Czech University of Life Sciences Prague

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Diploma Thesis

Public E-Services: a case study of Egypt

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Thesis title

Public e-services: a case study of Egypt

Objectives of thesis

The main goal of the thesis is to explore the importance and identify the components of E-services in Egypt. The higher purpose is to deeply examine how such services contributes to the country and its people.
The partial goals of the thesis are such as:
- Investigating the strategy of the government in developing E-services
- To make a comparison between Egypt and European countries.
- Providing some solutions on how to improve those services further.

Methodology

The research strategy and methodology of this thesis will be utilized using descriptive quantitative method, that will definitely help in analysing the data and process the information gathered from various sources in order to intensely understand the concept of E-services and how it adds to the infrastructure of a country such as Egypt. Furthermore all the data gathered would definitely help in identifying the major issues for businesses from E-Services prospective. In addition we will be focusing on the comparison between Egypt and countries in EU and try to comprehend on the advantages of having E-services and to visualize the room for improvement and advancement. In the practical part, a new application will be analysed and design by using particular software engineering methods. The proposed solution will be evaluated and compared to other solutions.

The proposed extent of the thesis

60 – 80 pages

Keywords

E-Services, Security, E-Readiness, Accessibility, E-government, E-Commerce, E-business

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Declaration

I declare that I have worked on my diploma thesis titled " Public E-Services: a case study of Egypt" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 27/03/2019 _____

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Veřejné Elektronické služby: případová studie Egypta

Souhrn

Cílem této diplomové práce je prozkoumat elektonické služby, které poskytuje egyptská vláda podnikům, a jaká je mise a strategie vlády při rozvoji a implementaci těchto služeb. Tato práce zahrnuje poznatky z několika případových studií provedených egyptskou elektronickou službou. Dále popisuje Egypt z hlediska vývoje ICT a indexu rozvoje eGovernmentu. Identifikuje klíčové ukazatele, ve kterých Egypt zaostává za ostatními zeměmi. Je zde představena současná úroveň elektronických služeb v Egyptě a výzvy, kterým čelí vláda při jejich realizaci. Jsou uvedeny příklady, které brání vládě stát se efektivní v eGovernmentu. Práce analyzuje a navrhuje řešení jak začít podnikat online, které funguje jako koncept a doporučení pro elektronické služby. Tyto doporučení může vláda vzít v úvahu k implementaci v blízké budoucnosti.

Klíčová slova: Elektronické služby, Egypt, ICT, bezpečnost, připravenost používat elektronické služby, eGovernment, elektronické obchodování.

Public E-Services: a case study of Egypt

Summary

This thesis aims to explore the E-Services provided by the Egyptian Government to businesses and to examine the government efforts in terms of what missions and strategies they are adopting for developing and implementing these services. It also includes several findings from different case studies conducted on Egypt E-services. This thesis also describes Egypt in terms of ICT development and E-Government development indices. It highlights what are the key indicators that the country lacks in an attempt to identify how these indicator affect the country's rank among other countries. Furthermore current state of E-Services in Egypt and the challenges the government faces in implementing them will be explained and examples will be provided on what hinders the Government from becoming an efficient E-government. An E-service solution on how to start a business online is analysed and designed that acts as a concept and recommendations for an E-Service the government can take into consideration and implement in the near future.

Keywords: E-Services, Egypt, ICT, Security, E-Readiness, Accessibility, E-government, E-Commerce

Table of content

1 Introduction 11

2 Objectives and Methodology 12

2.1 Objectives 12

2.2 Methodology 12

3 Literature Review 13

3.1 Introducing E-services 13

3.1.1 Importance and benefits of E-services 16

3.2 E-Government: Digital Public Services 17

3.3 Egyptian E-Government 18

3.3.1 Egyptian Government strategy for E-services 19

Measuring the Digital Society in Egypt 21

3.3.2 Internet User Behaviour 22

3.3.2.1 Challenges preventing individuals from using the internet 23

3.3.3 Government Entities 24

3.3.3.1 Internet Activities Undertaken by Government Entities 24

3.3.4 Business Enterprises 25

3.3.4.1 Internet Usage of business enterprises by firm size 25

3.3.4.2 Internet Usage of Business Enterprises by Sector 26

3.3.4.3 Internet Activities Undertaken by Business Enterprises 26

3.3.4.4 Challenges Preventing Business Enterprises from Using the Internet27

3.3.5 Challenges Preventing Business Enterprises from Engaging in e-Government Services (2015) 28

3.3.5.1 E-Government Activities Undertaken by Businesses 28

4 Practical Part 29

4.1 ICT Comparison between Egypt to European countries 29

4.2 Analysis 34

4.2.1 Qualitative Survey – Interview with business representatives 34

4.2.1.1 Challenges faced by the Egyptian government in developing E-Services 37

4.2.1.2 The proposed solution 40

4.2.2 Use case Scenarios and Diagrams: 48

4.2.2.1 Use case Diagram Login / Register via SSO service: 48

4.2.2.2 System (Overall) Use case Diagram: 50

4.2.2.3 Establishment of a contract (Fast) service Use case Diagram:..... 51
4.2.3 Sequence Diagrams: 53
4.2.3.1 Sequence Diagram for SSO registration: 53
4.2.3.2 Sequence Diagram for establishing company contract (Fast): 54
4.3 Design 55
5 Results and Discussion 65
5.1 Comparing between Estonia's solution and the proposed solution 65
5.2 SWOT analysis for the propose solution: 66
5.3 Identify Stakeholders 67
6 Conclusion and Future work 68
7 References 70
8 Appendix 72

List of Figures

Table 1: Strategic goals [Source: MCIT portal] 19
Table 2: Financial Development Program [Source: MCIT portal] 20
Table 3: International Internet Bandwidth [Source: MCIT portal] 21
Table 4: Internet Activities by individuals [Source: MCIT portal] 22
Table 5: Using internet challenges [Source: MCIT portal] 23
Table 6: Government usage for internet [Source: MCIT portal] 24
Table 7: Government Internet Activities [MCIT portal] 24
Table 8: Business enterprises usage for internet [Source: MCIT portal] 25
Table 9: Business enterprises Internet Usage by firm size [Source: MCIT portal] 25
Table 10: Internet Usage of business enterprises per sector [Source: MCIT portal] 26
Table 11: Internet Activities undertaken by business enterprises [Source: MCIT portal] 26
Table 12: Challenges preventing business enterprises from using the internet [Source: MCIT portal] 27
Table 13: Challenges Preventing Business Enterprises from Engaging in e-Government Services (2015) [Source: MCIT Portal] 28
Table 14: E-government activities undertaken by businesses [Source: MCIT Portal] 28
Table 15: ICT Development Index: indicators, reference values and weights [Source: ITU portal] 30
Table 16: IDI ACCESS SUB-INDEX [Source ITU] 31
Table 17: IDI USE SUB-INDEX [Source ITU] 32
Table 18: IDI SKILLS SUB-INDEX [Source ITU] 33
Table 19: Egypt E-government development Index [Source: public administration UN Portal] 33
Table 20: Types of companies involved in the interview conducted [Source: Self] 35

Table 21: GAFI - Start a business Tab [Source: GAFI Portal]....37
Table 22: Internet penetration in Egypt [Source: Statista 2018] 39
Table 23: Non-SSO Scenario [Source: auth0 website]....46
Table 24: Using a Central Authentication Domain [Source: Auth0]....47
Table 25: SSO Use case diagram [Source: own]....48
Table 26: System Overall [Source: own]....50
Table 27: Establish Business online use case diagram [Source: own] 51
Table 28: Squence Diagram for SSO Registration [Source: own] 53
Table 29: Sequence Diagram for registering business online [Source: own]....54
Table 30: Wireframe for login page [Source: own]....55
Table 31: Wireframe for SSO registration page - First Tab [Source: own] 56
Table 32: Wireframe for Phone verification tab [Source: own] 57
Table 33: Wireframe for Terms and agreement tab [Source: own]....58
Table 34: Wireframe for Register Business online Service Homepage [Source: own]....59
Table 35: Wireframe for First Tab - Company type [Source: own] 60
Table 36: Wireframe for Register company name tab [Source: own]....61
Table 37: Wireframe for Submit Partners approvals [Source: own] 62
Table 38: Wireframe for Summery tab [Source: own]....63
Table 39: Wireframe for Fees and payment tab [Source: own]....64
Table 40: Illustration of E-Estonia company registration portal [Source: YouTube video]65
Table 41: Proposed Solution vs Estonia online business registry solution [Source: Own].66
Table 42: SWOT Analysis for proposed Solution [Source: own] 66
Table 43: Stakeholders [Source: own]....67

1 Introduction

It is a new era for the entire world as the most outstanding of technological advancements in the information and communications technology (ICT) sector has been the rise of internet and the unfolding of the electronic technologies (E-Technologies) such as the web-based technologies. Remarkably the E-technologies took an exponentially important role in our day to day lives. They have a tremendous impact that deeply transformed many aspects some of those includes technological, social, and political or even economical landscapes.

It is vital to understand the power that information technology provides as it works as an accelerating catalyst in economic development. It has been a major shift of focus from the developing countries to shift their attention to the development of ICT. In the latest few years ICT had been acknowledged as a very crucial tool to the economy and its contribution to the economic development of the countries. In light of recent years governments have exerted a lot of effort in providing their countries with a respectable amount of electronic services (E-Services) as it is believed that ICT has the prospective for sustaining the development of Electronic governments (E-government).

2 Objectives and Methodology

2.1 Objectives

The main goal of the thesis is to explore the importance and identify the components of E-services in Egypt. The higher purpose is to deeply examine how such services contributes to the country and its people.

The partial goals of the thesis are such as:

- Investigating the strategy of the government in developing E-services
- To make a comparison between Egypt and European countries.
- Providing some solutions on how to improve those services further.
- Analyse and design of a new e-service for companies in Egypt.

2.2 Methodology

The research strategy and methodology of this thesis will be utilized using descriptive quantitative method, that will definitely help in analysing the data and process the information gathered from various sources in order to deeply understand the concept of E-services and how it adds to the infrastructure of a country such as Egypt. In addition we will be focusing on the comparison between Egypt and Countries in EU from an ICT perspective in an attempt to comprehend the advantages of having proper E-services and to visualize the room for improvement and advancement for future development. In the practical part, a new application will be analysed and design by using particular software engineering methods. The proposed solution will be evaluated and compared to other solution.

3 Literature Review

3.1 Introducing E-services

A respectable amount of conducted researches revolves around the exploration and defining the different characteristics of e-services and e-service delivery. It is essential to shed light on the e-service delivery and not only have the focus service quality on its own. In order to comprehend E-services it is important to look at the bigger picture and to differentiate each factor from one another.

One of the top e-services adopted by governments is the e-government service and there are several factor in the e-government that needs to be revealed some of those factors are:

- **E-readiness:**

  To better comprehend e-readiness a definition is in order it is a factor to measure how the ability of a country to influence digital channels for commerce, communication and government in order to rapidly increase the social and economic development. In understanding of e-readiness comes the comprehension of how the usage of internet services and communications devices help citizens and businesses to flourish and expand their efficiencies. In addition the understanding of how e-readiness can extend and governments and exploit it to assist in the development of the informant and communications technology industries.

