant articles.

3.3 Selection of primary studies

After the 471 articles have been selected, it was all skimmed with the aim of removing duplicate articles and non-relevant ones, this process resulted in 131 articles.

Then the shortlisted 131 articles were again scanned once more in more details, while applying the following inclusion and exclusion criteria:

- Include, highlight and prioritize articles that are:
  - Empirical in nature.
  - Identified the models used
  - Included a systematic review on the same topic.

- o Conducted meta-analysis.

- Exclude if the article is obviously not focusing on Citizen Adoption for Government Services.

- Exclude if the article is targeting services uptake in general and not targeting digital government services in specific.

- Exclude if the article is not analyzing the factors from the customer/citizen perspective.

After applying the above inclusion/exclusion criteria on the 131 articles, several articles are excluded, which left up with a final short list of 28 articles.

3.4 Synthesis

In each of the 28 articles, the main analyzed concepts and models were extracted, also the main findings, conclusions and results. All were used to find answers to the identified research questions.

3.5 Results

3.5.1 Factors Affecting digital services adoption

Table 2 demonstrates the main concepts on the factors that affect digital services adoption and findings from relevant shortlisted

articles. It answers the following research question:

1. RQ1: What are the factors that affect digital services adoption?

Concept	Used Model	Main Finding	Reference
Perceived Ease of Use (PEOU) Perceived Public Value (PPV) Attitude (ATT) Behavioral Intention (BI) Trust Culture: Uncertainty avoidance	An updated version of TAM	Perceived public value and attitude were significant predictors of public intentions towards using digital services. There is a positive significance of the perceived ease of use and public attitude toward using digital government. Another positive correlation between trust and perceived public value and perceived ease of use. Uncertainty avoidance is a cultural dimension that was confirmed to have a significant positive impact on perceived ease of use and perceived public value. Other culture dimensions such as power distance, individualism, masculinity, and long-term orientation, were confirmed to have no impact on public intentions.	(Alhujran, 2016)
Attitude (ATT) Perceived usefulness Perceived ease of use Trust Interactivity External influence Interpersonal influence	TPB	• Hung et al. (2013) discovered that the public intention to use digital government services is mostly affected by their attitude toward using these services. • Ease of use, usefulness, trust, and interactivity significantly affect attitude.	Hung et al. (2013)

Self-efficacy Facilitating conditions		• External influence and interpersonal influence significantly influence subjective norm. • Self-efficacy and facilitating condition significantly influence behavioral control.	
Perceived usefulness (PU) Perceived ease of use (PEOU) Computer self-efficacy Continuance intention to use	TAM	• TAM results confirmed that perceived usefulness and perceived ease of use of eGovernment Services has direct impact on the public continuance intention to use the electronic government services • The strongest factor affecting public continuance intention to use eGovernment services was the Perceived usefulness • Public computer self-efficacy has significant positive correlation with the continuance intention to use eGovernment services but it was surprising that it is not correlated with the Perceived ease of use (PEOU)	(Wangpipatwong, Chutimaskul and Papasratorn, 2008)
Facilitating conditions Peer Influence Performance expectancy Effort expectancy Behavioral intention Use Behavior	UTAUT	• The outcome of applying the UTAUT model showed that digital services adoption by the public is significantly affected by facilitating conditions, peer influence, performance expectancy.	(Morris, 2008)
Relative advantage Compatibility Image Complexity Perceived usefulness (PU) Perceived ease of use (PEOU) Trustworthiness Intention to use	TAM DOI Trust Literature	• Public perceptions of Perceived usefulness (PU) and Perceived ease of use (PEOU) were significant predictors of public behavioral intention to use digital government services. • Trustworthiness directly affects public behavioral intention to use digital government services. • Compatibility is confirmed to be a significant determinant of public behavioral intention to use digital government services.	(Bélanger and Carter, 2005)

		• Relative advantage and image were not confirmed to be significant determinant on public behavioral intention.	
Perceived ease of use (PEOU) Perceived usefulness (PU) Intention to use Compatibility Perceived risk Technology facilitating conditions Resource facilitating conditions Self-efficacy	TAM TPB	• PU was the strongest factor that influencing taxpayers' intention to use a particular tax-filing method. • Perceived risk and the independent variables in the TPB model (subjective norm, self-efficacy, resource facilitating conditions, and technology facilitating conditions) were not significant determinants of an intention • Perceived ease of use was a significant determinant of Perceived usefulness. • Compatibility was a significant predictor of Perceived usefulness and Perceived ease of use.	(Fu, Farn and Chao, 2006)
Institution-based trust (associated with public organization) Characteristic-based trust (associated with personal characteristics) Disposition to Trust Perceived risk Intention to use	TRA Trust Literature	• Disposition to trust is correlated to Institution-based and Characteristic-based trust. • Institution-based trust and Characteristic-based trust are correlated with the intention to use. • Perceived risk significantly influences intention to use. • Characteristic-based trust negatively influence perceived risk. • Institution-based trust had no impact on perceived risk	(Carter and Bélanger, 2005)
PU PEOU Attitude Intention to use Information system quality (ISQ) Information quality (IQ) Perceived	TAM	• TAM proves perceived usefulness (PU) and perceived ease of use (PEOU) to be significant determinants while PU has created more impact than PEOU on the public intention to use the system.	(Chang and Hung, 2005)

		• information system quality (ISQ), information quality (IQ), as well as perceived credibility (PC) has positive impact on PU • IQ positively impacts PEOU.	
Public Trust Privacy Data protection Security	A newly introduced model based on TAM, TRA, and TPB	• (Akkaya et al., 2011) studied the factors impacting public adoption in Germany and concluded that data protection, privacy and security are the top influencers.	(Akkaya et al., 2011)
Relative advantage Trustworthiness of eGovernment	DOI Trust	(Carter, 2008) assured that the Relative advantage and Trustworthiness of eGovernment are significant factors for the success eGovernment public adoption.	(Carter, 2008)
Trust factors Perceived ease of use Perceived usefulness User Skills	TAM TBP	Trust, perceived behavioral control and attitudes were confirmed to be significant to the intention to use an e-Government service.	(Ozkan & Kanat, 2011)
Digital Divide (lack of inclusiveness) Age – Gender – ICT literacy		(Ghalandari, 2012) concluded that age and gender did not impact behavioural intention for public eService adoption.	(Ghalandari, 2012)
Social exclusion - Social influence (lack of inclusiveness and openness)		(Ghalandari, 2012) concluded that social influence did not impact behavioural intention for public eService adoption.	(Ghalandari, 2012)
Digital First (lack of inclusiveness)		Governments are now promoting the "Digital First" and "Digital by Default" approaches, which means initially designing the service from the very beginning for online	(UN eGovernment Survey, 2018)

		use. This eventually will increase adoption of online services. But will isolate people who has a digital divide due to lack of access or lack of skills	
Service Quality (Lack of effectiveness)		(Akkaya et al., 2011) studied the factors impacting public adoption in Germany and concluded that reliability of systems and completeness of information are affecting users adoption.	(Akkaya et al., 2011)
Service Usefulness, Ease of Use, User Experience (Lack of effectiveness)		(Ghalandari, 2012) reported positive correlation to effort expectancy, performance expectations, facilitating conditions, and internet experience.	(Ghalandari, 2012)
Customer Satisfaction - Public Adoption		(Alhujran, 2016) survey proven that public value is on top of the significant factors affecting public adoption of eServices..	(Alhujran, 2016)

Table 2 Concepts and main findings for Q1

3.5.2 Enhance government digital services customer adoption

Table 3 demonstrates how to enhance government digital services customer adoption and

answers the following research questions:

RQ2: How to enhance government digital services customer adoption?

Concept	Main Finding	Reference
User-centricity	The eGovernment strategy in Jordan states that one of the major success factor for an eGovernment implementation is the effective participation by different stakeholders, including citizens. To ensure a user centric government	(Alomari, Woods and Sandhu, 2012)
Crowd-sourcing / Public Engagement	The success of the smart government entails active public engagement of two sides, the government and the public. Still many researchers realized the direct benefits of open government and open data like: better efficiency, unified processes, crowd sourcing of feedback, better citizens participation, standardized operations, improved operations, and more satisfied citizens	(Thunibat et al., 2011) (Abu-Shanab, 2015)
Cyber Security	The Public expect that digital services are safe and secure, and they also assume that their privacy is protected. privacy and keen handling of private information that is shared with government entities is crucial to successful eGovernment implementation.	(Waller and Genius, 2015)
	The digital government came with powerful capabilities, it also came with more outstanding threats that should be taken into consideration to consider the cyber security while dealing with this massive amount of personal data which is created and shared, in addition to protecting the identities of both individuals and organizations.	(UN eGovernment Survey, 2018)
Emerging technologies	Using the newly emerging technologies such as big data which can improve decision making and Artificial intelligence which can help analyze large amounts of data, to support the government to provide more user-friendly services.	(UN eGovernment Survey, 2018)
whole-of-government	Adopting whole-of-government approaches across public, private sectors along with the civil society,	(UN eGovernment

	as well as facilitating partnerships with external stakeholders with non-government actors, will provide more tailored services to the needs of users	Survey, 2018)
	Digital transformation should incorporate the whole of government approach, and ensure, in addition to ICT, the availability of an organizational integration plan. This will overcome risks, design challenges and failures to achieve customer adoption.	(Sun, Ku and Shih, 2015)
Leaving no one behind	Governments should still invest in service centers and one-stop-shops where an employee can help users who are digitally illiterate or have no online access in applying for online services. Governments should involve women, elders, kids and the poorest including the most vulnerable people in decision-making.	(UN eGovernment Survey, 2018)
Transparency	Open Government Data (OGD) is the main actor for achieving transparency, OGD implies that government information is disclosed and is online by default for the public to access, without restriction. OGD helps strengthen the relation between the public, the government, and the other stakeholders. Digital governments should proactively open government owned data in accordance to the expectations of the public. This is what we call it transparency. ICTs are the ultimate tool for achieving transparency in a cost-effective manner	(UN eGovernment Survey, 2018) (Bonsón, Royo and Ratkai, 2015)
Innovation	Some of the major digital technology trends fueling innovation and growth in both the private and public sectors are mainly related to digital, analytics, cloud, core modernization, and the changing role of information and communications technologies overall. Social and mobile technologies, open data initiatives, and Internet of Things (IoT) also play an important role in transforming government efforts. Governments are now beginning to focus on the larger and more holistic task of service innovation in order to provide more productive and better services for better adoption rates.	(UN eGovernment Survey, 2018) (Sun, Ku and Shih, 2015)

Table 3: Concepts and main findings for Q2

3.5.3 The effect of emerging technologies on government efficiency

Table 4 demonstrates the effect of emerging technologies on government efficiency; responding the areas of this review set in the first section of this article. It answers the following research questions:

- RQ3: What is the effect of emerging technologies on government efficiency

Concept	Main Finding	Reference
Resilience and Emergency response	Geographic Information Systems (GIS), open data, eGovernment services, and emerging cutting-edge technologies such as artificial intelligence (AI) or blockchain, can serve as a means for improving both resilience and emergency response	(UN eGovernment Survey, 2018)
	UK Government Digital Strategy, ensured the importance of the Legality, security and resilience pillar which include transactional services that will be redesigned to be robustly protective of the security of sensitive user information, to maintain the privacy and security of all personal information, and to be resilient, to ensure continuity of service to users and departments	(UK Cabinet Office, 2012)
Artificial Intelligence and Robotic Process Automation	Artificial intelligence can support in analyzing huge amounts of data, which in turn can improve predictions, prevent crimes and help governments to provide more efficient and user-friendly services.	(UN eGovernment Survey, 2018)
	As the quantity of data available from devices, things and people grows exponentially, AI techniques will be indispensable in several areas: to appraise policy performance and drive policymaking, to progress and resolve cases in a variety of domains, to support decisions based on data of different quality, and so forth. Emerging technologies such as AI are constantly changing and reshaping the ecosystems. eGovernments should	(Gartner ID: G00334540 , 2017)

	proactively adapt using AI technologies to enhance service delivery and ensure public adoption	
	The increased interest in this technology is based on heavily improved natural-language processing technologies. Chat-centric mobile channels that are designed to engage with customers and customer acceptance of robotic technology are the main drivers behind this rise in interest. Underway now is the transition from reactive human-programmed virtual assistants that respond to questions with answers found in structured and unstructured content libraries, to proactive, sometimes machine-learned VCAs that look at the characteristics of individuals and act on their behalf.	(Gartner ID: G00340212 , 2017)
Data, intelligent apps and analytics	Public data can be used to drive private sector innovations, also private sector data can enhance public services. Technological. Data can improve the decision-making accuracy.

Through dark analytics, which means analyzing data which is not commonly used, can get needed information on the spot, from sources as documents, e-mails, tickets, videos, and tweets.

Algorithms, with the aid of recognition protocol, can read machine print and hand print, and executed automatic validation using contextual logic databases.

This can generate trends, people movements, identify personnel preferences, demographics, transportation information, etc. User trends can be then analyzed to improve customer service.

Decision-making in such areas as migration can be made more transparent and targeted and have profound impacts. | (UN eGovernment Survey, 2018) |
| Intelligent "things", cyber-physical integration and edge computing | Intelligent things are the evolution of the Internet of Things (IoT) which can be described as physical objects including sensors that are connected to a network, and can function almost autonomously by using artificial intelligence | (UN eGovernment Survey, 2018) |
| Virtual and augmented reality | Virtual Reality (VR) enables users to immerse themselves in a digital world. Augmented Reality | (UN eGovernment |

	(AR) shows the world in real time enriched with digital images, and digital and physical objects interact. With augmented and virtual reality and intelligent things, information is added to the space around the user. This helps the user in processing critical information, visualizing scenarios, improving the quality and speed of decision-making, and communicating with others.	Survey, 2018)
High Performance- and Quantum Computing	Both high performance computing and quantum computing can help process the vast amount of available data faster, paving the way for new insights into ways to overcome obstacles to achieving sustainable development. Combined	(UN eGovernment Survey, 2018)
Blockchain and Distributed Ledger Technologies	Distributed Ledger Technologies are ways of storing information in a distributed manner across numerous actors. Distributed Ledger Technologies benefit the public sector in certifying identities, establishing trust, exchanging assets between parties across borders, and sealing digital contracts. Payment and authentication processes can be made more convenient for citizens and can include parties that are currently outside the traditional financial system Blockchain is noteworthy because of its high likelihood of a transformational impact on many nonfinancial government uses, including identities, voting, public records, citizen transactions and more. This innovation profile is contextualized for governments generally (federal, state/regional and local/municipal), and its positioning has been determined from the perspective of government use cases.	(UN eGovernment Survey, 2018) (Gartner, ID: G00340212 , 2018)

Table 4: Concepts and main findings for Q3

Chapter Four:

Case Study on users' behaviors towards using current digital services in the UAE

4.1 Overview

In this case study, the aim is to analyze the AS-IS situation in the UAE, by studying users'

behaviors towards using current digital services, knowing the current situation of users' behavior

towards using the UAE government eServices gives us insights that will help concluding more

effective directions towards improving government services adoption in the UAE.

The idea was selecting one of the main channels in digital serviced provisioning in the UAE, and

the aim is to use web analytics capability, such as Google Analytics (Google Analytics, 2018), to

collect a huge amounts of user interactions data that can be the base upon which deeper insights

evolve.

The official portal of the UAE government, government.ae, which is ranked the 6th worldwide in

the Online Service Index, as per UN e-government survey 2018 (UN eGovernment Survey,

2018). Government.ae serves as a one stop shop for all UAE government information and

services. It is worth noting that gaining access to government.ae google web analytics account,

gives us a rich repository about statistics of all users interacting with government services, which

we use throughout this study to analyze government.ae visitors' behavior and answer several

relevant questions, such as:

1.   How loyal are government.ae visitors?

2.   What are the main topics/services that government.ae users are interested in?

3.   What are the main locations in UAE and outside that use government.ae mostly?

4.   What are the users' demographics, males/females, Age groups, etc.?

5.   How government.ae acquires users, organic search, Direct, Referral, etc.?

6.   What are the users' preferred languages?

7.   What is the users' preferred operating system?

8.   What are the devices mostly used to access government.ae services?

9.   What are the users' preferred browser?

The user journey on government.ae can be classified into two main stages:

- Acquisition: which means that users are aware of and interested in the website

- Behavior/interaction: which means that the user is engaged with the website and adopted the provided services and interacting actively.

4.2 Data Collection

Government.ae is directly linked to google analytics and is setup to collect huge amount of user's interaction data 24/7. Which is a very rich repository upon which users' behavior can be analyzed.

4.3 The Problem

UAE is ranked 21st in the eGovernment Development Index (UN eGovernment Survey, 2018), Achieving the UAE vision 2021 to be one of the top 10 countries in the world entails efforts towards a digital transformation that is people centric to achieve public satisfaction and happiness. Despite the advancement in UAE digital transformation, but still services adopting is facing low percentages, action should be taken to enhance adoption levels to digital government

services in the UAE. Doing so requires factual insights on users' behavior and to understand people needs, interests and preferences. So, our study includes in detail the web analytics data of government.ae, the one stop shop for all UAE information and services, which are gathered through google analytics (Google Analytics, 2018) .

4.4 Data Analysis Approach

We worked on the web analytics of government.ae users' interactions gathered through google analytics, in order to answer each of the previously mentioned questions as follows:

- How loyal are government.ae visitors?

- What are the main topics/services that government.ae users are interested in?

- What are the main locations in UAE and outside that use government.ae mostly?

- What are the users' demographics, males/females, Age groups, etc.?

- How government.ae acquires users, organic search, Direct, Referral, etc.?

- What are the users' preferred languages?

- What is the users' preferred operating system?

- What are the devices mostly used to access government.ae services?

- What are the users' preferred browser?

Based on the results achieved, we managed to analyze each outcome in order to conclude the needed findings as will be elaborated in the coming sections.

4.5 Selecting the tools used

We used Google Analytics to get insights on users' interactions/behavior on government.ae, within google analytics we made use of the following analysis dimensions:

1. Audience analysis

   Used to explore government.ae audience characteristics/interests.

2. Demographic Analysis

   Understanding the age and gender composition of government.ae audience can guide us in targeting those who are not interested enough to use the digital government.

3. Geo Analysis

   It's also very important to be aware of the users' preference in the language to be able to target them successfully.

   It is also important to get to know who is interested in UAE services and information from outside the country.

4. Technology Analysis

   Understanding the technologies that the UAE services users use to reach out government.ae information and services is also an important factor in planning for the future developments.

5. Channel Analysis

   Analyze if the source of the traffic is from Social, Direct, Referral, Organic Search, Paid Search, Display, or Email.

   Table 5 shows the meaning of each source type (UN E-Government Survey 2018):

Channel	Description
Direct	Is the traffic which you will get when someone visits your website directly tying in browser.
Organic Search	this type of traffic the site will get through unpaid search like a non-paid Google, yahoo, bing, yandex etc.
Social	Is the traffic, you get from social media websites like facebook, twitter, google plus, linkedin etc.
Email	Traffic generated through links clicked in e-mail messages you send.
Affiliates	Traffic due to affiliate marketing
Referral	Is what you get from other sites who placed your link on their website.
CPC/Paid Search	Traffic from search engine results that is the result of paid advertising via Google AdWords or another paid search platform
Display	Traffic generated from display advertisements, such as Google AdWords re-marketing campaign.

Table 5: Channel analysis source type

6. Devices Analysis

    To understand which desktop/mobile devices are mostly used by government.ae users.

4.7 Assumptions and Metrices

We focused our analysis on government.ae google analytics data during the period from August

2017 till August 2018. Initially, we aimed to start our study over a two years period, from August

2016 till August 2018; however, when we first generated google analytics report over this period

of time, we noticed that there is significant change in the audience overview starting 3rd quarter

of 2017 as illustrated in Figure 14
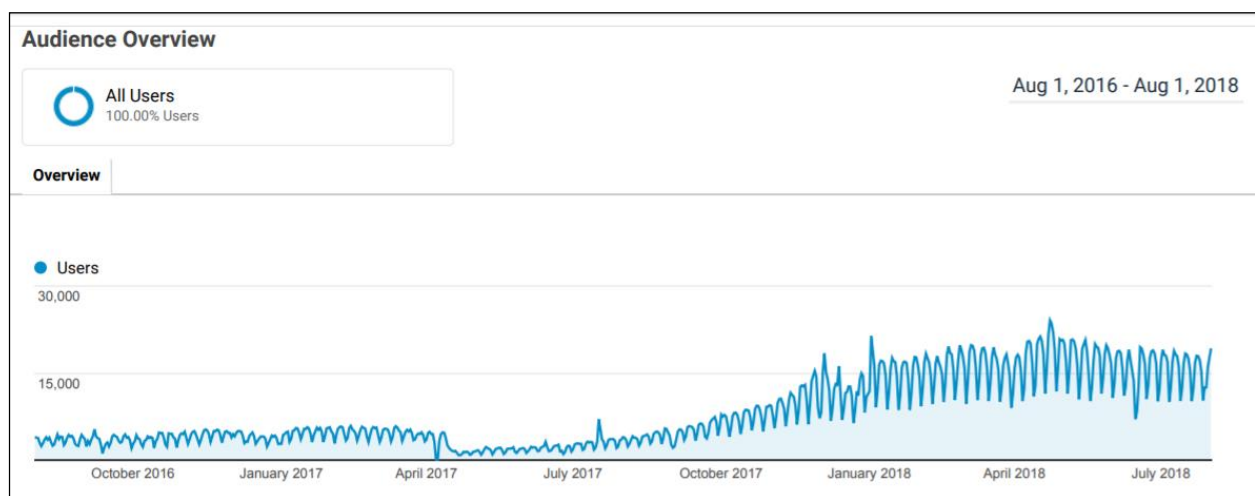
Figure 14: Government.ae Audience Overview over two years

After some investigations, we got to know that the UAE smart government have revamped the

whole portal in mid-2017.

The following quote is announced by ITP.net, which is:

"*The portal is an integrated platform that brings together all the eServices provided by*

government entities in the UAE. It was launched after a revamp project in April last year. By

mid-March 2018, the portal had about three million visits in total, while the number of portal

page views approached six million."

Which means that many pages, URL, and services where either cancelled or changed. This

means including the previous years will cause unexpected insights rather than giving a

comprehensive conclusion. Based on that, and assuming that it took them around a couple of

months to stabilize the portal structure /pages /content, we decided to use the time period of one

full year starting August 2017 till August 2018 for all our data collection and analysis tasks.

Google Analytics groups all activities in a "session" period. A session starts when a user lands

on a certain page of the website and lasts for 30 minutes of inactivity, which is called a timeout.

If the user returns to a page after the timeout period, then, a new session begins. (Google

Analytics 2018).

Google analytics provides some useful metrics such as:

- "Sessions" the number of sessions on certain date/range

- "Users" the number of users who visited government.ae on certain date/range

- "Pageviews" represents the total number of times a page is viewed by a government.ae user, this number could include a repetition of a single page multiple views by a single user.

- "Pages per session" represents the average number of pages viewed by government.ae users during each session. (can include repetition as well)

- "Average session duration" represents the average session duration of users' sessions in a specific date/range

- "Bounce rate" which represent the percentage of government.ae visitors who viewed only one page and left the website without clicking any other link

4.8 Results & Analysis (Empirical Findings)

Google Analytics is used to answer the aforementioned questions regarding the users' behavior on government.ae.

4.8.1 How loyal are government.ae visitors?
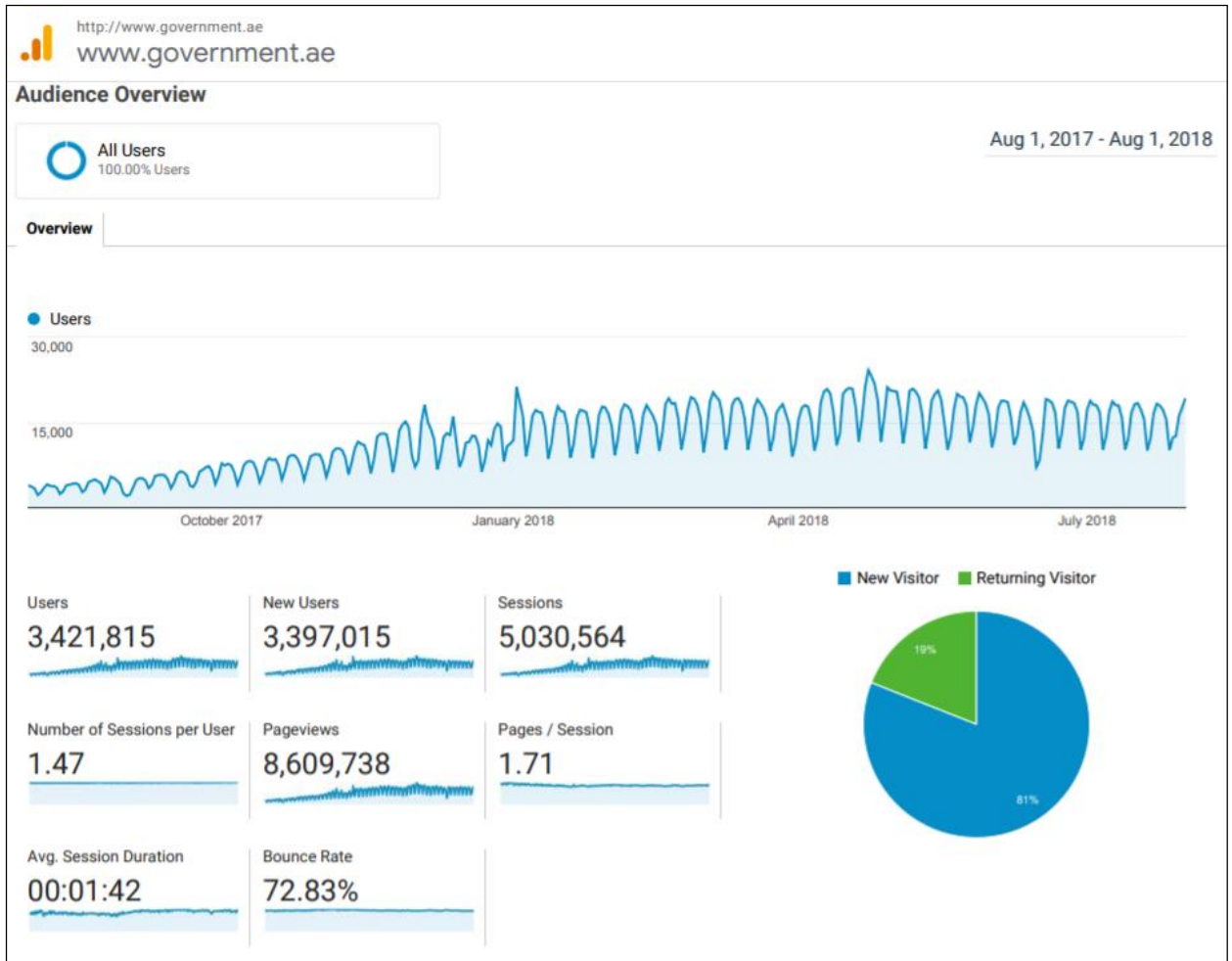
Figure 15: Government.ae users interactions overview over the period August 2017 – August 2018

The figure shows the following results which are reported for over the period August

2017 – August 2018:

- "Sessions" the number of created sessions is 5,030,564 sessions.