  A vast number of researches revolved around the e-readiness but their focus mainly was on analysing and studying of different services in the form of its public policies and infrastructure while missing one important aspect the e-readiness or the citizen participation in it. Based on an article written by Ramessur Taruna Shalini She mentioned in her article “The results of the research project reveal that a high e-readiness index may be only indicating that a country is e-ready in terms of ICT infrastructure and info structure, institutions, policies, and political commitment, but it is a very poor measure of the e-readiness of citizens. To summarize the findings, it can be said that Mauritius is e-ready but the Mauritians are not, and the main factors preventing the citizens from being e-ready are resistance to change,

static websites, and a lack of awareness and trust in online public services." (Shalini, 2009)

- **Security**

  When implementing e-services security is conceded one of the most critical challenges that is being faced as without security there is absolutely no guarantee of privacy and security which will definitely cause a chain reaction from the citizens to not use or not to be willing to adopt the e-government services due to the lack of security. Different types of attacks causes' security concerns such as stealing credit card information or hacker attacks on the system. Such doubts of insecurity forces the hand of the governments to be a bit hesitant in providing such e-services or online services to the public. According to a statement of Linda D. Koontz Director, Information Management Issues "security concerns present one of the toughest challenges to extending the reach of e-government. The rash of hacker attacks, Web page defacing, and credit card information being posted on electronic bulletin boards can make many federal agency officials—as well as the general public—reluctant to conduct sensitive government transactions involving personal or financial data over the Internet."(Koontz, 2002).

  Citizens would pretty much like to be assured about the safety of those services provided when they are performing any sort of online transactions or interacting with the online services and to be assured that by providing or submitting any sort of information related has to remain confidential and secured. In general security a very challenging aspect that is being faced by the implementation and development of e-services.

- **Accessibility**

  Accessibility is another important factor since it shows the user's ability to access the online services or e-services in general, however most of the e-services provided by the governments failed to serve users with disabilities as they have been pressured by the rapid technological advancement and

the eagerness for better and widely improved transparency and efficiency in public administration. In addition each day that passes by a new e-government webpage is introduced to the web, however many of those websites are poor and not meeting the citizens' satisfaction and as a result some of those website are left abandoned due to a greater fear of using those website by the citizens. Hence developers of such web sites or web services have to take into consideration the usability standards.

- **Efficiency**

  This is one of the main objectives of the e-government in order to improve the agency efficiency and as well as offering more benefits to the citizens such as ease of access, more information provided or even better quality of interactions with the agencies. Efficiency is being focused on from government departments when it comes to the internal competence as it shows the way of delivering the e-services. According to one European journal that elaborates the importance of efficiency "There is an emerging trend seemingly moving away from the efficiency target and focussing on users and governance outcome. While the latter is worthwhile, efficiency must still remain a key priority for E-Government given the budget constraints compounded in the future by the costs of an ageing population. Moreover, efficiency gains are those that can be most likely proven empirically through robust methodologies"(Codagnone, 2008)

3.1.1 Importance and benefits of E-services

As a citizen it is wise to question whether if this services will be of benefit or not, hence shedding some light on the benefits of e-services is vital in understanding the reasons to accept using these services and put citizens' minds at ease and intrusting the government. Such benefits is not only for citizens it involves everyone all the stakeholders, the e-services benefits are:

- It enables the companies and local markets to gain and sustain competitive advantages.
- It helps realizing business strategies.
- Reducing the delivery time and transaction time.
- Around the world anything where ever it is sold can be purchased with just few mouse clicks and of course a credit card's number. So shoppers will exert no effort or waste time at all in standing in queues or go to shops physically.
- Online transactions using money and credit cards are now so easy to use and fast to interact with. Which has definitely taken the financial environment to a whole new level a boost to a new future.
- Being able to access the services at any time of day available 24/7.

3.2 E-Government: Digital Public Services

Improving the activities of public sector organisations and providing public services to citizen and business enterprises through using the information & communication technologies (ICTs) is the basic definition of E-government (Heeks, 2008). Many tools such as civic tech, automation, open data, govtech and much more advanced complex digital service design that would render services to be more effective, cost efficient and radically smarter; have been adopted by governments who had undergone digital transformation. Not only pushing those governments towards the future but also it triggered an exceptional leap forward in public services (apolitical, 2018).

A wide variety of benefits can be provided through an effective E-government that means better savings for enterprises, originations and governments, more efficient, citizens become more involved in political life and increased transparency between governments and the public sector. The benefits and advantages brought by a successful implementation of e-government are identically applied to both developing a developed countries. The e-government applications provides several benefits for business entities, citizens and governmental institutions as well. As such services enables users to access the government data/information any time throughout the day, as it is available 24/7. Which improves intensely the level and quality of services provided to the people, businesses and government sectors. A proper implementation of the e-government will greatly reduce the operational costs and the levels of the organizational processes though reorganizing the operating procedures and streamlining them (M. Alshehri, S. Drew, 2019).

In addition, by increasing the frequency of using the e-services provided by the government it will help in developing a better understanding and improves the performance of any government entities in better delivering public services in a more efficient and effective manner for all customers (M. Alshehri, S. Drew, 2019).

3.3 Egyptian E-Government

In order to observe the transformation of the Egyptian government a journey down the history would be an imperative key to understand its transition to a digital government. Looking into the past decades, various reforms of the civil services were carried out by the Egyptian government. The information and decision support centre was established in 1985 as an opportunity to help government initiatives in facilitating the public accessibility of government information. Moving forward in time, the government took another step in easing the transition of the country into the global information society by establishing the ministry of communication and information technology in 1999. Various online services such as accessing telephone bills started to emerge during the year of 2004, as the Egyptian's portal pilot project was lunched (Elaswad, Othoman; Jensen, Christian D., 2016).

The E-government in Egypt has a vision of providing public services to all citizens in a way to suit them. A number of projects were initiated by the ministry of state for administrative development (MSAD) with the aim to integrate and build an Egyptian Citizens National Databases. In addition, the MSAD had recognized the most frequent public services requested by the citizens through reviewing all public services thus unifying the decrees that governs service delivery and reduced the procedures and documentations required. Such action has transformed those public services that were provided through the internet into a one-stop-shop. Online public libraries, electricity bills inquiries, Egypt Air flight services, tourism complaints, renewing car license, guides for college enrolments and most importantly the replacement services for National ID or birth certificates are merely examples of citizens services provided. The business community was not forgotten, as it was also a target of some of these public services while other public services targeted the Citizens. Some of the business services supported are online banking, commercial license registration, customs services and guides for exports. The Egyptian government's portal was mentioned in a case study that it provides more than 70% of public services and that online transaction was a Milestone achieved by the Egyptian e-government initiative (Elaswad, Othoman; Jensen, Christian D., 2016).

3.3.1 Egyptian Government strategy for E-services

The Ministry of communications and information technology (MCIT) aims to support the Egyptian ICT sector that have a vital role in achieving the economic, social and political goals during the current transition period in Egypt. Their purpose is to firmly build a strong positive interpretation of systems and ICT tools, in addition to facilitating the adaptation and the development of the services provide in order to meet the requirements of the Egyptian society. Which includes the development of tools and applications that support online services and digital citizenship. Their mission is to develop and sustain a robust democratic knowledge based society that boosts the Egyptian economy and is based on reasonable access to communication services and information. It also guarantees the digital right of citizens and facilitates the development of a national industry that is endorsing the human talent and creativity (MCIT, 2019). The following table is an illustration of the strategic goals that the government aims for to improve the government ICT infrastructure and Digital services:

	Strategic Goals			
	Supporting the Democratic Transition	Promoting Digital Citizenship and Information Society	Promoting Sustainable Development	Strengthening the National Economy
Government ICT Infrastructure and Digital Services	▪ Digital identity management program	▪ E-signature activation program ▪ e-Commerce program ▪ Initiative for education development using IT, cloud computing and the Egyptian Educational Tablet Computer ▪ Green ICT initiative ▪ Arabic digital e-Content initiative	Programs to develop State sectors: ▪ Healthcare services ▪ Educational services ▪ Agricultural services ▪ Development of commercial sector activities through chambers of commerce ▪ Development of financial sector activities ▪ Improvement of the work environment in administrative entities ▪ Legislative services ▪ Housing sector ▪ People's Assembly and Shoura Council work systems ▪ Transport system ▪ Security system ▪ Tourism system ▪ Infrastructure in marginalized regions ▪ Ministry of Foreign Affairs system ▪ Ministry of Culture system ▪ National Broadband Initiative	▪ National Broadband Initiative ▪ Arabic digital e-Content initiative ▪ E-signature activation program ▪ e-Commerce program ▪ Initiative for education development using IT, cloud computing and the Egyptian Educational TABLET

Table 1: Strategic goals [Source: MCIT portal]

MCIT aims to support the research and development, innovation and entrepreneurship from an ICT perspective. In addition to assist in improving the government entities' performance and to the increase the level of the service quality they to the public. Some of the strategic objectives for the government ICT infrastructure and digital services is creating better work environment and support for decision making, Such as providing proper access to the public services across the governorates, Help in developing information systems and databases, and support the senior management in decision making (MCIT, 2019).

In addition to the cyber security program where the government focuses on developing and implementing tools/Applications that helps in establishing a sufficient human capacity to activate e-services across all sectors, which is also incorporated with universities, the private sector and NGOs. Furthermore they aim to cooperate with not only various other countries but also the international organizations that are related to the fields of e-service provision and cyber security. The infrastructure has to be established as well given the necessity of ensuring confidents in electronic transactions and defend the digital identity such as the credit bureaus and public key infrastructure. The cyber security program also aims to raise the public awareness towards the importance of cyber security but it also encourages individuals, businesses and institutions to the benefits of electronic services how it can facilitate their day to day tasks and activities (MCIT, 2019).

Last but not least the government aims to endorse the business sector through the financial sector development program that would boost the productivity and efficiency of the business entities that would return benefits towards the Egyptian economy as shown below (MCIT, 2019):

Financial Sector Development Program	■ Creating an empowering legislative and regulatory environment to facilitate the growth of e-commerce on the business-to-business (B2B), business-to-government (B2G) and business-to-consumer (B2C) levels both nationally and internationally ■ Maintaining a legal and regulatory framework that promotes development of the logistics infrastructure necessary to support growth in e-commerce on the national, regional and international levels ■ Preparing the human resources necessary to boost e-commerce through the development of relevant applications, particularly payment and clearing systems

Table 2: Financial Development Program [Source: MCIT portal]

Measuring the Digital Society in Egypt

Egypt with 18 maritime cables is considered to be the second largest country in the world, the cables stretches more than 160,000 KM. At the moment Egypt owns a global peering license, in addition to 7 carrier internet licenses (Class A), 4 Data service providers licenses (Class B) and plus around 154 service-based ISPs' licences (Class C). All of which provide ADSL services to the country (MCIT, 2015).

In addition the internet speed provided by the ISPs in Egypt have different speed that goes up to 24MB. As for the structure of technology of the internet services provided in Egypt, it is provided through both wireless and fixed internet. Wireless internet is provided through the mobile network that includes (users' handsets and USBs) and Satellite internet. While on the other hand, Fixed internet in Egypt is provided as either narrowband (Dial up and ISDN) or broadband (ADSL and Leased Lines). (MCIT, 2015).

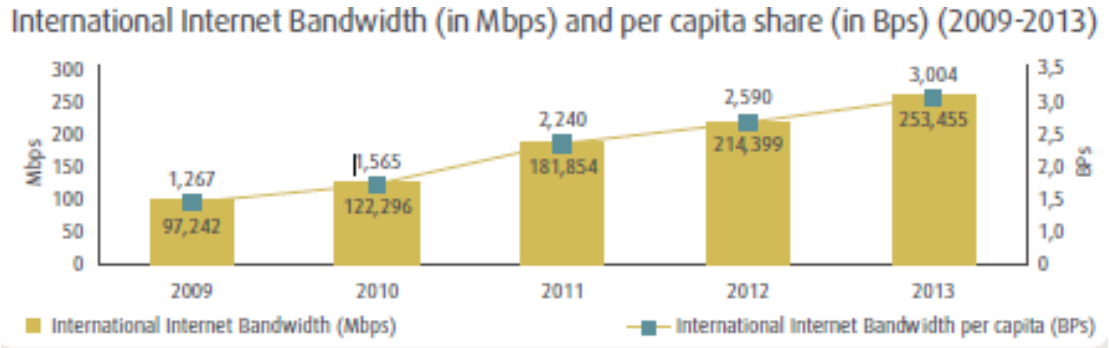


Table 3: International Internet Bandwidth [Source: MCIT portal]

This indicator refers to international internet bandwidth is calculated in megabits per second (mbps), while Internet bandwidth per capita is calculated in bit per second per person ((byte/second/person).

International internet bandwidth grew greatly during the last five years from 97,242 Mbps in 2009 to 253,455 Mbps in 2013, which is almost 160% increase. In 2013 it shows that the used capacity has reached 84.7% of the internet bandwidth available (MCIT, 2015).

Consequently, the international internet bandwidth per capita increased as well during the same period by 137% from 1,267 Bps to reach 3,004 Bps (MCIT, 2015).

3.3.2 Internet User Behaviour

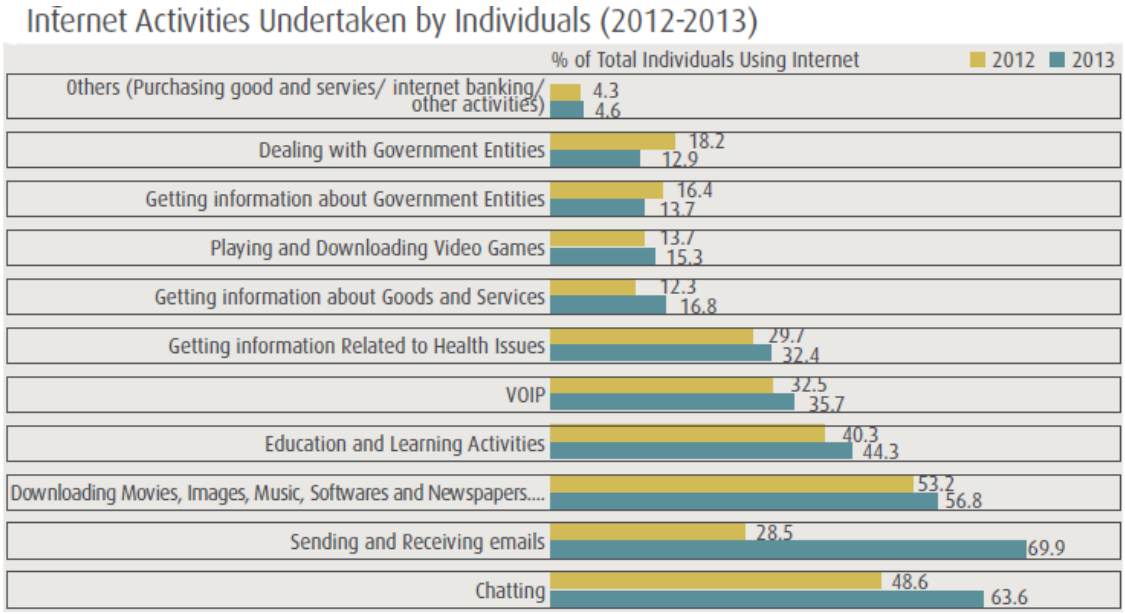
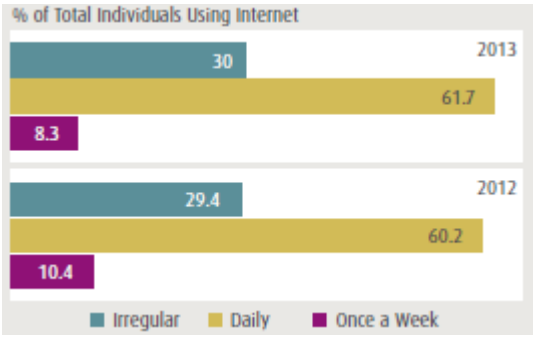


Table 4: Internet Activities by individuals [Source: MCIT portal]

One of the most common internet activities performed by individuals in 2013 is chatting, Figure 4 Shows about 63.6% of users chat over the internet. On the other hand sending and receiving emails is also considered as a more frequently performed activity with Usage percentage of (69.9%) followed by includes downloading movies, images, music and watching TV (56.8%).

In 2012 and 2013, Dealing with government entities (18.2%-12.9%) and getting information about the government entities (16.4%-13.7%) is quite low and it shows that the government should make an effort advertising for its e-services and to facilitate the ease of access for users.



In 2013, daily usage was the most common internet access frequency rate. In 2013, 61.7% of total internet users used internet daily, increasing from 60.2% in 2012. While 30% of the users accessed the internet on irregular pattern (MCIT, 2015).

3.3.2.1 Challenges preventing individuals from using the internet

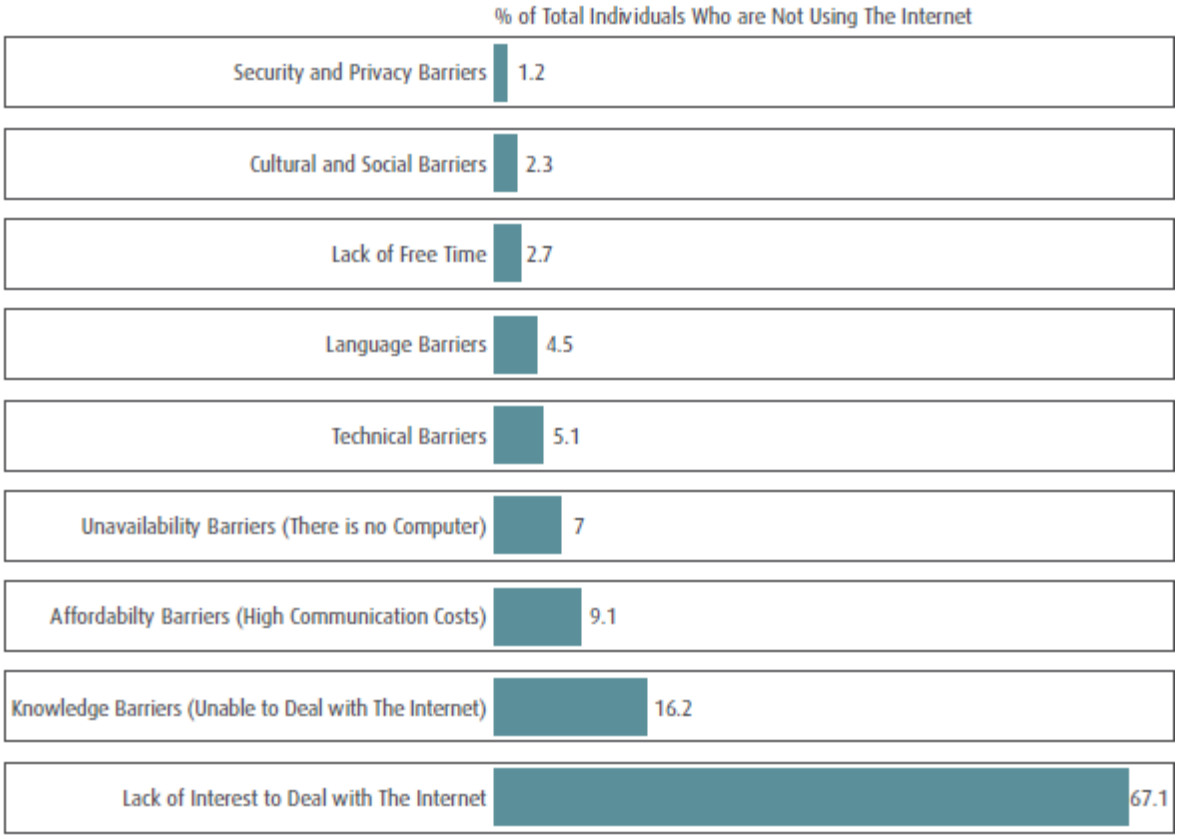


Table 5: Using internet challenges [Source: MCIT portal]

Among the challenges preventing individuals from using the internet in 2015 was the lack of interest to deal with internet (67.1% of individuals who are not using the internet). While 16.2% and 9.1% of individuals not using the internet identified knowledge and affordability, respectively, as barriers to internet usage. Which presents a challenge for the government when implementing and providing online services to the country (MCIT, 2015).

3.3.3 Government Entities

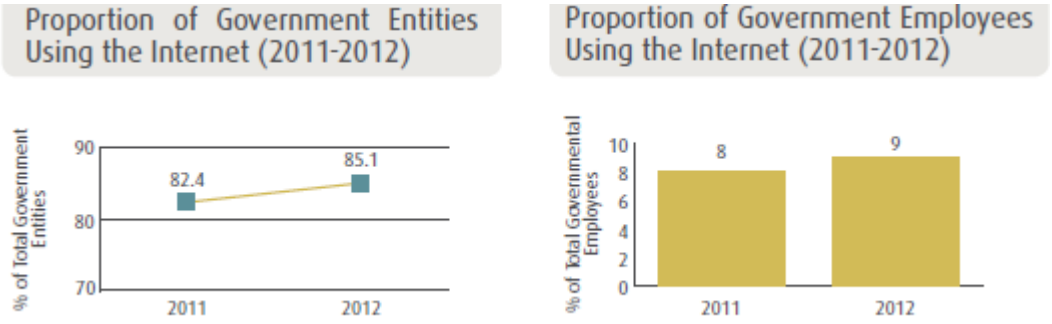


Table 6: Government usage for internet [Source: MCIT portal]

According to the MCIT government publication in 2015 the Internet usage increased in government entities between 2011 and 2012 by 2.7%. More than 85% of government entities used the internet in 2012, compared to 82.4% in 2011. This comes in line with the rise in internet usage by government employees between 2011 and 2012 by 1% to reach 9% of the total number of government employees (MCIT, 2015).

3.3.3.1 Internet Activities Undertaken by Government Entities

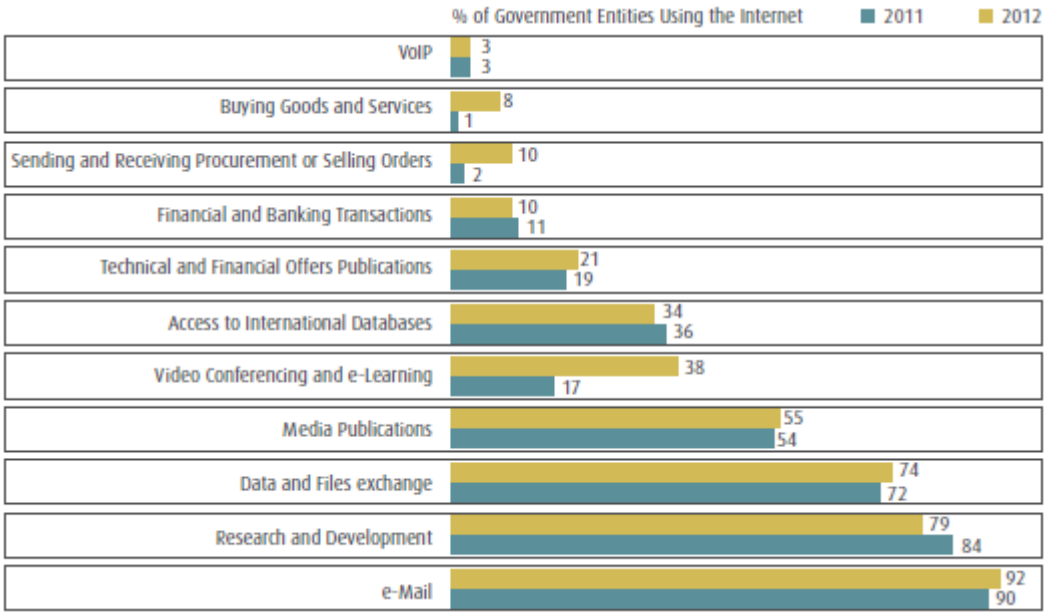


Table 7: Government Internet Activities [MCIT portal]

Emailing services were the most common internet activity undertaken by government entities in 2012, as 92% of government entities using internet used emailing services, increasing from 90% in 2011, followed by research and development (79%) and data and files exchange (74%) during 2012 (MCIT, 2015).