- "Users" the number of users who visited government.ae is 3,421,1315 users. Out of these, 3,397,015 are new visitors.

- 8,609,7738 Pageviews were executed, (this number could include repetitions)

- "Pages per session" is 1.7, which means the average number of pages viewed by government.ae users during each session is less than two pages.

- "Average session duration" is 1.42, means that the average active session duration is less than 2 minutes.

- "Bounce rate": 72.83% of government.ae visitors viewed only one page and left the website without clicking any other link
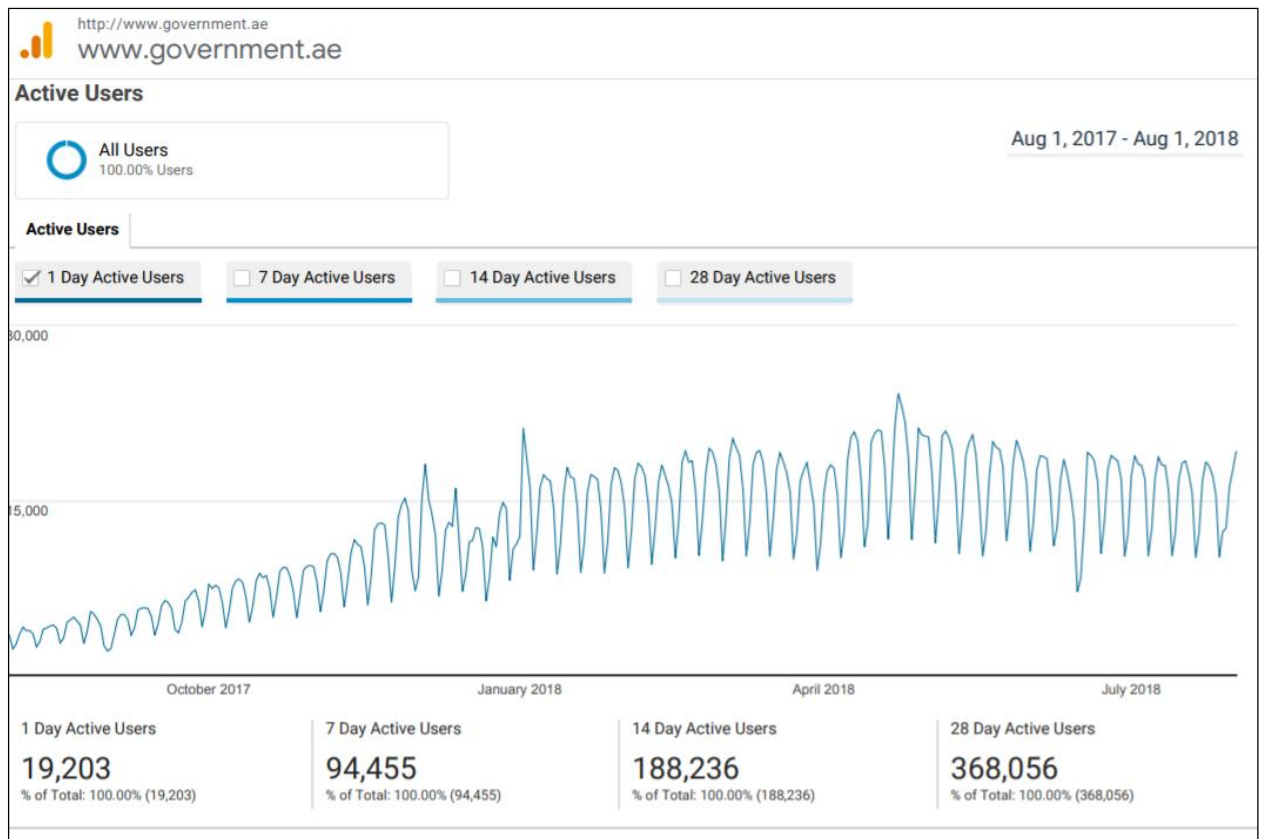
Figure 16: Active users on government.ae over the period August 2017 – August 2018

The above figure shows that the number of unique users who had at least one session within the last day is 19,203

And those who had at least one session within the last 7 days is 94,455, and in the past 14 days, 188,236 users had at least one session, finally 368,056 users accessed government.ae in the past 28 days.

It is clear from Figure 16 as well, that users are gaining more interest and trust in using the UAE government digital services, the increase in the overall number of users accessing the website is rising significantly comparing October 2017 and July 2018. Which gives us some positive signs that we are targeting a well-educated human capital in the UAE who are up to the task of transforming their daily routines into digital form, hence will be eager to consume the digital government services.

An average of 72.83% bounce rate is significantly high and reveals that the audience have no interest to dig deeper in the website to get further info or explore other services. It also mostly means that they come to get some information about a service but not to really access the service.

Average session duration of 1.42 minutes gives us an indication to the type of nowadays digital services users, the rhythm of life is very fast, and this fact should be taken into consideration while digitizing services. People are very busy with tons of transactions every day, and they will not spend more than one minute on a digital service to get the needed piece of information or execute a transaction. So, it is our challenge to be able to confront this fact and work towards implementing an efficient and effective digital government.

4.8.2 What are the main topics/services that government.ae users are interested in?

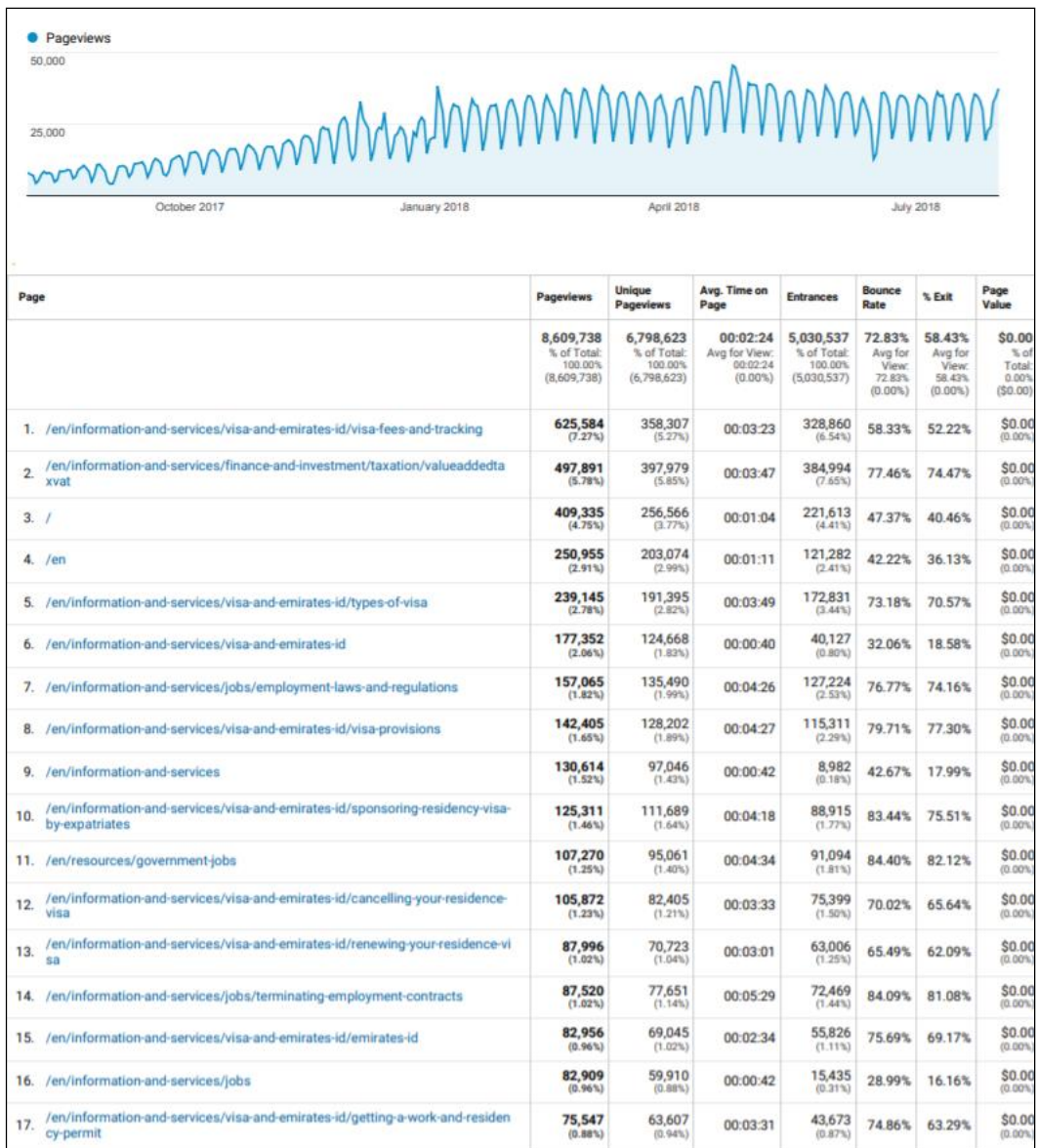| Page	Pageviews	Unique Pageviews	Avg. Time on Page	Entrances	Bounce Rate	% Exit	Page Value
	8,609,738 % of Total: 100.00% (8,609,738)	6,798,623 % of Total: 100.00% (6,798,623)	00:02:24 Avg for View: 00:02:24 (0.00%)	5,030,537 % of Total: 100.00% (5,030,537)	72.83% Avg for View: 72.83% (0.00%)	58.43% Avg for View: 58.43% (0.00%)	$0.00 % of Total: 0.00% ($0.00)
1. /en/information-and-services/visa-and-emirates-id/visa-fees-and-tracking	625,584 (7.27%)	358,307 (5.27%)	00:03:23	328,860 (6.54%)	58.33%	52.22%	$0.00 (0.00%)
2. /en/information-and-services/finance-and-investment/taxation/valueaddedtaxvat	497,891 (5.78%)	397,979 (5.85%)	00:03:47	384,994 (7.65%)	77.46%	74.47%	$0.00 (0.00%)
3. /	409,335 (4.75%)	256,566 (3.77%)	00:01:04	221,613 (4.41%)	47.37%	40.46%	$0.00 (0.00%)
4. /en	250,955 (2.91%)	203,074 (2.99%)	00:01:11	121,282 (2.41%)	42.22%	36.13%	$0.00 (0.00%)
5. /en/information-and-services/visa-and-emirates-id/types-of-visa	239,145 (2.78%)	191,395 (2.82%)	00:03:49	172,831 (3.44%)	73.18%	70.57%	$0.00 (0.00%)
6. /en/information-and-services/visa-and-emirates-id	177,352 (2.06%)	124,668 (1.83%)	00:00:40	40,127 (0.80%)	32.06%	18.58%	$0.00 (0.00%)
7. /en/information-and-services/jobs/employment-laws-and-regulations	157,065 (1.82%)	135,490 (1.99%)	00:04:26	127,224 (2.53%)	76.77%	74.16%	$0.00 (0.00%)
8. /en/information-and-services/visa-and-emirates-id/visa-provisions	142,405 (1.65%)	128,202 (1.89%)	00:04:27	115,311 (2.29%)	79.71%	77.30%	$0.00 (0.00%)
9. /en/information-and-services	130,614 (1.52%)	97,046 (1.43%)	00:00:42	8,982 (0.18%)	42.67%	17.99%	$0.00 (0.00%)
10. /en/information-and-services/visa-and-emirates-id/sponsoring-residency-visa-by-expatriates	125,311 (1.46%)	111,689 (1.64%)	00:04:18	88,915 (1.77%)	83.44%	75.51%	$0.00 (0.00%)
11. /en/resources/government-jobs	107,270 (1.25%)	95,061 (1.40%)	00:04:34	91,094 (1.81%)	84.40%	82.12%	$0.00 (0.00%)
12. /en/information-and-services/visa-and-emirates-id/cancelling-your-residence-visa	105,872 (1.23%)	82,405 (1.21%)	00:03:33	75,399 (1.50%)	70.02%	65.64%	$0.00 (0.00%)
13. /en/information-and-services/visa-and-emirates-id/renewing-your-residence-visa	87,996 (1.02%)	70,723 (1.04%)	00:03:01	63,006 (1.25%)	65.49%	62.09%	$0.00 (0.00%)
14. /en/information-and-services/jobs/terminating-employment-contracts	87,520 (1.02%)	77,651 (1.14%)	00:05:29	72,469 (1.44%)	84.09%	81.08%	$0.00 (0.00%)
15. /en/information-and-services/visa-and-emirates-id/emirates-id	82,956 (0.96%)	69,045 (1.02%)	00:02:34	55,826 (1.11%)	75.69%	69.17%	$0.00 (0.00%)
16. /en/information-and-services/jobs	82,909 (0.96%)	59,910 (0.88%)	00:00:42	15,435 (0.31%)	28.99%	16.16%	$0.00 (0.00%)
17. /en/information-and-services/visa-and-emirates-id/getting-a-work-and-residency-permit	75,547 (0.88%)	63,607 (0.94%)	00:03:31	43,673 (0.87%)	74.86%	63.29%	$0.00 (0.00%)

Figure 17: The top visited 17 pages on government.ae over the period August 2017 – August 2018

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The "Total Pageviews" metric is simply the sum of each time a user loaded a page on

Government.ae. high pageviews means this page is of high interest

Figure 17 shows that users are interested in the following topics:

1. Visa

    a. Types of visa

    b. Fees and tracking

    c. Emirates ID

    d. cancelling / renewing residence

    e. Getting a work residence

2. Taxes

    a. Value Added Tax (VAT)

3. Employment

    a. Laws and regulations

    b. Fining a Jobs

    c. Getting work permit

After analyzing the rest of the data over the one-year period, and in addition to the above, topics

such as the following, in order, are also of high interest to government.ae audience:

1. Starting a Business in the UAE

    a. Starting a business in free zone

2. Public holidays

3. Pension and end of service benefits

4. Controlled medicines

5. Consumer protection

6. Customs

7. Marriage

    a. Getting married in the UAE

    b. Divorce in the UAE

8. Educations

    a. Joining a school

    b. Qualifications to work as a teacher

9. Special needs facilities

 "Average Time on Page" and "Bounce Rate" indicate how government.ae users are engaged on each page. High average time on a page means that it is valuable for users to spend time reading about this subject and using the related services, this complements the pages views numbers, and assures that visa related issues as well as employment are on top of the needs/interests of government.ae audience. But as we know the UAE taxes issue, (Value Added Tax - VAT), just popped up starting 2018, such that we can have a closer look on the audience behavior in 2018.