3.3.4 Business Enterprises

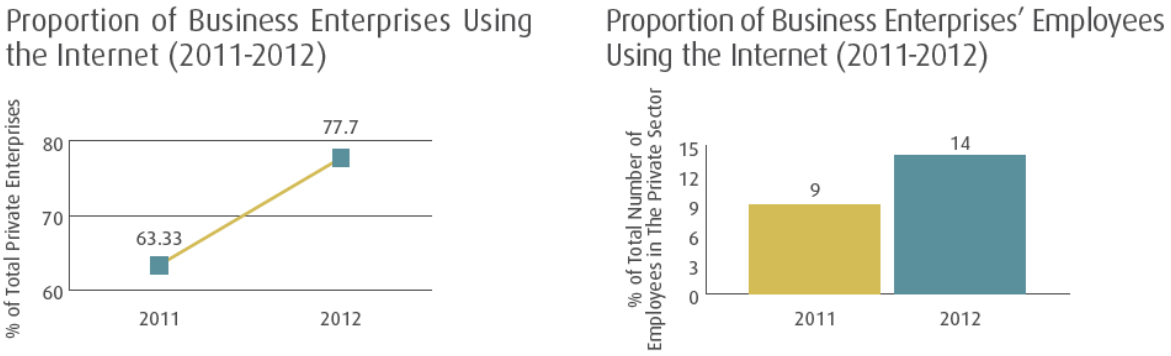


Table 8: Business enterprises usage for internet [Source: MCIT portal]

This indicator is calculated as a percentage of total private enterprises, based on the results derived from the "Private Sector Enterprises" survey released in 2011 (4,044 enterprises; 80% response rate) and in 2012 (4,676 enterprises; 92% response rate) (MCIT, 2015).

3.3.4.1 Internet Usage of business enterprises by firm size

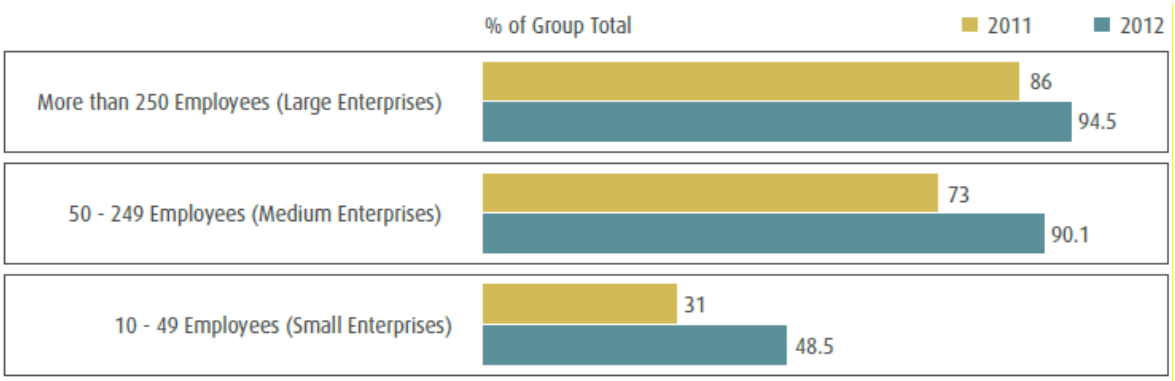


Table 9: Business enterprises Internet Usage by firm size [Source: MCIT portal]

The proportion of business enterprises using the internet reached 77.7% in 2012, increasing from 63.3% in 2011. This comes in line with the rise in business enterprises' employees using the internet from 9% in 2011 to 14% in 2012.

During 2012, more than 90% of the businesses using the internet were either large enterprises (more than 250 employees) or medium enterprises (50 – 249 employees). (MCIT, 2015)

This indicator is calculated as a percentage of each of business group, and it represents the internet usage in different business enterprises in terms of the firm size according to the number of its employees. It is calculated as a percentage of the total

enterprises in three different groups (large enterprises (more than 250 employees), medium enterprises (50-249 employees) and small enterprises (10-49 employees). Results are derived from the "Private Sector Enterprises" survey released in 2011 (4,044 enterprises; 80% response rate) and in 2012 (4,676 enterprises; 92% response rate) (MCIT, 2015).

3.3.4.2 Internet Usage of Business Enterprises by Sector

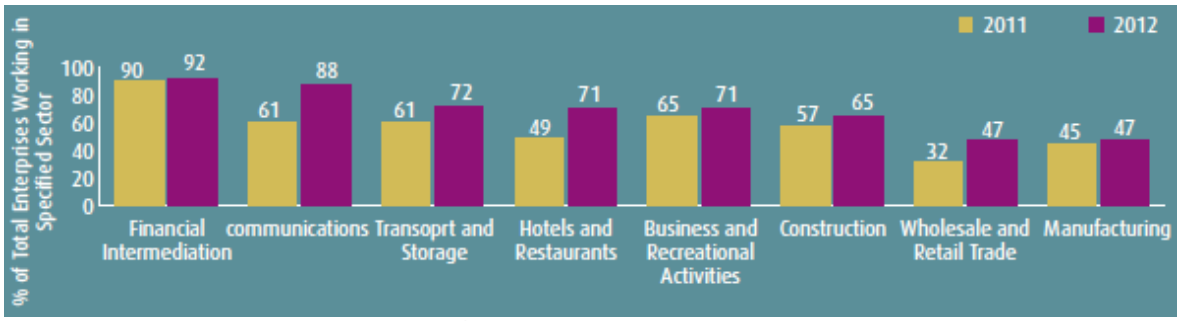


Table 10: Internet Usage of business enterprises per sector [Source: MCIT portal]

In 2012, financial and communication sectors used internet the most; where the business enterprises using the internet reached 92% and 88% respectively out of the total number of enterprises in the sector (MCIT, 2015).

3.3.4.3 Internet Activities Undertaken by Business Enterprises

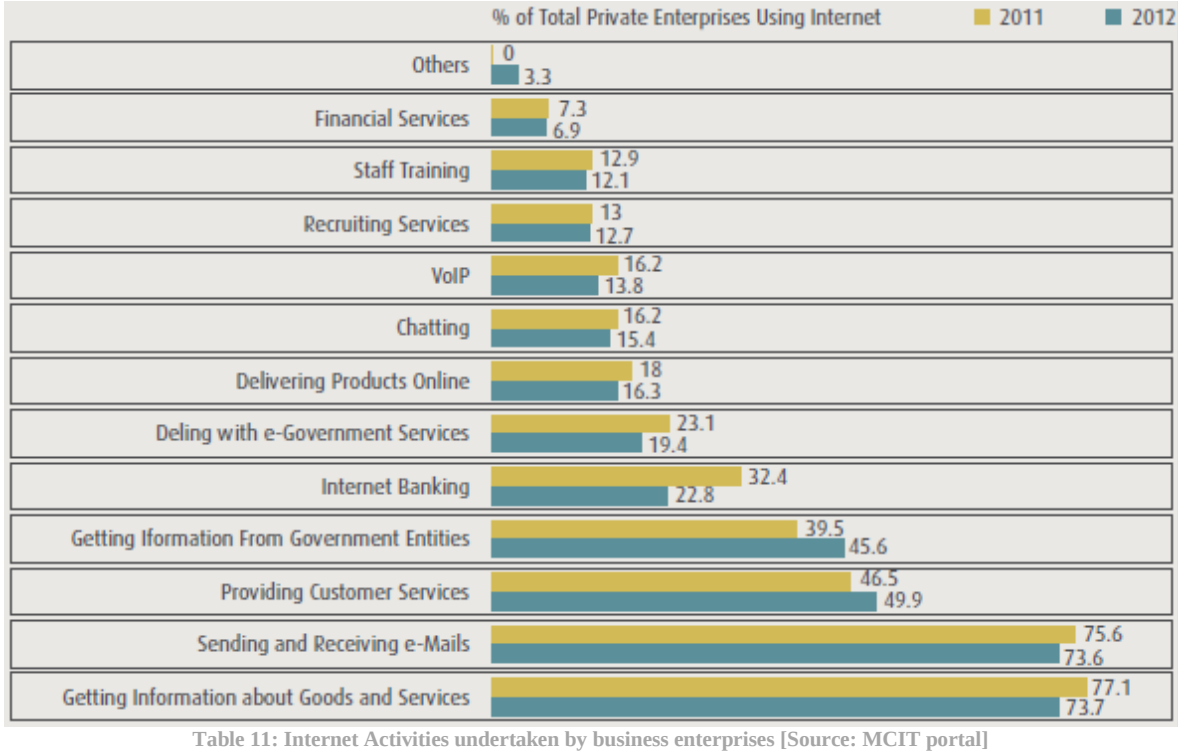


Table 11: Internet Activities undertaken by business enterprises [Source: MCIT portal]

Getting information about goods and services (73.7%) was the most common internet activity undertaken by business enterprises in 2012, followed by sending and receiving e-mails (73.6%) (MCIT, 2015).

Acquiring the data or information regarding goods and services was quite a common practice taken by business enterprises in 2012 which was 73.7% while on the other hand it was almost 73.6% for the usage of sending and receiving emails.

Furthermore, almost half of business enterprises used the internet for providing online customer services in the same year (MCIT, 2015).

3.3.4.4 Challenges Preventing Business Enterprises from Using the Internet

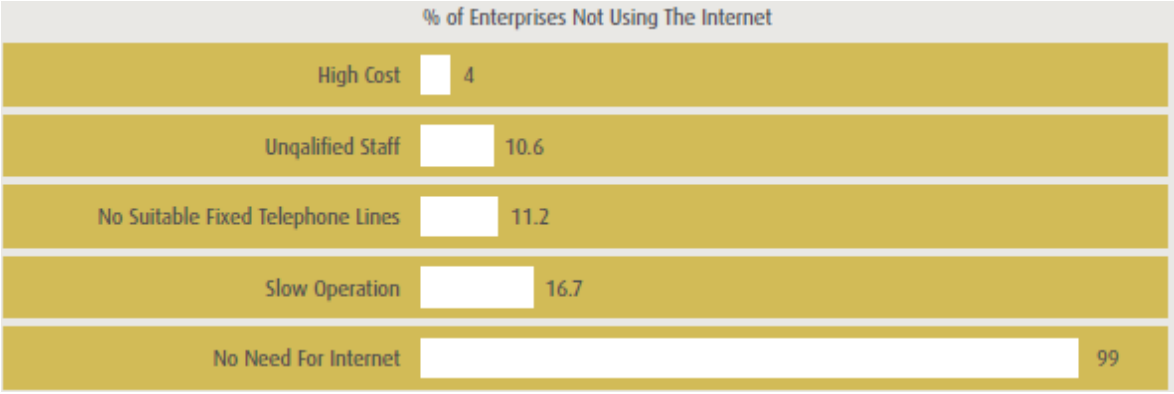


Table 12: Challenges preventing business enterprises from using the internet [Source: MCIT portal]

In 2012, 99% of the business enterprises which were not using the internet reported that they didn't need it. While slow operation and unavailability of proper telephone lines were also among the main reasons of business enterprises not using the internet, with 16.7% and 11.2% respectively (MCIT, 2015).