Page	Pageviews	Unique Pageviews	Avg. Time on Page	Entrances	Bounce Rate	% Exit	Page Value
	6,416,026 % of Total: 100.00% (6,416,026)	5,016,528 % of Total: 100.00% (5,016,528)	00:02:30 Avg for View: 00:02:30 (0.00%)	3,758,132 % of Total: 100.00% (3,758,132)	72.45% Avg for View: 72.45% (0.00%)	58.57% Avg for View: 58.57% (0.00%)	$0.00 % of Total: 0.00% ($0.00)
1. /en/information-and-services/visa-and-emirates-id/visa-fees-and-tracking	618,650 (9.64%)	354,171 (7.06%)	00:03:24	327,439 (8.71%)	58.31%	52.34%	$0.00 (0.00%)
2. /en/information-and-services/finance-and-investment/taxation/valueadded taxvat	345,940 (5.39%)	272,254 (5.43%)	00:03:38	266,194 (7.08%)	76.04%	73.10%	$0.00 (0.00%)
3. /	285,798 (4.45%)	163,423 (3.26%)	00:01:03	140,015 (3.73%)	45.75%	38.10%	$0.00 (0.00%)
4. /en	164,568 (2.56%)	132,935 (2.65%)	00:01:11	78,468 (2.09%)	41.98%	35.44%	$0.00 (0.00%)
5. /en/information-and-services/visa-and-emirates-id/types-of-visa	164,072 (2.56%)	130,686 (2.61%)	00:03:55	122,624 (3.26%)	72.03%	70.42%	$0.00 (0.00%)
6. /en/information-and-services/visa-and-emirates-id	135,060 (2.11%)	95,151 (1.90%)	00:00:43	30,166 (0.80%)	33.37%	18.96%	$0.00 (0.00%)
7. /en/information-and-services/jobs/employment-laws-and-regulations	125,493 (1.96%)	109,682 (2.19%)	00:04:29	103,135 (2.74%)	77.83%	75.44%	$0.00 (0.00%)
8. /en/information-and-services/visa-and-emirates-id/cancelling-your-residence-visa	104,968 (1.64%)	81,721 (1.63%)	00:03:33	74,940 (1.99%)	70.05%	65.74%	$0.00 (0.00%)
9. /en/information-and-services/visa-and-emirates-id/sponsoring-residency-visa-by-expatriates	100,304 (1.56%)	89,205 (1.78%)	00:04:19	69,900 (1.86%)	82.79%	74.73%	$0.00 (0.00%)
10. /en/information-and-services	92,283 (1.44%)	68,603 (1.37%)	00:00:41	5,966 (0.16%)	43.25%	17.68%	$0.00 (0.00%)

Figure 18: The top visited 10 pages on government.ae in 2018

As per the Figure 18, the check revealed that still Visa issues is prominent and is on top of all customer interests, following this comes the taxes and then the employment.

On the other hand, a high bounce rate while having high page views means that although the topic is of high interest, but the contained information or service is not engaging to users to the extent that the users left the portal without clicking a single link. This should be taken into consideration to dig deeper and identify factors that frustrates users from continuing to execute their digital services or at least stop them from browsing more on government.ae to get further insights.

4.8.3 What are the main locations inside and outside UAE that use government.ae mostly?
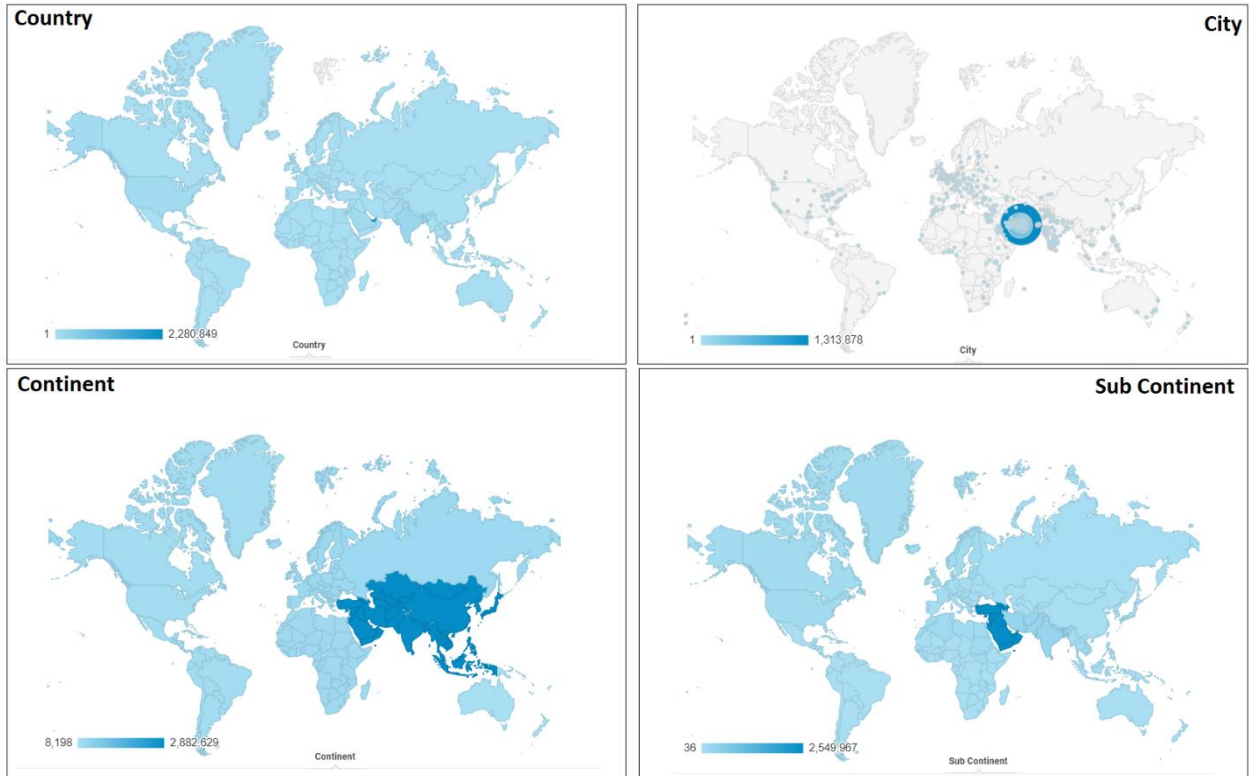
Figure 19 Government.ae users traffic geographic heat map, classified based on the four-different metrics.

I presented government.ae, users'/audiences' traffic source location in 2 forms, through a heat map, and using a tabular form. I applied 4 different metrices (continent, sub-continent, country, and city).

Figure 19 shows Government.ae users traffic geographical heat map, which is classified based on the four-different metrics.

On the country metric, it shows that local UAE traffic is far beyond any other country as shown in the top left corner.

While on the city level, it shows that UAE and neighbor countries and GCC contain the top ranked cities having traffic towards government.ae.

And accordingly, analyzing the continent and sub-continent reveals that Asia and Western-Asia where UAE is located, are on top of all traffic.

N.B. google analytics identifies users' location by their IP address (Google Analytics 2018).

	Country	Acquisition			Behavior				
		Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		
		3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)	3,421,815 % of Total: 100.00% (3,421,815)	
1.	United Arab Emirates	2,280,849 (65.86%)	2,246,242 (66.07%)	3,484,875 (69.27%)	73.22%	1.68	00:01:37	65.86%	
2.	India	219,466 (6.34%)	213,678 (6.28%)	287,673 (5.72%)	70.23%	1.79	00:01:57	6.34%	
3.	Saudi Arabia	119,760 (3.46%)	119,559 (3.52%)	153,386 (3.05%)	71.64%	1.78	00:01:44	3.46%	
4.	United Kingdom	92,661 (2.68%)	89,879 (2.64%)	119,708 (2.38%)	75.71%	1.65	00:01:32	2.68%	
5.	United States	90,486 (2.61%)	87,384 (2.57%)	113,336 (2.25%)	75.67%	1.67	00:01:40	2.61%	
6.	Egypt	81,096 (2.34%)	79,255 (2.33%)	114,038 (2.27%)	69.54%	1.86	00:02:26	2.34%	
7.	Pakistan	52,735 (1.52%)	51,623 (1.52%)	73,000 (1.45%)	65.89%	1.95	00:02:20	1.52%	
8.	Oman	29,220 (0.84%)	28,303 (0.83%)	36,950 (0.73%)	70.12%	1.80	00:01:51	0.84%	
9.	Germany	29,079 (0.84%)	27,725 (0.82%)	36,504 (0.73%)	73.45%	1.67	00:01:42	0.84%	
10.	Jordan	22,625 (0.65%)	22,195 (0.65%)	30,513 (0.61%)	70.74%	1.79	00:01:54	0.65%	
11.	Kuwait	20,181 (0.58%)	19,817 (0.58%)	25,264 (0.50%)	70.38%	1.79	00:01:42	0.58%	
12.	France	19,804 (0.57%)	19,115 (0.56%)	23,743 (0.47%)	80.99%	1.52	00:01:11	0.57%	
13.	Philippines	19,326 (0.56%)	18,660 (0.55%)	24,822 (0.49%)	75.52%	1.60	00:01:52	0.56%	
14.	Canada	17,464 (0.50%)	16,919 (0.50%)	22,333 (0.44%)	73.34%	1.74	00:01:46	0.50%	
15.	Morocco	16,666 (0.48%)	16,387 (0.48%)	21,398 (0.43%)	74.12%	1.72	00:02:01	0.48%	
16.	Australia	16,418 (0.47%)	16,540 (0.49%)	21,514 (0.43%)	74.86%	1.66	00:01:44	0.47%	
17.	Algeria	15,944 (0.46%)	16,037 (0.47%)	20,680 (0.41%)	76.04%	1.66	00:02:00	0.46%	
18.	Qatar	15,327 (0.44%)	14,988 (0.44%)	19,120 (0.38%)	68.63%	1.84	00:01:50	0.44%	
19.	Bahrain	12,659 (0.37%)	12,583 (0.37%)	17,285 (0.34%)	68.63%	1.90	00:01:58	0.37%	
20.	Sudan	12,350 (0.36%)	12,310 (0.36%)	16,234 (0.32%)	75.10%	1.62	00:01:57	0.36%	

Figure 20: **Sample of government.ae users traffic** by country metric – top 20 records

Figure 20 shows that over 65% of government.ae traffic comes from within the UAE. Another 10% comes from the top 10 countries having traffic to government.ae, and the remaining 25% is divided over the rest of the world other countries.

City	Acquisition			Behavior		
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)
1. Dubai	1,313,878 (37.05%)	1,272,107 (37.42%)	1,961,949 (39.00%)	73.50%	1.68	00:01:35
2. Abu Dhabi	455,791 (12.85%)	437,021 (12.85%)	688,957 (13.70%)	72.57%	1.71	00:01:38
3. Sharjah	239,339 (6.75%)	226,028 (6.65%)	347,153 (6.90%)	73.13%	1.67	00:01:42
4. (not set)	209,229 (5.90%)	200,385 (5.89%)	270,342 (5.37%)	71.82%	1.76	00:01:55
5. Al Ain	108,364 (3.06%)	104,841 (3.08%)	166,072 (3.30%)	72.85%	1.71	00:01:42
6. Ajman	100,845 (2.84%)	94,279 (2.77%)	148,772 (2.96%)	72.92%	1.68	00:01:42
7. Riyadh	54,333 (1.53%)	53,269 (1.57%)	69,241 (1.38%)	71.03%	1.81	00:01:46
8. Ras Al-Khaimah	51,151 (1.44%)	48,047 (1.41%)	74,458 (1.48%)	73.90%	1.66	00:01:34
9. London	40,467 (1.14%)	38,635 (1.14%)	52,809 (1.05%)	75.64%	1.64	00:01:31
10. Jeddah	39,968 (1.13%)	39,384 (1.16%)	49,901 (0.99%)	72.98%	1.73	00:01:40
11. Fujairah	32,768 (0.92%)	31,078 (0.91%)	48,592 (0.97%)	73.35%	1.69	00:01:35
12. Cairo	28,828 (0.81%)	26,869 (0.79%)	38,916 (0.77%)	69.72%	1.85	00:02:20
13. Bengaluru	27,890 (0.79%)	26,196 (0.77%)	35,993 (0.72%)	73.16%	1.70	00:01:45
14. Chennai	23,028 (0.65%)	21,921 (0.64%)	30,197 (0.60%)	70.27%	1.78	00:02:00
15. Mumbai	22,668 (0.64%)	21,824 (0.64%)	29,203 (0.58%)	71.43%	1.75	00:01:51
16. Kochi	17,595 (0.50%)	16,544 (0.49%)	22,597 (0.45%)	71.12%	1.70	00:01:49
17. Lahore	15,924 (0.45%)	15,304 (0.45%)	21,983 (0.44%)	64.84%	1.96	00:02:22
18. Dammam	15,863 (0.45%)	15,136 (0.45%)	19,256 (0.38%)	70.95%	1.79	00:01:44
19. Hyderabad	15,352 (0.43%)	14,855 (0.44%)	19,914 (0.40%)	69.38%	1.84	00:02:01
20. Doha	15,138 (0.43%)	14,803 (0.44%)	18,867 (0.38%)	68.51%	1.85	00:01:50

Figure 21: Sample of government.ae users traffic by city metric – top 20 records

Figure 21 shows that almost the 6 of the emirates are on top of all other cities, Riyadh, Jeddah, London, and Cairo have strong presence of government.ae traffic as well

An interesting note is that although government.ae is a national service channel that provides government services information on a federal level while accommodating the local options. But

surprisingly Dubai traffic is significantly higher than Abu Dhabi traffic, almost Dubai traffic

triple the traffic percentage of Abu Dhabi. In our efforts towards identifying the reason behind

this, I thought of first to compare the population between Dubai and Abu Dhabi, I referred to the

world population review (Worldpopulationreview.com, 2018), and it shows that the population

of Dubai is almost double the population of Abu Dhabi. this could be one factor in the reason

behind the traffic gap, but of course it is not the only factor, efforts should be spent to study this

gap.

The average session duration of most of the visits ranges between 1.5 and 2 minutes. Which

again reflects the type of users who are willing to get what they want in less than two minutes;

otherwise, they might get frustrated to continue.

Continent	Acquisition			Behavior			
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)	3,421,815 % of Total: 100.00% (3,421,815)
1. Asia	2,882,629 (83.96%)	2,863,543 (84.22%)	4,310,324 (85.68%)	72.70%	1.71	00:01:41	83.96%
2. Europe	229,879 (6.70%)	222,634 (6.55%)	297,630 (5.92%)	74.48%	1.71	00:01:40	6.70%
3. Africa	173,280 (5.05%)	171,637 (5.05%)	235,859 (4.69%)	71.67%	1.78	00:02:15	5.05%
4. Americas	119,822 (3.49%)	115,451 (3.40%)	151,123 (3.00%)	74.59%	1.73	00:01:46	3.49%
5. Oceania	19,389 (0.56%)	19,523 (0.57%)	25,311 (0.50%)	74.61%	1.67	00:01:45	0.56%
6. (not set)	8,198 (0.24%)	7,195 (0.21%)	10,317 (0.21%)	73.86%	1.66	00:01:41	0.24%

Figure 22: Government.ae users traffic by continent metric

The figure shows the traffic by the continent metric. The outcome is not surprising based on the

above insights. Asia has almost 84% of the overall traffic of government.ae.

Sub Continent	Acquisition			Behavior				
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)	3,421,815 % of Total: 100.00% (3,421,815)	
1. Western Asia	2,549,967 (73.71%)	2,513,332 (73.92%)	3,833,963 (76.21%)	73.05%	1.69	00:01:38	73.71%	
2. Southern Asia	289,619 (8.37%)	284,815 (8.38%)	386,987 (7.69%)	69.11%	1.83	00:02:04	8.37%	
3. Northern Africa	133,619 (3.86%)	131,586 (3.87%)	182,397 (3.63%)	71.61%	1.79	00:02:16	3.86%	
4. Northern Europe	111,473 (3.22%)	108,115 (3.18%)	143,810 (2.86%)	75.28%	1.67	00:01:34	3.22%	
5. Northern America	108,503 (3.14%)	104,368 (3.07%)	135,747 (2.70%)	75.28%	1.68	00:01:41	3.14%	
6. Western Europe	73,151 (2.11%)	69,375 (2.04%)	90,794 (1.80%)	75.26%	1.66	00:01:35	2.11%	
7. Southeast Asia	47,138 (1.36%)	45,846 (1.35%)	62,182 (1.24%)	75.08%	1.66	00:01:51	1.36%	
8. Eastern Europe	24,007 (0.69%)	22,943 (0.67%)	32,776 (0.65%)	71.85%	1.85	00:01:55	0.69%	
9. Southern Europe	22,685 (0.66%)	22,201 (0.65%)	30,250 (0.60%)	71.15%	1.88	00:01:59	0.66%	
10. Australasia	19,017 (0.55%)	19,176 (0.56%)	24,847 (0.49%)	74.75%	1.67	00:01:44	0.55%	
11. Eastern Asia	16,999 (0.49%)	16,572 (0.49%)	23,069 (0.46%)	67.87%	2.06	00:02:23	0.49%	
12. Western Africa	16,048 (0.46%)	15,942 (0.47%)	22,088 (0.44%)	70.52%	1.81	00:02:31	0.46%	
13. Eastern Africa	14,670 (0.42%)	14,597 (0.43%)	19,139 (0.38%)	71.77%	1.72	00:02:04	0.42%	
14. (not set)	8,198 (0.24%)	7,195 (0.21%)	10,317 (0.21%)	73.86%	1.66	00:01:41	0.24%	
15. Southern Africa	8,122 (0.23%)	7,939 (0.23%)	10,167 (0.20%)	75.63%	1.66	00:01:45	0.23%	
16. South America	7,396 (0.21%)	7,291 (0.21%)	10,153 (0.20%)	68.22%	2.20	00:02:34	0.21%	
17. Central Asia	3,052 (0.09%)	2,978 (0.09%)	4,123 (0.08%)	71.23%	1.82	00:02:05	0.09%	
18. Central America	2,264 (0.07%)	2,236 (0.07%)	3,171 (0.06%)	66.54%	2.28	00:02:46	0.07%	
19. Middle Africa	1,597 (0.05%)	1,573 (0.05%)	2,068 (0.04%)	68.81%	1.83	00:02:42	0.05%	
20. Caribbean	1,581 (0.05%)	1,556 (0.05%)	2,052 (0.04%)	72.81%	1.84	00:01:55	0.05%	

Figure 23: Government.ae users traffic by sub-continent metric

The figure shows the traffic by the sub-continent metric. Western and southern Asia are on top of all, then northern Africa where the rest of the Arab world resides comes in the 3rd level.

4.8.4 What are the users' demographics, males/females, Age groups, etc.?
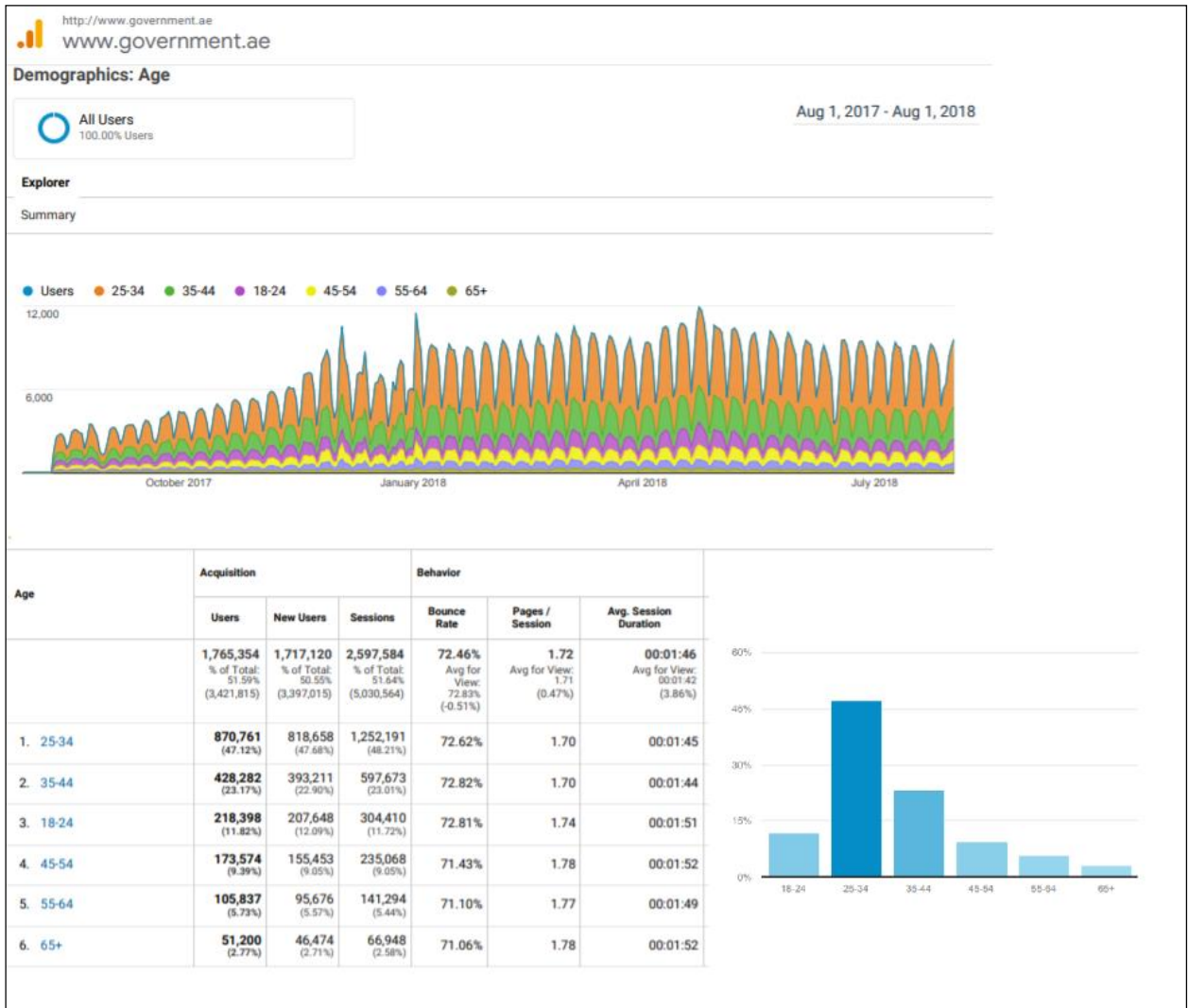
Figure 24: Users Demographic/Age on government.ae over the period August 2017 – August 2018

Figure 24 shows the age groups classified by 10 years gap. The analysis shows that the 25-34 age group has significantly the higher traffic of 47.12% of the overall traffic on government.ae. following that the second age group of 35 – 44, with a traffic percentage of 23.17%. The sum of both age groups traffic percentage is around 70.3% of the overall traffic on government.ae during the one-year period.

If we can correlate to the other question regarding the main topics/services that government.ae users are interested in, it makes sense that the above mentions age groups from 40 – 44 are those who are on the peak level of their career and personal life paths, and no doubt that those group of users will be interested in the top ranked topics/services visas, taxes, finding a job, opening a new business, etc. Also they belong to the new generation and it is easy and convenient for them to adopt new techniques and they can intuitively cope with the digital transformation efforts as a whole. In conclusion and following the 20-80 rule to ensure the digital government services effectiveness and efficiency, we should focus our efforts on the needs of this group of users to be able to achieve the maximum benefits and the highest return on investments (ROI).
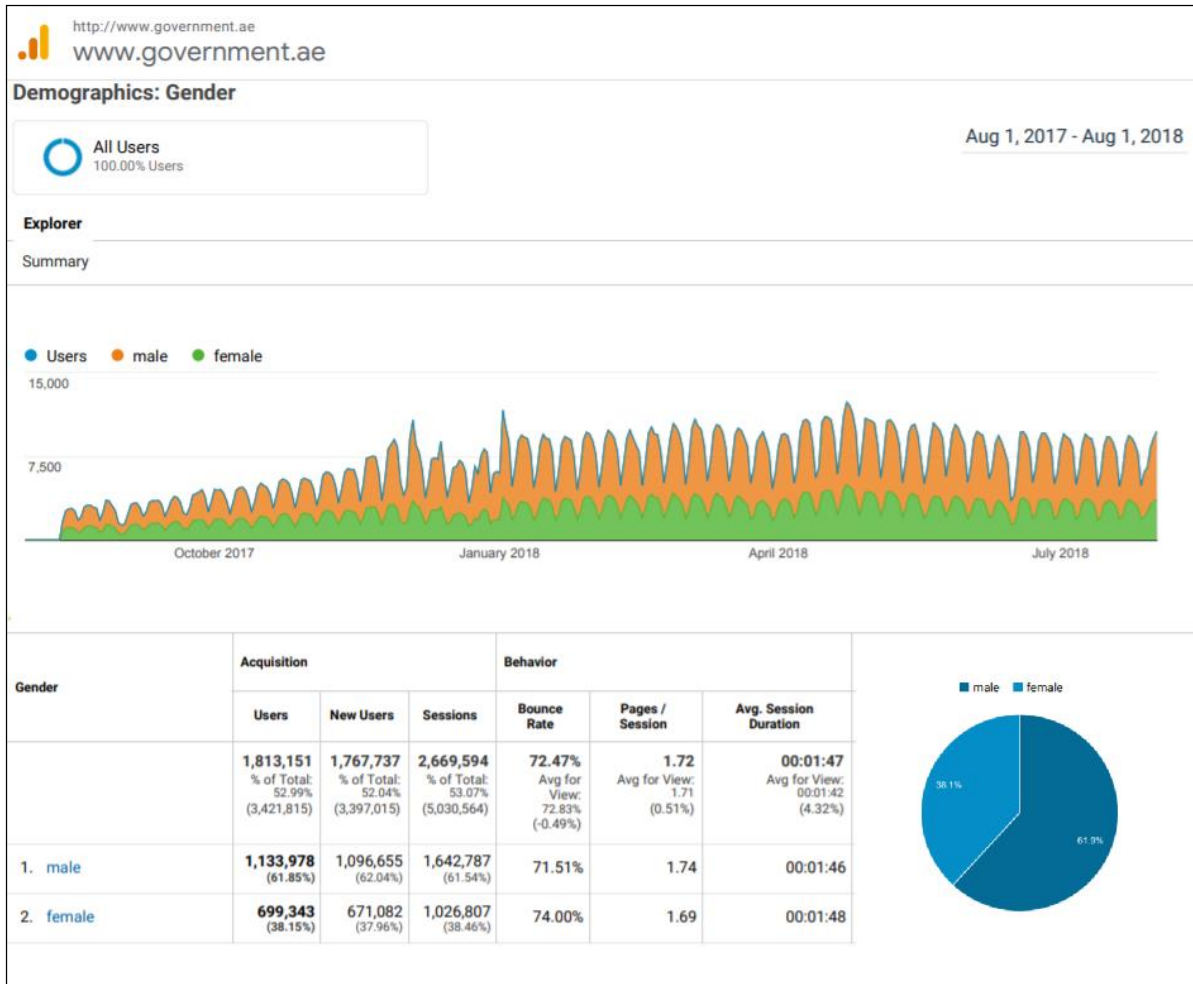
Figure 25: Users Demographic/Gender on government.ae over the period August 2017 – August 2018

Figure 25 is actually very interesting and surprising to discover that male audience are significantly higher than females. Gender equality is one of the concepts/pillars that UAE government is emphasizing and working with, UAE women are participating in the society as well as in the government structure at all levels, and the leadership is also strongly bridging the gender gap by supporting women to fulfil their roles in building UAE present and future. (Uaecabinet.ae, 2018)

If I tried to analyze the expected reasons behind this gap, we can think of the following factors:

- Men usually take the lead in government services bill payments.