This sort of percentage in which business enterprises found no need for internet represents is somehow showing the real meaning of the word technophobic. It shows that such companies are not aware of the potential for growth and enhancement for their profits and reduction in their expenses. Maybe such companies are simply afraid of taking the risk, security reasons perhaps, being exposed on the web as transformation from an offline enterprise to an online E-business is a huge step and full of challenges but the rewards are great if studied, carefully planned, analysed and implemented properly.

3.3.5 Challenges Preventing Business Enterprises from Engaging in e-Government Services (2015)

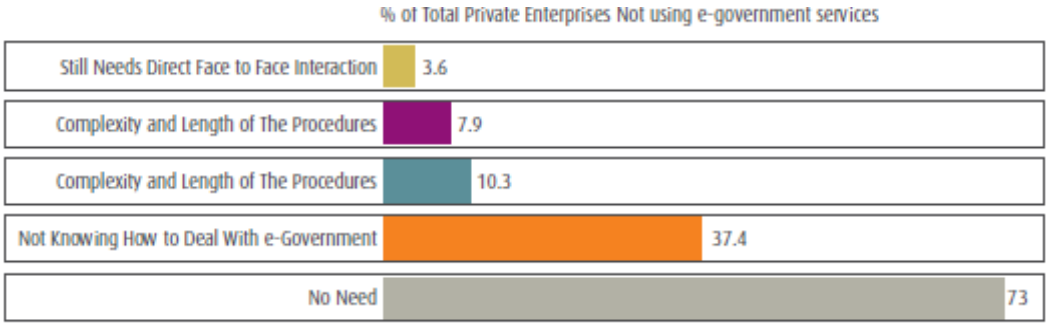


Table 13: Challenges Preventing Business Enterprises from Engaging in e-Government Services (2015) [Source: MCIT Portal]

In 2015, around 73% of business enterprises which did not engage in e-government activities reported that there was no need for it which is quite shocking result, and 37.4% claimed that they do not know how to deal with e-government services. Only 3.6% of these enterprises reported that not all procedures for e-government services are conducted online and that there were some procedures that needed to be done face to face (MCIT, 2015).

3.3.5.1 E-Government Activities Undertaken by Businesses

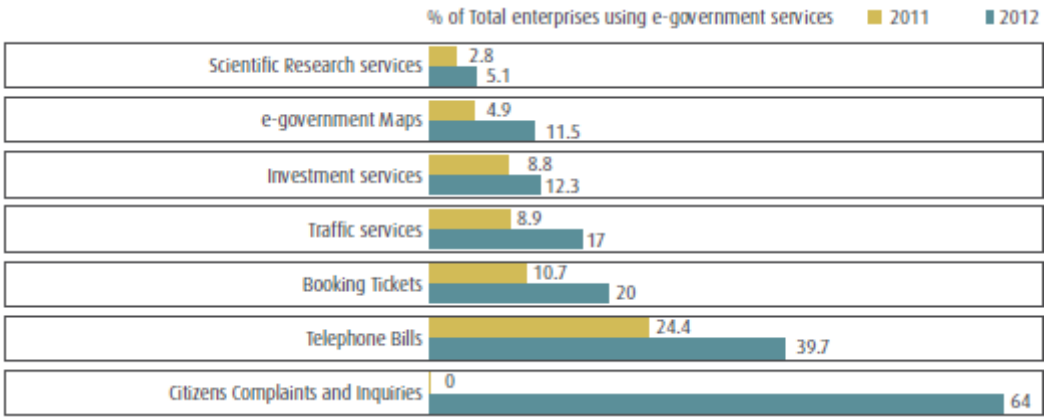


Table 14: E-government activities undertaken by businesses [Source: MCIT Portal]

A considerable percentage of business entities using E-Government services have increased between 2011 and 2012 by 5.7%. In 2012, 64% of business entities have engaged in E-Government services in order to access the citizens' complaints and inquiries service, while 39.7% used the service provided in order to pay the telephone bills (MCIT, 2015). It can be deduced that the E-government activities provided so far are not of so much interest for the business or at least not the services that would add value to their business.

4 Practical Part

4.1 ICT Comparison between Egypt to European countries

In a better practical approach we have to take into consideration the differences between Egypt and other countries when it comes to ICT development which will be based on the three levels of country development, in our case choosing Czech Republic and Serbia as a subject for comparison. Such comparison would bring us closer to understand the variances not only from a digital divide perspective but also given the fact that Czech republic is classified as a "developed" country from an economical position, Egypt is on the other hand is currently classified as a "developing" country and last but not least Serbia which is at the moment considered as "Economy under transition" country according to the United nations document on World Economic Situation and Prospects 2018 (United Nations, 2018).

There are quite a substantial differences in levels of ICT development when it comes to comparing between such countries from a geographical region viewpoint. Mobile broadband subscription would be a great example to show the digital division specially the low development countries "LDCs" in the comparison between developed and developing countries. Mobile broadbands subscriptions per 100 inhabitants are almost as twice as many in developed countries when compared to developing countries, Europe is almost as three times compared to Africa. Thus proving that Subscribers tend to have a great advantage in benefitting from high bandwidth in developed countries than those in developing countries (International Telecommunication Union, 2017).

A question would be raised on the reason behind picking countries in Europe as subjects for comparison, it is due to the fact that Europe in general is currently leading the way in ICT development as it scores the highest average of ICT development index (IDI) among other world regions. Such high level of economic development and competitive communication markets is a definitive evidence on this regions level of ICT skills. There are 40 countries in Europe in which 28 of them lay within the highest quartile (International Telecommunication Union, 2017).

The purpose of the index is that it is designed to monitor the differences on a global scale and reflects the changes occurring on different levels of ICT development for the countries. Since it is based on a limited set of data it is therefore established with a reasonable confidence at all levels of development in countries. The following tables should provide us with more insight on the differences in some of the IDI components that are worth mentioning between of our previously mentioned subjects of interest. The indicators included in the IDI are based on a certain criteria which includes data availability, index objectives that holds relevancy and the results of different statistical analyses such as the principal component analysis (PCA).

The following Diagram explains how the IDI is broken down into three different sub-indices and the value of each attribute:

ICT access	Reference value	(%)
1. Fixed-telephone subscriptions per 100 inhabitants	60	20
2. Mobile-cellular telephone subscriptions per 100 inhabitants	120	20
3. International Internet bandwith (bit/s) per internet user	2'158'212*	20
4. Percentage of households with a computer	100	20
5. Percentage of households with Internet access	100	20
ICT use	**Reference value**	**(%)**
6. Percentage of individuals using the Internet	100	33
7. Fixed-broadband subscriptions per 100 inhabitants	60	33
8. Active mobile-broadband subscriptions per 100 inhabitants	100	33
ICT skills	**Reference value**	**(%)**
9. Mean years of schooling	15	33
10. Secondary gross enrolment ratio	100	33
11. Tertiary gross enrolment ratio	100	33

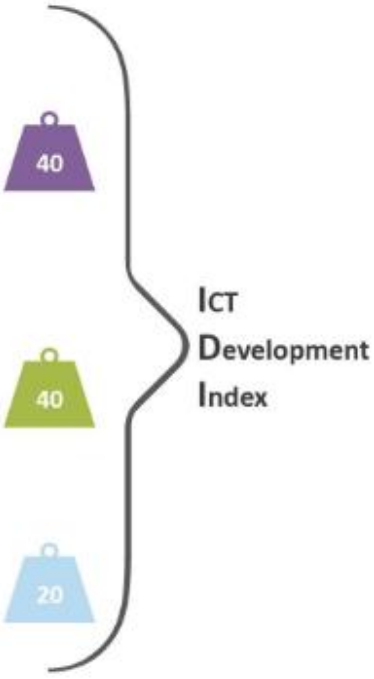


Table 15: ICT Development Index: indicators, reference values and weights [Source: ITU portal]

Starting with Stage (1) "ICT readiness" that reflect access to ICTs and the level of networked infrastructure, the following group of indicators will provide us with an insight on the availability of ICT infrastructure and the accessibility of individuals' to the basic ICTs for the countries picked for comparison, the following values are derived from 2017 IDI analysis:

	IDI Attributes	Egypt	Czech Republic	Serbia
	IDI 2016 Rank	104	39	55
	IDI 2017 Rank	103	43	55
	IDI 2017 Value	4.63	7.16	6.61
IDI ACCESS SUB-INDEX	Fixed-telephone subscriptions per 100 inhabitants	7.11	15.56	35.97
	Mobile-cellular telephone subscriptions per 100 inhabitants	113.70	115.47	120.62
	International internet bandwidth per Internet user (Bit/s)	17193.52	180696.61	26291.76
	Percentage of households with computer	53.12	75.57	65.81
	Percentage of households with Internet access	43.32	76.07	64.66

Table 16: IDI ACCESS SUB-INDEX [Source ITU]

In table (1) we can definitely start to recognise a trend in Egypt's IDI ranking that has slightly increased from 104 to 103 in the period of 2016 - 2017, while Czech Republic has declined significantly to 43 after holding a rank of 39 in 2016, on the other hand Serbia still maintains the same rank of 55 in the past 2 years. One of the most important points of comparison here is the international internet bandwidth per internet user in the three countries, by observing the significant difference between Czech republic and the other two countries we can determine that Egypt and Serbia both are struggling when it comes down to the total used capacity of international internet bandwidth. Another issue that Egypt faces is lack of households with either a computer or an internet access which poses quite the problem for citizens accessing any e-services provided by the government or a private entity. Egypt shows 53.12% as a percentage for households with computers and even less when it comes to internet access with the value of 43.32% that it is almost half

the average value of the indicators which is 100%. Compared to the other two countries Egypt is quite behind when it comes to the ICT infrastructure and access indicators.

	IDI Attributes	Egypt	Czech Republic	Serbia
IDI USE SUB-INDEX	Percentage of individuals using the Internet	39.21	76.48	67.06
	Fixed (wired)-broadband subscriptions per 100 inhabitants	5.20	27.65	18.95
	Active mobile-broadband subscriptions per 100 inhabitants	52.60	76.02	67.44

Table 17: IDI USE SUB-INDEX [Source ITU]

In table (2) the percentage of individuals using the internet is based on the users that have access to the internet through any device with such capability whether it uses fixed or mobile network. Observing the difference between three countries percentages, it can be determined that huge gap between Egypt and the other subjects, specifically showing almost half the value of Czech republic percentage for individuals using the internet. The fixed wired broadband subscriptions is intended for subscriptions for high speed access to the internet which is significantly low in Egypt given that the average value is 60, the calculated value is showing only 5.20 which barely contributes to Egypt's IDI total value.

	IDI Attributes	Egypt	Czech Republic	Serbia
IDI Skills SUB-INDEX	Mean years of schooling	7.10	12.30	10.80
	Secondary gross enrolment ratio	86.10	105.13	96.67
	Tertiary gross enrolment ratio	36.23	66.02	58.29

Table 18: IDI SKILLS SUB-INDEX [Source ITU]

In table (3) mean years of schooling describes the average number of education completed years for a country's population. Mean years has an ideal value of 15 and refers to the projected maximum number of schooling years. Serbia and Czech Republic are showing higher values than Egypt which means that their population spend more years in schooling. To conclude the ICT comparison, Egypt despite being under development country, the IDI score of 4.63 is lower when compared to a country such as Serbia whose economy is under transition.