- The UAE's population is over 9 million; out of which expatriates are over 8 million. (Government.ae, 2018) Men percentage in the expatriates' population is almost double the women percentage as per the "Population by Age Groups, Gender and Nationality" dataset on bayanat.ae the UAE official data portal, which shows population by age groups, gender and nationality in United Arab Emirates from 1975 until 2005 for every 5 years. (Data.bayanat.ae, 2018)

Still further investigations could be conducted to understand the reason behind this gap

4.8.5 How government.ae acquires users (organic search, Direct, Referral, etc.)?

Default Channel Grouping	Acquisition			Behavior					
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		Bounce Rate (compared to site average)	
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)	3,421,815 % of Total: 100.00% (3,421,815)		72.83% Avg for View: 72.83% (0.00%)
1. Organic Search	2,845,228 (81.44%)	2,796,814 (82.26%)	4,179,202 (83.08%)	74.75%	1.62	00:01:41	81.44%	2.64%	
2. Direct	439,376 (12.58%)	441,956 (13.00%)	564,515 (11.22%)	65.36%	2.03	00:01:48	12.58%	-10.25%	
3. Referral	180,318 (5.16%)	134,872 (3.97%)	252,304 (5.02%)	56.94%	2.49	00:01:52	5.16%	-21.82%	
4. Social	28,714 (0.82%)	26,313 (0.77%)	34,504 (0.69%)	78.36%	1.56	00:01:12	0.82%	7.61%	
5. Email	19 (0.00%)	15 (0.00%)	21 (0.00%)	71.43%	1.52	00:00:22	0.00%	-1.92%	
6. (Other)	17 (0.00%)	13 (0.00%)	18 (0.00%)	94.44%	1.11	00:00:06	0.00%	29.69%	

Figure 26 : Users traffic source channel over the period August 2017 – August 2018

Figure 26 shows that the organic search can be identified as the most effective traffic source for government information and services. People search for their needed service and they are directed to government.ae. as per the figure, the organic search has relatively higher bounce rate than the average of the website overall bounce rate, still having a high bounce rate for the

organic search can be a negative indication but comparing that it is the source for more than 80% of the traffic then still we can consider it the most effective channel.

The second most effective traffic source is government.ae direct traffic. Where 12.58% of government.ae visitors are aware of it URL or may be saved in their favorite websites to ensure easy and regular access. This percentage can directly represent loyal users to the official portal for UAE government information and services.

The referral percentage of 5.16% of the portal traffic represents those who reach government.ae from other sources, based on the data I have, most referral comes from the federal government entities corporate websites.

4.8.6 What are the users' preferred languages?

Language	Acquisition			Behavior				
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)	3,421,815 % of Total: 100.00% (3,421,815)	
1. en-us	2,253,494 (65.78%)	2,241,070 (65.91%)	3,369,505 (66.98%)	73.22%	1.69	00:01:41		65.78%
2. en-gb	527,448 (15.40%)	521,834 (15.35%)	758,781 (15.08%)	73.55%	1.67	00:01:41		15.40%
3. ar	323,116 (9.43%)	320,787 (9.43%)	466,778 (9.28%)	74.25%	1.67	00:01:38		9.43%
4. de-de	40,197 (1.17%)	40,308 (1.19%)	44,323 (0.88%)	29.18%	3.68	00:02:15		1.17%
5. ar-ae	30,612 (0.89%)	28,738 (0.85%)	46,052 (0.92%)	68.51%	2.17	00:02:35		0.89%
6. fr	28,597 (0.83%)	28,663 (0.84%)	38,065 (0.76%)	73.73%	1.74	00:02:00		0.83%
7. fr-fr	21,710 (0.63%)	21,299 (0.63%)	30,291 (0.60%)	74.35%	1.67	00:01:52		0.63%
8. en	18,222 (0.53%)	17,862 (0.53%)	24,010 (0.48%)	72.46%	1.64	00:01:37		0.53%
9. ar-eg	13,005 (0.38%)	12,259 (0.36%)	19,029 (0.38%)	70.98%	1.78	00:02:13		0.38%
10. en-in	12,952 (0.38%)	12,206 (0.36%)	18,175 (0.36%)	69.03%	1.81	00:01:58		0.38%
11. en-au	12,386 (0.36%)	12,336 (0.36%)	16,924 (0.34%)	76.23%	1.58	00:01:33		0.36%
12. (not set)	11,321 (0.33%)	11,341 (0.33%)	13,193 (0.26%)	71.29%	1.55	00:01:44		0.33%
13. en-ca	10,113 (0.30%)	9,909 (0.29%)	13,762 (0.27%)	77.91%	1.52	00:01:23		0.30%
14. ru-ru	8,907 (0.26%)	8,641 (0.25%)	13,146 (0.26%)	71.92%	1.81	00:01:57		0.26%
15. de	7,911 (0.23%)	7,870 (0.23%)	10,215 (0.20%)	70.10%	1.83	00:02:00		0.23%
16. zh-cn	7,268 (0.21%)	7,257 (0.21%)	11,219 (0.22%)	62.01%	2.28	00:03:01		0.21%
17. ru	6,129 (0.18%)	6,107 (0.18%)	9,423 (0.19%)	68.92%	1.96	00:02:11		0.18%

Figure 27: government.ae visitors' language selection over the period August 2017 – August 2018

Another surprising fact that although the mother tongue in UAE is Arabic, but still the English interface in many digital services in the most preferred language for the majority of users. Figure 13 shows that the top two ranked languages are, English for the United States, en-US, as well as en-GB which means United Kingdom English, used in UK, and other Commonwealth countries

including Canada. If we combine both it will be more than 80% of website visitors who use English to navigate through government.ae information and services. around 10% goes for the Arabic language, and the rest are a mix of several languages such as French and Korean.

N.B. Government.ae uses a language translation plugin that supports all worldwide languages

4.8.7 What is the users' preferred operating system?

Operating System	Acquisition			Behavior				
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)		3,421,815 % of Total: 100.00% (3,421,815)
1. Windows	1,524,254 (44.86%)	1,523,008 (44.79%)	2,302,633 (45.77%)	69.55%	1.86	00:01:54		44.86%
2. Android	874,229 (25.73%)	873,660 (25.70%)	1,278,214 (25.41%)	72.71%	1.69	00:01:49		25.73%
3. iOS	803,707 (23.65%)	806,016 (23.71%)	1,156,031 (22.98%)	79.38%	1.44	00:01:13		23.65%
4. Macintosh	170,907 (5.03%)	173,178 (5.09%)	261,868 (5.21%)	73.16%	1.72	00:01:41		5.03%
5. Linux	8,954 (0.26%)	8,557 (0.25%)	11,592 (0.23%)	76.58%	1.71	00:01:29		0.26%
6. (not set)	6,237 (0.18%)	6,227 (0.18%)	7,538 (0.15%)	67.42%	1.69	00:02:03		0.18%
7. Chrome OS	4,728 (0.14%)	4,726 (0.14%)	6,380 (0.13%)	72.92%	1.78	00:02:04		0.14%
8. BlackBerry	2,296 (0.07%)	2,281 (0.07%)	3,227 (0.06%)	78.09%	1.47	00:01:02		0.07%
9. Windows Phone	1,922 (0.06%)	1,918 (0.06%)	2,569 (0.05%)	76.45%	1.59	00:01:34		0.06%
10. Tizen	167 (0.00%)	167 (0.00%)	200 (0.00%)	75.00%	1.60	00:01:51		0.00%
11. Samsung	98 (0.00%)	98 (0.00%)	110 (0.00%)	72.73%	1.75	00:01:43		0.00%
12. Nokia	46 (0.00%)	46 (0.00%)	83 (0.00%)	86.75%	1.36	00:01:12		0.00%
13. SymbianOS	31 (0.00%)	31 (0.00%)	32 (0.00%)	93.75%	1.06	00:00:51		0.00%
14. OS/2	26 (0.00%)	25 (0.00%)	26 (0.00%)	80.77%	1.42	00:00:54		0.00%
15. FreeBSD	21 (0.00%)	14 (0.00%)	22 (0.00%)	90.91%	1.09	00:00:04		0.00%

Figure 28: government.ae visitors' OS selection over the period August 2017 – August 2018

The figure is a sample of the top 15, (out of 26), operating systems used by

government.ae visitors, it shows that the visitors use mostly four different operating

systems, on top of all is Windows with a percentage of 44% of the overall usage, then

comes android OS with 25.73% and very close comes iOS with 23.65%. the least of the

top four is Macintosh OS with 5% only. The top 4 OS's represents more than 99% of the

overall usages, and all the rest are less than 1%.

4.8.8 What are the devices mostly used to access government.ae services?

Device Category	Acquisition			Behavior				
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)		3,421,815 % of Total: 100.00% (3,421,815)
1. desktop	1,690,635 (49.69%)	1,697,634 (49.93%)	2,563,992 (50.97%)	69.94%	1.84	00:01:52		49.69%
2. mobile	1,592,570 (46.81%)	1,585,407 (46.63%)	2,300,406 (45.73%)	75.90%	1.57	00:01:31		46.81%
3. tablet	119,004 (3.50%)	116,942 (3.44%)	166,166 (3.30%)	74.76%	1.62	00:01:48	3.50%	

Figure 29: government.ae visitors' device selection on government.ae over the period August
2017 – August 2018

Figure 30 shows that users navigate through the desktop and mobile devices with almost the

same percentage. Also bounce rate on both desktop and mobile devices are also close. If we

combine the tablet usage percentage to the mobile devices to represent the smart devices

classification, we can say that users have easy and convenient access to the smart devices the

same as desktop and it is even exceeding the desktop channel by a relatively very small margin

around 1%

Detailed Mobile Device Info:

Mobile Device Info	Acquisition			Behavior				
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		
	1,714,604 % of Total: 50.11% (3,421,815)	1,702,349 % of Total: 50.11% (3,397,015)	2,466,572 % of Total: 49.03% (5,030,564)	75.82% Avg for View: 72.83% (4.12%)	1.57 Avg for View: 1.71 (-8.06%)	00:01:32 Avg for View: 00:01:42 (-10.04%)		1,714,604 % of Total: 50.11% (3,421,815)
1. Apple iPhone	725,163 (42.61%)	729,080 (42.83%)	1,050,674 (42.60%)	79.61%	1.43	00:01:11		42.61%
2. Apple iPad	69,044 (4.06%)	68,525 (4.03%)	95,866 (3.89%)	76.87%	1.54	00:01:40		4.06%
3. (not set)	59,976 (3.52%)	60,000 (3.52%)	82,310 (3.34%)	72.93%	1.66	00:01:45		3.52%
4. Samsung SM-G935F Galaxy S7 Edge	43,492 (2.56%)	43,491 (2.55%)	65,898 (2.67%)	74.51%	1.64	00:01:33		2.56%
5. Samsung SM-G955F Galaxy S8+	26,181 (1.54%)	26,391 (1.55%)	40,558 (1.64%)	74.51%	1.63	00:01:28		1.54%
6. Samsung SM-N920C Galaxy Note 5	23,123 (1.36%)	23,167 (1.36%)	35,573 (1.44%)	73.91%	1.65	00:01:34		1.36%
7. Samsung SM-G950F Galaxy S8	21,472 (1.26%)	21,506 (1.26%)	32,134 (1.30%)	75.28%	1.58	00:01:22		1.26%
8. Samsung SM-G610F J7 Prime	19,505 (1.15%)	19,632 (1.15%)	28,835 (1.17%)	70.87%	1.77	00:01:55		1.15%
9. Samsung SM-N9005 Galaxy Note 3	14,381 (0.85%)	14,283 (0.84%)	21,167 (0.86%)	73.36%	1.70	00:01:48		0.85%
10. Samsung SM-N910C Galaxy Note 4	13,640 (0.80%)	13,827 (0.81%)	21,053 (0.85%)	74.14%	1.63	00:01:39		0.80%
11. Microsoft Windows RT Tablet	13,039 (0.77%)	12,792 (0.75%)	19,094 (0.77%)	69.45%	1.86	00:02:01		0.77%
12. Samsung SM-G925F Galaxy S6 Edge	12,261 (0.72%)	12,180 (0.72%)	18,512 (0.75%)	74.23%	1.64	00:01:35		0.72%
13. Samsung SM-G930F Galaxy S7	11,925 (0.70%)	11,970 (0.70%)	17,716 (0.72%)	75.56%	1.59	00:01:26		0.70%
14. Samsung SM-N950F Galaxy Note8	11,921 (0.70%)	11,124 (0.65%)	17,670 (0.72%)	73.56%	1.64	00:01:29		0.70%
15. Samsung SM-G532F Galaxy Grand Prime+	10,993 (0.65%)	11,043 (0.65%)	15,472 (0.63%)	71.45%	1.76	00:01:59		0.65%

Figure 30: government.ae visitors' mobile brand selection over the period August 2017 – August 2018

Figure 31 is a sample of the top 15, (out of 6638), smart devices used by government.ae visitors, it shows a chocking fact, that amongst all the mobile devices, Apple iPhone with a percentage of 42.61% out of all other smart devices. The next is Apple iPad with 4.06%. around 30% of the rest are small percentage divided amongst all Samsung smart phones different brands, and the remaining around 20 percent divided on Xiaomi, Huawei, Lenovo, Windows, Nokia, and others.

4.8.9 What are the users' preferred browser?

Browser	Acquisition			Behavior				
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration		
	3,421,815 % of Total: 100.00% (3,421,815)	3,399,983 % of Total: 100.09% (3,397,015)	5,030,564 % of Total: 100.00% (5,030,564)	72.83% Avg for View: 72.83% (0.00%)	1.71 Avg for View: 1.71 (0.00%)	00:01:42 Avg for View: 00:01:42 (0.00%)	3,421,815 % of Total: 100.00% (3,421,815)	
1. Chrome	1,983,852 (58.15%)	1,969,120 (57.92%)	2,976,547 (59.17%)	71.60%	1.76	00:01:51		58.15%
2. Safari	820,517 (24.05%)	821,501 (24.16%)	1,172,561 (23.31%)	77.07%	1.55	00:01:17		24.05%
3. Internet Explorer	180,798 (5.30%)	181,378 (5.33%)	257,155 (5.11%)	69.62%	1.90	00:01:51	5.30%	
4. Firefox	120,308 (3.53%)	120,745 (3.55%)	176,931 (3.52%)	70.49%	1.81	00:01:56	3.53%	
5. Samsung Internet	103,568 (3.04%)	104,375 (3.07%)	159,661 (3.17%)	73.75%	1.65	00:01:40	3.04%	
6. Edge	73,258 (2.15%)	73,714 (2.17%)	113,547 (2.26%)	68.88%	1.89	00:01:52	2.15%	
7. Android Webview	33,993 (1.00%)	33,618 (0.99%)	43,452 (0.86%)	71.25%	1.77	00:01:42	1.00%	
8. UC Browser	29,357 (0.86%)	29,577 (0.87%)	40,994 (0.81%)	77.59%	1.49	00:01:18	0.86%	
9. Opera	18,417 (0.54%)	18,515 (0.54%)	30,235 (0.60%)	72.35%	1.71	00:01:50	0.54%	
10. Opera Mini	15,352 (0.45%)	15,318 (0.45%)	18,862 (0.37%)	75.09%	1.52	00:01:29	0.45%	
11. Android Browser	11,823 (0.35%)	11,695 (0.34%)	15,770 (0.31%)	74.33%	1.62	00:02:02	0.35%	
12. Safari (in-app)	11,295 (0.33%)	11,309 (0.33%)	12,934 (0.26%)	76.05%	1.56	00:01:00	0.33%	
13. UCWEB	2,522 (0.07%)	2,493 (0.07%)	3,170 (0.06%)	80.82%	1.39	00:00:37	0.07%	
14. (not set)	2,186 (0.06%)	2,201 (0.06%)	2,743 (0.05%)	47.43%	2.05	00:03:51	0.06%	
15. BlackBerry	1,358 (0.04%)	1,341 (0.04%)	1,884 (0.04%)	79.62%	1.41	00:00:51	0.04%	

Figure 31: government.ae visitors' browsers selection over the period August 2017 – August 2018

The figure is a sample of the top 15, (out of 67 different browsers), browsers used by

government.ae visitors, it shows that Chrome is on top of all browsers with a percentage of

58.15% usage and the second is Safari with 24%, third is Internet Explorer 5% and then Firefox

3.5, the rest of browsers are used on a small scale.

4.9 Case Study Outcomes

The digital government web portal Government.ae is considered the main gate and the one stop shop for all UAE national level information and services. In our research, we rely on it as one of the most reliable sources of information that can help us in studying and gathering insights on users' interactions with digital services. Researches should be conducted to study the individual behavior within the country with regard to services provided the local governments service channels, either web or smart apps, kiosks, to name a few. Nevertheless, the study should cover the private sector services, especially banking services where many of the government services audience use to perform their transactions. To sum up, public/private institutional alignment should be enforced by the leadership directions.

Our case study analysis indicates that there is significant increase of users adoption to the UAE government services. In other words, users are gaining more interest and trust in using the digital services, such characteristics of a nation makes them eager to be part of the digital transformation efforts and willing to consume the digital government services.

Government.ae has an average of 72.83% bounce rate, which is significantly high and reveals that the audience in most cases has no interest to dig deeper in the website to get further information or explore other services. It also mostly means that the audience usually focuses on getting some information about a service through either direct link or redirection from a usage guideline, but not to really access the service through government.ae.

Average session duration of 1.42 minutes gives us an indication to the type of nowadays digital services users, the rhythm of life is very fast, and this fact should be taken into consideration while digitizing services. People are very busy with tons of transactions every day, and they will not spend more than one minute on a digital service to get the needed piece of information or execute a transaction. So, it is a challenge to be able to confront this fact and work towards implementing an efficient and effective digital government.

UAE Government services' audience focuses mainly on certain areas, where we should focus our efforts on, such services as

    a. Visa

        i. Types of visa

        ii. Fees and tracking

        iii. Emirates ID

        iv. cancelling / renewing residence

        v. Getting a work residence

    b. Taxes

        i. Value Added Tax (VAT)

    c. Employment

        i. Laws and regulations

        ii. Fining a Jobs

        iii. Getting work permit

An interesting note is that although government.ae is a national service channel that provides government services information on a federal level while accommodating the local options. But surprisingly Dubai traffic is significantly higher than Abu Dhabi traffic, almost Dubai traffic triple the traffic percentage of Abu Dhabi. In our efforts towards identifying the reason behind this, we compared the population between Dubai and Abu Dhabi, I referred to the world population review (Worldpopulationreview.com, 2018), and it shows that the population of Dubai is almost double the population of Abu Dhabi. this could be one factor in the reason behind the traffic gap, but of course it is not the only factor, efforts should be spent to study this gap.

Age groups ranging from 40 to 44 are the most who are using the digital government services. the reason behind that could be that they are on the peak level of their career and personal life paths, and no doubt that those group of users will be interested in the top ranked topics/services visas, taxes, finding a job, opening a new business, etc. Also they belong to the new generation and it is easy and convenient for them to adopt new techniques and they can intuitively cope with the digital transformation efforts as a whole. In conclusion and following the 20-80 rule to ensure the digital government service effectiveness and efficiency, we should start with focusing our efforts on the needs of this group of users to be able to achieve the maximum benefits and the highest return on investments (ROI).

Considering the efficiency and quality of government.ae source channels, the organic search can be identified as the most effective traffic source for government information and services where it formulates the source for more than 80% of the traffic. People usually search by themselves for

their needed services and they are directed to government.ae. They do so themselves because they use either their personal or business sensitive information for getting the service.

Another surprising fact that although the mother tongue in UAE is Arabic, but still the English interface in many digital services is the most preferred language. More than 80% of website visitors use English to navigate through government.ae information and services. Around 10% goes for the Arabic language, and the rest are a mix of several languages such as French and Korean. This language preference is because the multinational and multicultural nature of expatriates in the UAE.

4   Chapter Five:
Discussion of Results

This research is conducted at the time that we are witnessing the fast-evolving digital government that leverages the power of digital data in transforming government services into optimized digital services. Unlike eGovernment was concerned only with availing government services through online channels.

It was noticed that governments are spending huge amounts on the digitization efforts, however, many governments are still struggling with relatively low public adoption percentages.

Public adoption of any innovation or new technology is always a challenge.

In digital government, public adoption reflects the extent of success and efficiency of each government in the provisioning of its digital services.

This research was conducted at this turning point of time to achieve two main objectives.

1. Analyze the factors that influence public adoption to government services, and

2. To suggest a plan including suggestions for boosting digital services public adoption in governments in general with a specific focus on the UAE government

To achieve this, we have done the following:

First, to undertake a systematic review to synthesize the findings from published researches concerning factors affecting citizen adoption of digital government in several countries, in total, 471 articles were identified to be relevant to the topic, of which, 131 were shortlisted, then a final refinement of 28 articles were studied based on the search strategy.

Second, to conduct an empirical analysis to provide insightful findings on United Arab Emirates' users behavior towards digital services, through the web analytics data captured from

government.ae, which is the official portal of the UAE government and the one stop shop for all UAE government information and services.

From the systematic review it was concluded that public adoption to government services is dependent on several factors such as:

- Perceived Ease of Use (PEOU)

- Perceived Public Value (PPV)

- Trust

- Culture: Uncertainty avoidance

- Self-efficacy

- Facilitating conditions

- Computer self-efficacy

- Continuance intention to use

- Compatibility

- Complexity

From the systematic review, the first objective of this research was achieved, to identify the main reasons behind low levels of public adoption.

User centricity, engaging the public in the process of services creation will help motivate the public to adopt the digital government.

UAE Public who access the Government services focus mainly on certain areas, where we should focus our efforts on, such services as

     a. Visa

          i. Types of visa

      ii. Fees and tracking

     iii. Emirates ID

     iv. cancelling / renewing residence

      v. Getting a work residence

  b. Taxes

      i. Value Added Tax (VAT)

  c. Employment

      i. Laws and regulations

      ii. Fining a Jobs

     iii. Getting work permit

Age groups ranging from 40 to 44 are the most who are using the digital government services. the reason behind that could be that they are on the peak level of their career and personal life paths, and no doubt that those group of users will be interested in the top ranked topics/services visas, taxes, finding a job, opening a new business, etc. also they belong to the new generation and it is easy and convenient for them to adopt new techniques and they can intuitively cope with the digital transformation efforts as a whole. In conclusion and following the 20-80 rule to ensure the digital government services effectiveness and efficiency, we should start with focusing our efforts on the needs of this group of users to be able to achieve the maximum benefits and the highest return on investments (ROI).

Strategies should be introduced to support this move on all the dimensions, at the heart of this strategy should be the ICT strategy, which should be a digital version of the national agenda, and in building such strategy we should incorporate all success factors that can facilitate the adoption

of users. This strategy should not only reflect the whole of government concept but also the

whole of society concept, by activating the partnership between the public, the private, and the

people (PPPP public – private – people partnership)

Ensure high cyber security measures when working on digitization, The Public expect that digital

services are safe and secure, and they also assume that their privacy is protected. privacy and

keen handling of private information that is shared with government entities is crucial to

successful eGovernment implementation.

The digital government came with powerful capabilities, it also came with more outstanding

threats that should be taken into consideration to consider the cyber security while dealing with

this massive amount of personal data which is created and shared, in addition to protecting the

identities of both individuals and organizations.

All the efforts that will be done should focus on user centricity, this can be achieved by ensuring

sharing the government data publicly and allowing the citizens to participate and take part in the

decision making towards enhancing the services and policies.

Making use of the new emerging technologies such as AI and blockchain can enhance

personalization and will affect the public behavior positively. by providing the citizen with

proactive bundled services, where he is reminded by his due payments through his smart phone

or his digital personal assistant and all-inclusive in a single sign on manner where all integrations

are done beyond the seen.

Increasing customer adoption will capitalize to the efforts conducted to achieve the UAE

leadership position as one of the top countries by 2021, also will contribute to the world 2030

agenda towards achieving the sustainable development goals, leaving no one behind

domestically and internationally, while bridging the digital gap between citizens in all emirates

and even between the world different countries. (UN E-Government Survey 2018)

Clear and long-term policy and strategic frameworks are needed to create an enabling

trustworthy, accountable, inclusive and effective environment for technology use in public

service and good governance.

Governments should pay extra efforts to promote participation through the two-way sharing of

knowledge and experiences between governments and citizens. Which makes it possible to co-

create public services and collaborate on evidence-based decision and policy-making

Some people have no access to digital services due to lack of access to ICT, or lack of skills.

there are many opportunities to enhance social and digital inclusion through digital government

and that emerging technologies and innovative multi-stakeholder partnerships can help to expand

e-government access for all and provide dedicated services to address traditional problems

related to poverty and social exclusion.

Online use, offers an opportunity for e-inclusion but also risks a new digital divide, owing to

insufficient access in low-income countries, either because of a lack of devices or of bandwidth

and speed

For effective service delivery, e-government applications should be designed to meet needs and

should promote people's active participation in identifying real users' needs

Activate the design thinking and user behavioral approaches while working on all service stages, creating, delivering and using services. One approach for user centricity is to group related services together, based on the life events for example. while focusing on people real needs instead of the technical infrastructures.

Enabling citizens and others to contribute as co-creators to public services will support digital adoption where it will increase the ownership and public value by being more into the real needs of the public. This will shift governments' role to be more into the enablement part by facilitating the appropriate tools and support. Although this approach will enhance adoption, but governments should hold the ultimate responsibility to ensure that such activities are fair and ethical.

Governments should still invest in service centers and one-stop-shops where an employee can help users who are digitally illiterate or have no online access in applying for online services. Governments should involve women, elders, kids and the poorest including the most vulnerable people in decision-making.

Open Government Data (OGD) is the main actor for achieving transparency, OGD implies that government information is disclosed and is online by default for the public to access, without restriction. OGD helps strengthen the relation between the public, the government, and the other stakeholders.