Another point of comparison is the E-government development index, the figure below shows Egypt's E-GDI compared with Serbia and Czech Republic:

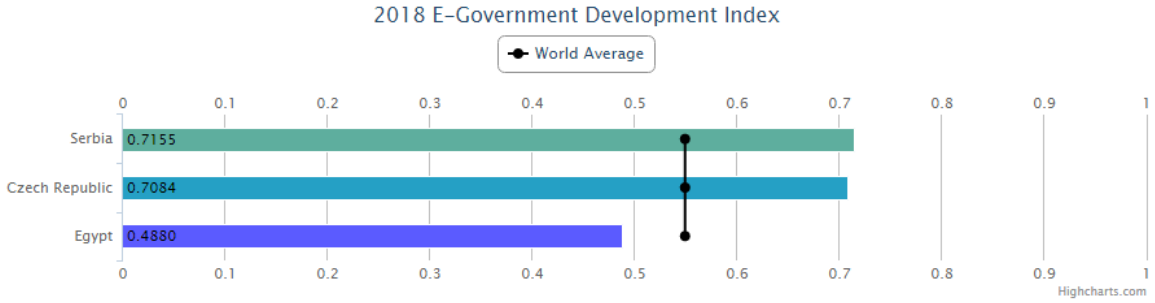


Table 19: Egypt E-government development Index [Source: public administration UN Portal]

Egypt rank worldwide is 114 in 2018 and observing the index value through the figure above, Egypt scores 0.4880 not only lower than Serbia and Czech Republic but also it shows value lower than the worldwide E-GDI average value of 0.5491 which means that Egypt still has a long way in establishing its services online and that the Egyptian e-government needs to improve its initiative to develop an effective E-government.

4.2 Analysis

4.2.1 Qualitative Survey – Interview with business representatives

Information had to be gathered from various sources for companies in order to identify the problems, discover opportunities to improve and to provide a solution to these problems. In this section an introduction would be given for certain issues that have been uncovered during extensive interviews conducted with different business owners and high management individuals of multiple establishments. The type of establishments that were targeted are not related to a certain industry or sector but rather of a diverse nature such as Agricultural companies, retailers that includes furniture, groceries, and other entities. Thus opening a gateway to exploit the current issues and develop the best approach to handle these issues. Interviewees agreed on not to disclose their identities in this research paper for the political circumstances in Egypt and will be referenced as "anonymous" respectfully, however it was acceptable to include their statements and honest opinions regarding E-services in Egypt that the investors and business owners would like to have or rather expecting to have and to be provided by the Government in Egypt in the near future.

A total of 12 interviews were conducted and to give a quick overview on the type of companies involved and their business owners and representatives that were the subjects of the interview conducted are as follows:

Company type	Company size	Interviewee Role
Grocery Retailers	3x Small sized companies 1x Medium - Large sized company with more than 3000+ Employees	2x Business Owners 1x Store General Manager
Furniture Retailers	2x Small Sized Company	1x CEO 1x Store General Manager
Travel Agency	2x Small Sized Company	2x General Manager
Book Shop	Micro Sized Company	Business Owner
Barber Shop	Micro Sized Company	Business Owner

Internet lounge (Workspace)	Micro Sized Company	Business Owner
Optronics Company and manufacturer	Medium Sized Company	Head Of business and accounting Department

Table 20: Types of companies involved in the interview conducted [Source: Self]

Throughout the 12 interviews conducted with the business owners, two service components were highlight as the most important and crucial in running their businesses:

- ✓ Starting/expanding a business online
- ✓ Paying taxes

Both components though vital but what most interviewees agreed on that paying taxes online is of complex structure and may not suit the country in the current economic and political state as that would require introducing new laws to be set in the constitution. An interviewee commented regarding their position towards the idea of implementing E-service solution to pay the taxes online, they stated: " We would totally support the idea to pay our company's taxes online, it will definitely save us a lot of time and effort just as similar to what they do currently in European countries these days, that would be better than trying to manually collect all receipts, purchase orders, invoices, etc. and put them in a folder or document holder and then go back and forth between the authorities but unfortunately this is Egypt we are talking about, if it's not supported by law then we are forced to run our business the old fashion long painful way which hinders our ability to control our business effectively" (Anonymous, 2017).

In another interview the interviewee provided their opinion on paying taxes online by saying "It is not a bad idea but I wouldn't be able to trust the system right away, since it will be new and might be vulnerable to attacks. However as a concept of paying takes online, I do agree if implemented properly and securely it would definitely benefit my company" (Anonymous, 2017). On the other hand starting a business had witnessed several changes lately including the new Investment law which was introduced in 2017 that replaced the old law, apart from the tax deductions, exemptions and customs taxation mentioned in the new law; one of the new features that is important to state is the investor services (American Chamber of Commerce in Egypt, 2018).

This investor services will enable investors to not only to acquire all licenses from the General Authority for investment and free zones (GAFI) which is associated with the ministry of Investment (MOI) and the principal government body regulating and facilitating investments in Egypt, but also it will save the investors from the need of interacting with any other authorities. GAFI will be supporting both incorporation and post-incorporation services, through collection of all fees from the applicants, and will be able to take a decision regarding the completion of the incorporated applications within their submission in one business day. The interesting fact mentioned in the law is that GAFI will establish electronically certain components or services to be provided and facilitate incorporation activities that they require to conduct their businesses. In addition, the investors are to be presented by private sector approval offices that are accredited and licensed by GAFI in front of government authorities (American Chamber of Commerce in Egypt, 2018).

Questions had to be raised around the matter of the government initiative in developing these services, "Are these projects already initiated?", "Are they still active?" ,"As a potential user what is the feedback around using these services?" Based on the answers gathered from the early interviews "Yes, we can already see on the E-government portal that they have launched a new e-service for business starters and investors. The link directs you to GAFI but the only thing we can do is to take appointment online and that is it. Not exactly the service we expected" (Anonymous, 2017) in another interview conducted with a CEO of one of the entities, the question had to be directed towards investigating or rather uncovering the truth about the efforts in which the government has stated that they have launched a new e-service for starting a business online, the interviewee stated "I've been checking this website occasionally since they announced it in 2015 and they haven't updated it since. Same message appearing "<this page is currently under maintenance please try again shortly>" (Anonymous, 2018).

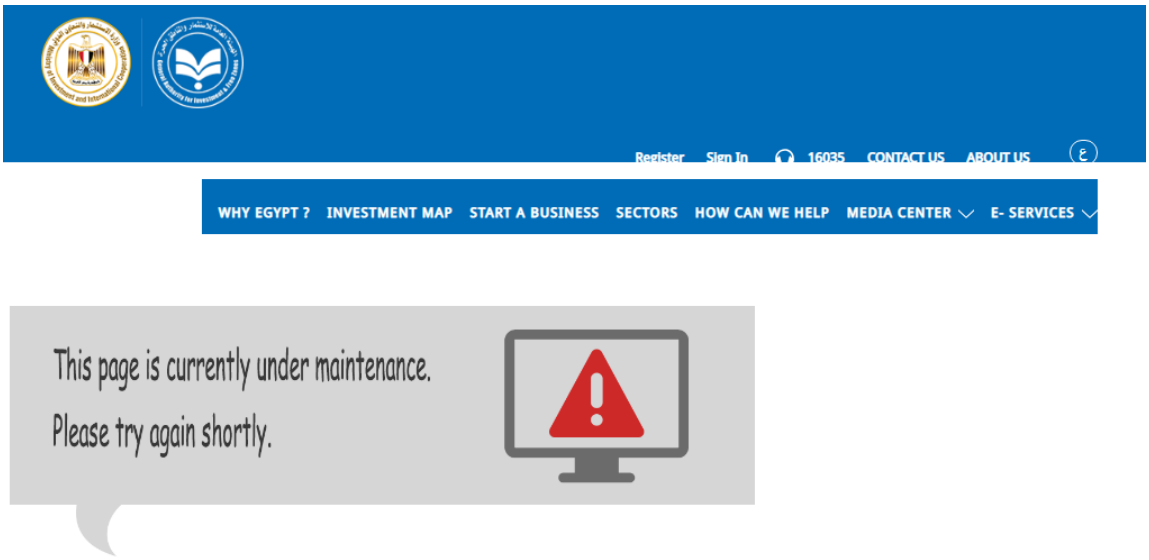


Table 21: GAFI - Start a business Tab [Source: GAFI Portal]

The discovery of such inactive service and the collection of the interviewee's answers leads to more questions and possibly an opportunity that this is in fact a missing piece and a key component that investors or business owners are looking forward to use but was not provided yet. Apart from the government attempts to reform this service, It appears that not only some of the government websites lacks development but also lacks the proper services that would facilitate most activities performed by investors, business owner or even the citizens. This in fact presents an opportunity to take the first step into introducing a solution to start a business in Egypt as a E-service which will be discussed in more details in later stage in this research paper, given the concrete evidence that the only service the government is offering at the moment regarding starting a business is only to take an appointment. Which means that only step after taking an appointment is to do manual work to register the business or even expand depending on the purpose of the appointment.

4.2.1.1 Challenges faced by the Egyptian government in developing E-Services

The Interviewees were questioned about "what is the main problem that they usually face when going through procedures that requires government services or paperwork?" A sample of an answer received "I am not fond of the idea of having to go myself and spend countless hours just so I could be physically present to sign a paper, why can't we do it

similarly to the banks such as authorizing payments through the phone or internet and save all our troubles" (Anonymous, 2017) all answers received had the same issue in common that almost sounded as a complaint that opens a door for an opportunity to design a service that would include E-signatures. A research was conducted regarding the challenges and obstacles that the Egyptian E-Government portals/websites are facing or lacking in the sense of what is absent in order to investigate the issues that users face while navigating through the governmental websites. The research highlights several issues and constraints that obscures the progress of implementing a successful E-government which can be broken down into a Technological, economic and social perspectives (Doaa M. Ayman & Riem Abdel – Azim, 2016). Surprisingly one of the main issues that were highlighted in that research paper was the lack of a proper e-signature mechanism on the governments' websites. Which was not a coincidence given the facts gathered it shows that most of these services and websites provided by the government has a lot of room for improvements.

The absence of a full functioning e-signature framework presents a real obstacle and is considered crucial to the successfulness of e-government implementation. In a matter of fact the lack of a proper implementation of a secured E-signature is considered to have a major setback on the progress of many electronic services in Egypt, that includes online transactions or payment of taxes, completing and submitting legal documentations that are needed for any procedures those in which requires a signature, among other services as well. Which means that in order to fully utilize the full potential of a successful e-government and the benefits it bring; government officials start mobilizing their resources into developing and secured e-signature service. Plus that would greatly reduce the time needed for the process of submitting documentations thus eliminating the requirement of being physically present by going to an official government institution or the ministry itself in order to complete the documents. What's more is that citizens or enterprises whom are aware of the benefits of E-Government should be insured by the government that their data would be protected, safe and secured to combat the uncertainty about privacy protection (Doaa M. Ayman & Riem Abdel – Azim, 2016).

There is another issue that acts as a roadblock against an effective e-government service, it is the lack of E-payment transactions. The framework of electronic payments

although present on the government portal for paying utility bills for citizen but it is not widely used. The question here is why if the service is available, how come people don't take advantage of such a service? The answer is due to the low penetration of credit cards that is mostly used by middle income class, however regardless of owning a credit card, some don't trust using their cards over the internet or some might get the feeling that they might be subjected to risking their money due to potential fraud. So they wouldn't mind going to the governmental institutions and pay with cash no matter how long the queues are or time that would be wasted due to such fear. In addition, there is currently 30% poverty rate in Egypt (middleeastmonitor, 2018), that don't have the luxury of owning a credit card which means that Egypt lacks many means of online payment tools such as credit cards with limitations pre-paid cards that can be used by the poor.

Computer illiteracy and low access rate of internet in Egypt is also considered as an issue that presents a challenge that slows down the progress of E-government implementation in Egypt. The following figure (18) represents and serve as an example for the internet penetration in Egypt:

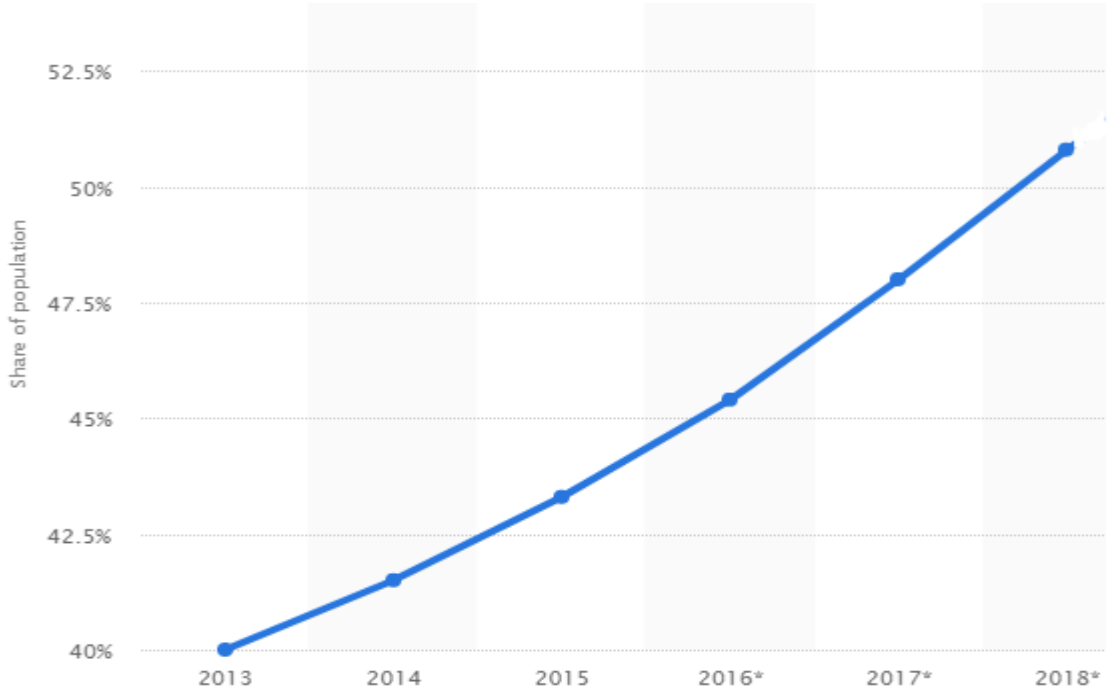


Table 22: Internet penetration in Egypt [Source: Statista 2018]

According to figure (18) it shows that the internet penetration in Egypt has reached 50.8% in 2018 which is in comparison to other counties is considered to be a low percentage rate (Statista, 2018). Although the graph shows a significant change in the past couple of years from people accessing the internet either through their mobile phones or using a PC thus granting them the opportunity to access and use the E-government services but the numbers are quite low as a result of high rate of computer illiteracy in Egypt. This shows how it affects the progress of the E-government and that almost half the population cannot yet benefit from E-services offered by governmental ministries and institutions (MCIT, 2017).

Last but not least Employees resistance does in fact present itself as an obstacle in the successful implementation of the E-Government in Egypt, such bureaucratic obstacles does offer a challenge that can potentially delay the e-government implementation. It may also lead the government to fail in providing any e-services due to the resistance to change (Abdelkader, 2015). It is quite understandable why employees would start building walls around them in order to protect their jobs as they interpret the introduction to Electronic services as a threat to their career. In addition the success of implementing an E-government is hindered due to multiple government institutions that shows a severe authority overlapping. (Gebba, T. R., & Zakaria, M. R., 2012)

It is highly recommended that the Egyptian government would start developing proper action plans to increase both the citizens and businesses' awareness of the E-government benefits. In that context, The government should explore the option of partnering with the private sectors in order to provide more effective training to government employees that highlights the importance of the E-government and most importantly to help them understand that the concept of implementing and reassure them that an effective E-government is not designed to affect their jobs but to facilitate their day to day tasks and activities.

4.2.1.2 The proposed solution

As this dissertation is designed to identify the best approach and propose a solution that would benefit businesses in Egypt via taking into account all the findings mentioned

earlier and based on the information gathered across the interview. Which would help in identifying the requirements for the new proposed solution. The focus will be on analysing and designing "How to establish a new business" as a solution that the Egyptian government could take into consideration as a mean to increase productivity and effectiveness of the public sector providing a better and efficient e-service to businesses in Egypt.

First step is to specify the business requirements needed for the solution, which is to identify the business components that highlights the requirements and what needs to be included so it can facilitate for users the way on how to start a new business:

Business requirements which is mandatory for any company/client that wishes to establish a new company:

1) Enabling Clients/Business entities to submit existing Trade Name Clearance Certificate which is obtained and issued by the commercial registry.
2) Allow Clients the privilege to register a new company name with the e-service that undergoes the system approval to check and verify that the name submitted has not been taken or registered before.
3) Users should be able to submit bank certificate which is obtained from an authorized bank.
4) To be able to upload Powers of attorney documentation if necessary.
5) Get notified when Chamber of Commerce Certificate is issued.
6) To be able to upload founders, partners and employees Passport/National ID copies and submit their details.
7) To be able to upload a Company's lease agreement
8) To enable the user to print out the summarized details of company registration in case of establishing a new company.
9) Fees for company establishment to be calculated and to be able to perform online payment transaction to complete the procedure. Since there are notary public fees, establishment fees, commercial syndicate fees, publication fee, Chamber of commerce fees, commercial registration, issuance of operation certificate all of which are necessary to pay during the process.

10) The ability to track missing or needed documentation.
11) To be able to perform digital signature when needed.

Technical requirements:-

Web Service:

The solution is recommended to be built as a web service, since the concept of web services are developed from the evolution of internet. It would greatly benefit and serve the purpose of the e-service solution proposed, as the nature of implementing a web service solves various issues that are related to intersystem communication, to give an example:

- The HTTP standard allows multiple systems to communicate to one another.
- Universal Description, Discovery, and Integration (UDDI) standardizes the publishing and finding of web services which allows other systems to be easily integrated with the solution.
- SOAP which is built on XML Language regulates the messaging capability on different systems.
- Web Services Description Language (WSDL) standardizes the description of web services so that the providers and requesters are able to speak the same language. (IBM, 2019)

The recommended vendor for the proposed solutions is to use Amazon web services (AWS Cloud) a product from Amazon for various reasons, it is designed to provide the product owner with scalable, high security and cost efficient solutions that meets any mission and unique requirements. The product is already been used across various government agencies, intelligence communities, civilian agencies and federal governments around the world. The cloud service is meant to drive efficiencies, reduce operational & capital costs, meet mandates and increase innovation. It delivers access to up to date technology resources that are being managed by certified experts. The AWS solution offers great deal of benefits to assist governments to lower IT costs and scale applications through providing storage, database, analytics, application and deployment services (Amazon, 2019).

Digital Signature:

Throughout the findings discovered during the gathering of information which also includes lessons learned from the interviews conducted as well, Digital signature was one of the components that is high on demand for its convenience, time saving and secure method of signing any electronic documents that includes official documents, images, contracts, transactions, etc. which is done in a matter of seconds once a document is signed. Since the Aim of establishing an efficient e-service will involve enabling the users to be able to upload documents electronically, signing them digitally would satisfy the needs of users using the new system. Not only to benefit the users but also the service owners (government) as the authenticity of any electronic document uploaded can be verified by the digital signature which ensures the following:

- Validity of the certificate
- Certificate path
- Authentication and non-repudiation
- The letters and documentation that are signed has not been altered or tempered with.

Two distinct keys are used when the Digital signatures are created, one is public and the other is private. The private key is both stored and encrypted for any document that is signed by the signatory. As for what happens after, users on the other end can view the signature using the public key (GAFI, 2019).

The Digital signature in Egypt is not just a conceptual idea but in fact the Egyptian government recently has enabled this technology to be used locally although it is more commonly used for e-banking but integrating such function with the solution provided will bring many benefits to the table. The international cooperation and the ministry of investment in Egypt are pioneering this technology for the public sector. Their mission is to help improve business transactions between government entities which includes also the private sector. (GAFI, 2019)

The requirements in order to apply for a digital signature is quite simple and is presented as follows:

- National Identification card, or passport for non-Egyptians
- Application fee of 700 EGP

Any user applying for a digital signature that would wish to have their job title and company title to be included in their digital signatures will need the following documentations:-

- Copy of the company contract as well as it's legal form
- Copy of the company's commercial license
- Copy of the company's tax ID card
- Copy of the company's commercial register
- A legally validated (stamped and signed) HR formal Letter

All procedures and transactions related to the digital signature application is done and handled by the investment service centre. As soon as the user submits the documentations and pay the fees, only then the operator hand them the certificate and the token once they are issued (GAFI, 2019). The user shall receive the following:

- A CD with the Installation Software and Guide
- An Original Copy of Digital Signature Contract
- A Sealed Pin Number Slip
- A Hardware Token

Single Sign on (SSO):

Single sign on authentication method is now on demand today more than ever before, by taking a look on how web sites and web services are built these days, what they all have in common is their need to have some sort of authentication in order to allow the user to access the content and features for that website. A centralized login system has become quite crucial as the number of services and websites are rising. SSO will bring so many benefits to the solution provided, despite that this research paper is targeting a certain service however it is of outmost importance to add such a function on an early stage since the government is trying to take its services online. Taking the government plans into account, SSO would be the perfect fit for the system, as its benefits apply to many areas:

- Security: This is one of the most important benefits specially that the solution is a government based e-service, security of the data is their number one concern. The user's credentials are stored and sent directly to the central SSO server, which means it is not stored on the actual service that is being accessed by the user. Thus the service won't be able to cache the user's credentials. Having a central authentication point means that the SSO service can in fact limit any possibility of phishing attempts (University of Guelph, 2019).

- User Experience: Another noticeable benefit brought by the SSO is that it enables users to be able to navigate between the services securely and without any interruptions as the system won't be asking them to enter their credentials every time they try to move from one service to another. SSO is quite effective when removing the service boundaries as it interconnects each of the individual services into portals thus to the eye of a user; switching between one service to another is easy and effortless (University of Guelph, 2019).

- Resource savings: IT administrators can benefit from the SSO as well. It can proficiently save their time and resources by utilizing the central web access

management service application and it allows web developers to have complete authorization and authentication framework that they can use to build customized and secured services for users (University of Guelph, 2019).