Digital governments should proactively open government owned data in accordance to the expectations of the public. This is what we call it transparency. ICTs are the ultimate tool for achieving transparency in a cost-effective manner

Some of the major digital technology trends fueling innovation and growth in both the private and public sectors are mainly related to digital, analytics, cloud, core modernization, and the changing role of information and communications technologies overall. Social and mobile technologies, open data initiatives, and Internet of Things (IoT) also play an important role in transforming government efforts.

Governments are now beginning to focus on the larger and more holistic task of service innovation in order to provide more productive and better services for better adoption rates. Geographic Information Systems (GIS), open data, eGovernment services, and emerging cutting-edge technologies such as artificial intelligence (AI) or blockchain, can serve as a means for improving both resilience and emergency response

UK Government Digital Strategy, ensured the importance of the Legality, security and resilience pillar which include transactional services that will be redesigned to be robustly protective of the security of sensitive user information, to maintain the privacy and security of all personal information, and to be resilient, to ensure continuity of service to users and departments Artificial intelligence can support in analyzing huge amounts of data, which in turn can improve predictions, prevent crimes and help governments to provide more efficient and user-friendly services.

As the quantity of data available from devices, things and people grows exponentially, AI techniques will be indispensable in several areas: to appraise policy performance and drive policymaking, to progress and resolve cases in a variety of domains, to support decisions based on data of different quality, and so forth. Emerging technologies such as AI are constantly

changing and reshaping the ecosystems. Digital Governments should proactively adapt using AI technologies to enhance service delivery and ensure public adoption

The increased interest in this technology is based on heavily improved natural-language processing technologies. Chat-centric mobile channels that are designed to engage with customers and customer acceptance of robotic technology are the main drivers behind this rise in interest. Underway now is the transition from reactive human-programmed virtual assistants that respond to questions with answers found in structured and unstructured content libraries, to proactive, sometimes machine-learned VCAs that look at the characteristics of individuals and act on their behalf.

Public data can be used to drive private sector innovations, also private sector data can enhance public services. Technological. Data can improve the decision-making accuracy.

Through dark analytics, which means analyzing data which is not commonly used, can get needed information on the spot, from sources as documents, e-mails, tickets, videos, and tweets.

Algorithms, with the aid of recognition protocol, can read machine print and hand print, and executed automatic validation using contextual logic databases.

This can generate trends, people movements, identify personnel preferences, demographics, transportation information, etc. User trends can be then analyzed to improve customer service.

Decision-making in such areas as migration can be made more transparent and targeted and have profound impacts.

Intelligent things are the evolution of the Internet of Things (IoT) which can be described as physical objects including sensors that are connected to a network, and can function almost autonomously by using artificial intelligence

Virtual Reality (VR) enables users to immerse themselves in a digital world. Augmented Reality (AR) shows the world in real time enriched with digital images, and digital and physical objects interact. With augmented and virtual reality and intelligent things, information is added to the space around the user. This helps the user in processing critical information, visualizing scenarios, improving the quality and speed of decision-making, and communicating with others.

Both high performance computing and quantum computing can help process the vast amount of available data faster, paving the way for new insights into ways to overcome obstacles to achieving sustainable development. Combined

Distributed Ledger Technologies are ways of storing information in a distributed manner across numerous actors.

Distributed Ledger Technologies benefit the public sector in certifying identities, establishing trust, exchanging assets between parties across borders, and sealing digital contracts. Payment and authentication processes can be made more convenient for citizens and can include parties that are currently outside the traditional financial system

Blockchain is noteworthy because of its high likelihood of a transformational impact on many nonfinancial government uses, including identities, voting, public records, citizen transactions and more. This innovation profile is contextualized for governments generally (federal,

state/regional and local/municipal), and its positioning has been determined from the perspective

of government use cases.

5   Chapter Six:
Conclusion and future work

This study examined the factors influencing public adoption to digital services. A systematic review was conducted to synthesize the findings from published researches concerning factors affecting citizen adoption of digital government in several countries, in total, 471 articles were identified to be relevant to the topic, of which, 131 were shortlisted, then a final refinement of 28 articles were studied based on the search strategy.

Second, a case study was also conducted an empirical analysis to provide insightful findings on United Arab Emirates' users behavior towards digital services,

From the systematic review, the first objective of this research was achieved, to identify the main reasons behind low levels of public adoption such as Perceived Ease of Use, Perceived Public Value, Trust, Culture Uncertainty avoidance, Self-efficacy, Compatibility, Complexity, and others.

To overcome these factors, Governments should ensure enabling trustworthy, accountable, inclusive and effective environment for government processes and operations to help in bridging the gap and leaving no one behind

Greater transparency and inclusiveness can be achieved by empowering the public in decision making will enhance transparency and public trust in government, also governments should target user centricity and engaging users in design thinking and service creation will help motivate the public to adopt the digital government.

User satisfaction and User happiness are two key measures that are related to public adoption of government services. It will be a smart idea to conduct a survey to measure the public happiness towards the digital services.

The case study revealed that UAE public who access the Government services focus mainly on certain areas, where we should focus our efforts on, such services as, Visas, Taxes, and Employment. Those topics worth investing the time and effort to think of innovative ideas to help in capitalizing on the public needs and enhance public adoption.

Age groups ranging from 40 to 44 are the most who are using the digital government services. A research can be conducted to analyze the reasons behind the significant difference in service adoption among different age groups. Hence put a plan to bridge this gap and engage other age groups.

Governments should encourage engagement and public participation of public, private and civil society stakeholders in both co-creating activities for public services design and delivery and also in policy making.

The newly emerging technologies and the digital government are all based on data, which requires governments to build capabilities in the data science field and build a society that is data aware; and in addition, governments should improve governance for better collaboration and results.

It is also worth the effort that Public behavioral analysis should be keenly monitored during the coming period, to study the impact of emerging technologies on public adoption

The research showed that public trust in digital government is one of the main issues that affects public adoption to the digital services, hence governments should ensure a risk management approach to addressing digital security issues and privacy threats.

Governments should create an agile digital strategy that reflects their digital agenda, aiming to achieve the sustainable development goals while ensuring leaving no one behind, to overcome potential digital divides.

As long as several stakeholders will take part in the digital transformation. Governments should establish effective policies and governance to coordinate the implementation of the digital strategy among all stakeholders

Governments should also strengthen the external cooperation on all levels including regionally and internationally to maximize the value of knowledge sharing in the digital transformation

Governments should at first work on developing clear business cases to invest their budgets effectively and in the right direction

References

1. ITP.net. (2018). Official UAE government portal gets 3m visits in one year - ITP.net. [online] Available at: http://www.itp.net/616839-official-uae-government-portal-gets-3m-visits-in-one-year [Accessed 1 Aug. 2018].
2. Analytics.google.com. (2018). Google Analytics 2018 [online] Available at: https://analytics.google.com/ [Accessed 5 Jul. 2018].
3. Publicadministration.un.org. (2018). UN E-Government Survey 2018. [online] Available at: https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2018 [Accessed 10 Aug. 2018].
4. Vision2021.ae. (2018). Home. [online] Available at: https://www.vision2021.ae/en [Accessed 4 Aug. 2018].
5. Uaecabinet.ae. (2018). News. [online] Available at: https://uaecabinet.ae/en/details/news/mohammed-bin-rashid-attends-first-meeting-for-uae-gender-balance-council-approves-gender-balance-index [Accessed 12 Aug. 2018].
6. Worldpopulationreview.com. (2018). [online] Available at: http://worldpopulationreview.com/countries/united-arab-emirates-population/ [Accessed 10 Aug. 2018].
7. Itu.int. (2018). WSIS-SDG Matrix. [online] Available at: https://www.itu.int/net4/wsis/sdg/ [Accessed 10 Nov. 2018].
8. Government.ae. (2018). The United Arab Emirates Government Portal 2018. [online] Available at: https://www.government.ae/#/ [Accessed 11 Aug. 2018].
9. Data.bayanat.ae. (2018). Population by Age Groups, Gender and Nationality - UAE Population By Age Groups, gender and Nationality - UAE Open Data Portal. [online] Available at: http://data.bayanat.ae/en_GB/dataset/population-by-age-groups-gender-and-nationality/resource/c69db246-2d77-4acf-a92a-0ff32af69f78 [Accessed 11 Aug. 2018].
10. Kraemer, K. and King, J.L., 2006. Information technology and administrative reform: will e-government be different?. International Journal of Electronic Government Research (IJEGR), 2(1), pp.1-20.
11. Ozkan, S. and Kanat, I.E., 2011. e-Government adoption model based on theory of planned behavior: Empirical validation. Government Information Quarterly, 28(4), pp.503-513.Abu-Shanab, E. A. (2015) 'Reengineering the open government concept: An empirical support for a proposed model', Government Information Quarterly. Elsevier Inc., 32(4), pp. 453–463. doi: 10.1016/j.giq.2015.07.002.
12. Akkaya, C. et al. (2011) 'Components of Trust Influencing eGovernment Adoption in Germany', pp. 88–99.
13. Al-Hujran, O. et al. (2015) 'The imperative of influencing citizen attitude toward e-government adoption and use', Computers in Human Behavior. Elsevier Ltd, 53, pp. 189–203. doi: 10.1016/j.chb.2015.06.025.
14. Alhujran, O. (2009) 'University of Wollongong Thesis Collection Determinants of e-government services adoption in developing countries : a field survey and a case study'.

15. Alhujran, O. (2016) 'Determinants of e-government services adoption in developing countries : a field survey and a case study'.
16. Alomari, M. (2018) 'Mobile Government Adoption : Citizen- Centric Approach', pp. 1–5.
17. Alomari, M., Woods, P. and Sandhu, K. (2012) 'Predictors for e-government adoption in Jordan Deployment of an empirical evaluation based on a citizen-centric approach', 1(2), pp. 207–234. doi: 10.1108/09593841211232712.
18. Bonsón, E., Royo, S. and Ratkai, M. (2015) 'Citizens' engagement on local governments' facebook sites. an empirical analysis: The impact of different media and content types in western europe', Government Information Quarterly, 32(1), pp. 52–62. doi: 10.1016/j.giq.2014.11.001.
19. Carter, L. (2008) 'Trust and risk in e-government adoption', 17, pp. 165–176. doi: 10.1016/j.jsis.2007.12.002.
20. Carter, L. and Bélanger, F. (2005) 'The utilization of e-government services: citizen trust, innovation and acceptance factors *', pp. 5–25.
21. Cycle, T. H. (2018) 'Hype Cycle for Digital Government Technology ', (July).
22. Findings, K. (2017) 'Introducing the Gartner Digital Government', (July).
23. Findings, K. (2018) 'Digital Government 2030 : Planning for an Uncertain Future', (January).
24. Fu, J., Farn, C. and Chao, W. (2006) 'Acceptance of electronic tax filing : A study of taxpayer intentions', 43(2). doi: 10.1016/j.im.2005.04.001.
25. Ghalandari, K. (2012) 'The Effect of Performance Expectancy , Effort Expectancy , Social Influence and Facilitating Conditions on Acceptance of E-Banking Services in Iran : the Moderating Role of Age and Gender', 12(6), pp. 801–807. doi: 10.5829/idosi.mejsr.2012.12.6.2536.
26. Khalil, I. and Nadi, A. (2012) 'Influence of Culture on e-Government Acceptance in Saudi Arabia', (June).
27. Meftah, M., Gharleghi, B. and Samadi, B. (2015) 'Adoption of E-government among Bahraini citizens', Asian Social Science, 11(4), pp. 141–149. doi: 10.5539/ass.v11n4p141.
28. Morris, A. (2008) 'The Use of the UTAUT Model in the Adoption of E-Government Services in The Use of the UTAUT Model in the Adoption of E-government Services in Kuwait Suha AlAwadhi Department of Information Science S.Alawadhi@lboro.ac.uk Department of Information Science', (January). doi: 10.1109/HICSS.2008.452.
29. Nations, U. (2018) 'E-GOVERNMENT SURVEY 2018'.
30. Office, C. (2012) 'Government Digital Strategy 01 Executive summary', (November), pp. 1–52.
31. Rana, N. P. et al. (2017) 'Citizens' adoption of an electronic government system: towards a unified view', Information Systems Frontiers. Information Systems Frontiers, 19(3), pp. 549–568. doi: 10.1007/s10796-015-9613-y.
32. Rogers, E. M. (2002) 'Diffusion of preventive innovations $', 27, pp. 989–993.
33. Sun, P. L., Ku, C. Y. and Shih, D. H. (2015) 'An implementation framework for E-Government 2.0', Telematics and Informatics, 32(3), pp. 504–520. doi: 10.1016/j.tele.2014.12.003.
34. Thunibat, A. Al et al. (2011) 'Identifying User Requirements of Mobile Government Services in Malaysia Using Focus Group Method', 2011. doi: 10.5171/2011.141651.

35. Venkatesh, V. et al. (2016) 'Studies Linked references are available on JSTOR for this article : A Theoretical Extension of the Technology Acceptance Model : Four Longitudinal Field Studies', 46(2), pp. 186–204.

36. Waller, L. and Genius, A. (2015) 'Barriers to transforming government in Jamaica: Challenges to implementing initiatives to enhance the efficiency, effectiveness and service delivery of government through ICTs (e-Government)', Transforming Government: People, Process and Policy, 9(4), pp. 480–497. doi: 10.1108/TG-12-2014-0067.

37. Wangpipatwong, S., Chutimaskul, W. and Papasratorn, B. (2008) 'Understanding Citizen ' s Continuance Intention to Use e- Government Website : a Composite View of Technology Acceptance Model and Computer Self-Efficacy', 6(1), pp. 55–64.

38. Wani, T. A. and Ali, S. W. (2015) 'Review & Scope in the Study of Adoption of Smartphones in India', (August).