Despite the focus of this research paper on designing an e-service but the main reason why SSO is a good fit for this solution is the fact that building an SSO on an early stage makes the system quite flexible and paves the road for any futuristic implementations for new e-services. By understanding the Egyptian government's mission to start delivering all its services online thus it will be crucial to have an SSO implemented in order to help the users navigate through different services. To explain this method in a more details, it comes down to the development teams as sooner or later they are faced with a certainty, after they have developed an application or a web service at Domain X, a problem appears as they would like to develop and deploy a new Domain Y that uses the same login credentials as Domain X (Sebastián Peyrott, 2015). That is the fact about SSO is to be able to share that information with each subsystem that requires the data. Below diagrams is designed to give a more illustrated example of a non-SSO scenario versus an SSO scenario:

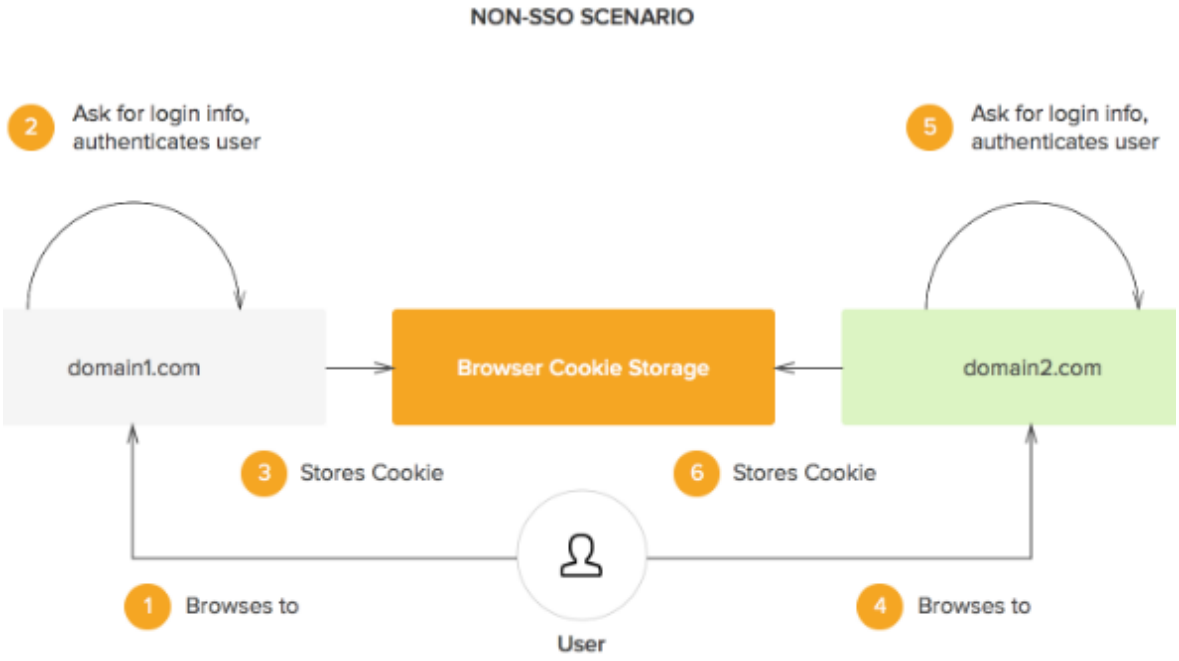


Table 23: Non-SSO Scenario [Source: auth0 website]

The diagram shows how a user accesses two different domains (Services) and how inconvenient it is to access both at the same time, as it asks the user to login twice or potentially more if there were more services offered. In addition to the browsers "Same origin" policy, it means that domain y cannot access cookies of domain x and vice versa. Hence the SSO solution comes to allow sharing the session information across different domain (services) as shown below (Sebastián Peyrott, 2015):

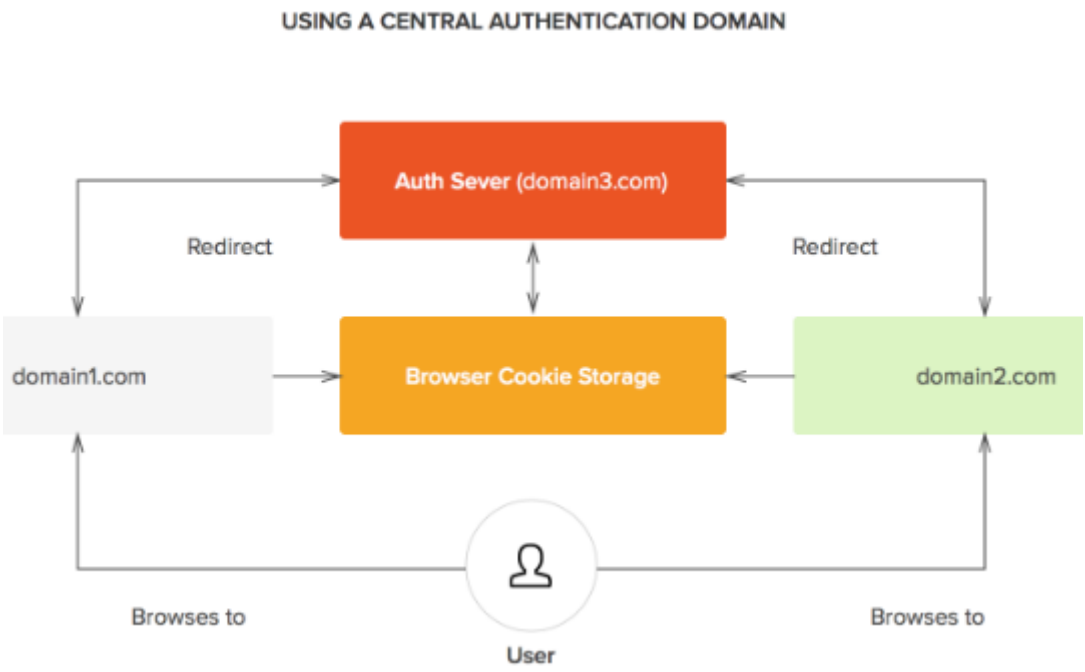


Table 24: Using a Central Authentication Domain [Source: Auth0]

Other technical requirements for the system:

- System should be developed to validate fields as it will involve important data that are required to be filled in order for the user to successfully register the business.
- Secured payment method should be implemented to enable the user to perform online payment for the fees required to be paid in order to finalize the business registration.
- System should be supported and compatible with available browsers as a way to ensure ease of use for the users.
- System should allow the user to save the progress in case of lack of sufficient data and allow the user to resume when ready
- System should support multiple languages depending on the user preference.
- Web service should be designed to be responsive to fit all devices.

4.2.2 Use case Scenarios and Diagrams:

4.2.2.1 Use case Diagram Login / Register via SSO service:

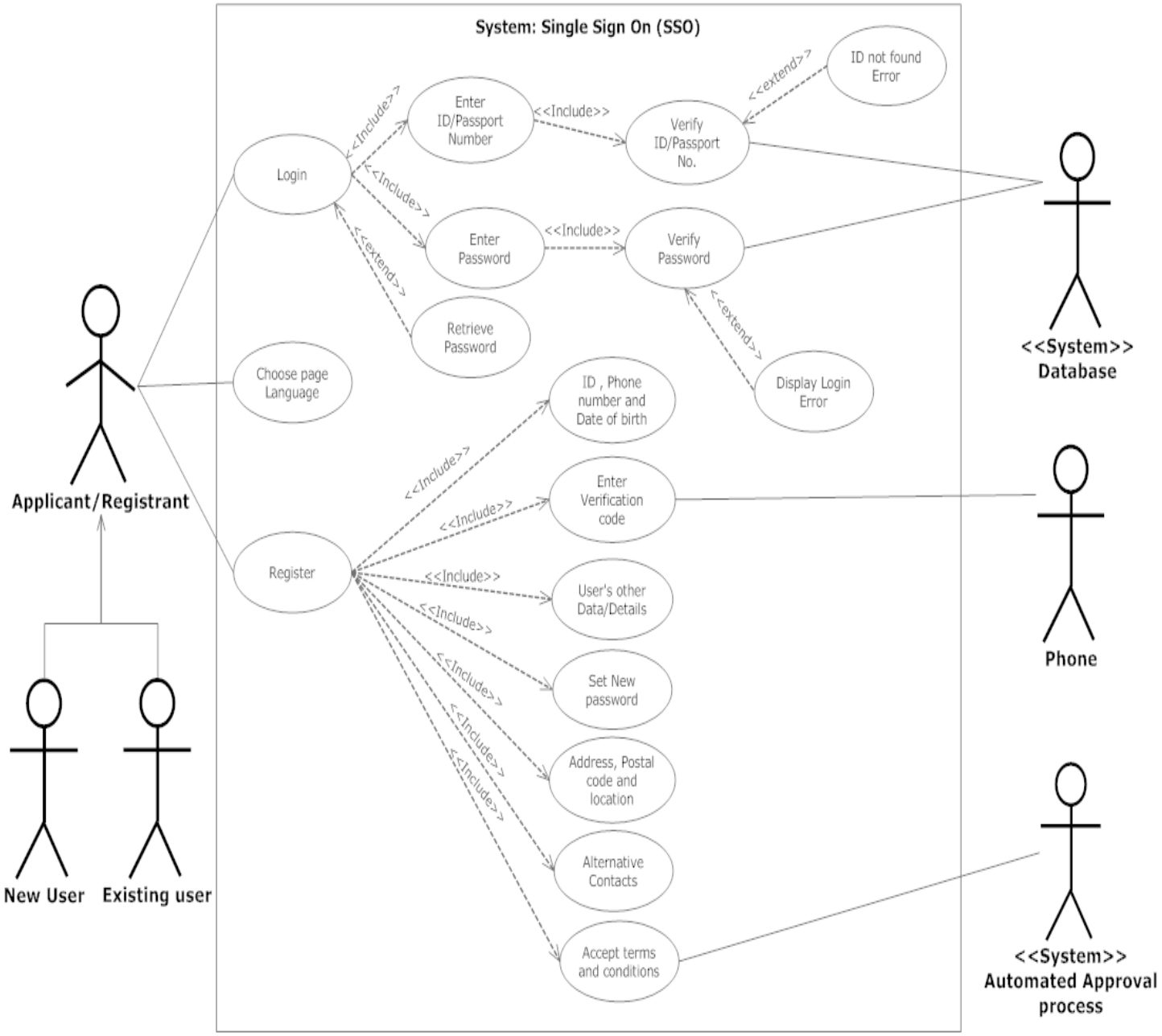


Table 25: SSO Use case diagram [Source: own]

Use Case: Login/ Register for Single Sign on (SSO)

Primary Actor: Applicant, System, Phone

Stakeholders and interest:

- Applicant: Choosing preferred language for the service, Login directly if user exists or register if is new user.
- System: The systems verifies the Local ID/Passport number across the database. Another interest is Auto approving for the registration process once all conditions are met.
- Phone: is used for code verification step as an authentication method which is sent to the user through SMS and user in return uses the code to continue the registration to the SSO system.

Preconditions: User must have an Identification card or passport number.

Success Guaranteed (Post condition): Registration and login are successful.

Main Success Scenario (or Basic Flow):

1. User wants to access the e-service
2. Applicant/Registrant Picks language
3. User login using ID and password via SSO
4. System verifies user credentials
5. If yes, then user gains access to the e-service

Extension (Or alternative flow):

3a. User has no account as he/she is a new user and will need to register through SSO to access the system

1. User initiates register a new account
2. User submits ID, Phone and Date of birth
3. System send SMS to User Phone with verification code
4. User submits the verification code to the system
5. System verifies the code
6. If yes, user move to next step
7. User inserts other details
8. User set a new password
9. User submits address, postal code and location
10. User inserts alternative contacts

11. User accepts terms and conditions
12. System approves User request to register a new account

4a. User fails to insert right ID.

1. System displays ID no found error
2. User won't be able to proceed any further without a correct ID

4b. User fails to insert the correct password.

1. System displays login error
2. User can re-attempt to try entering the correct password

4c. User forgets password

1. User initiates retrieve password process
2. User set a new password

4.2.2.2 System (Overall) Use case Diagram:

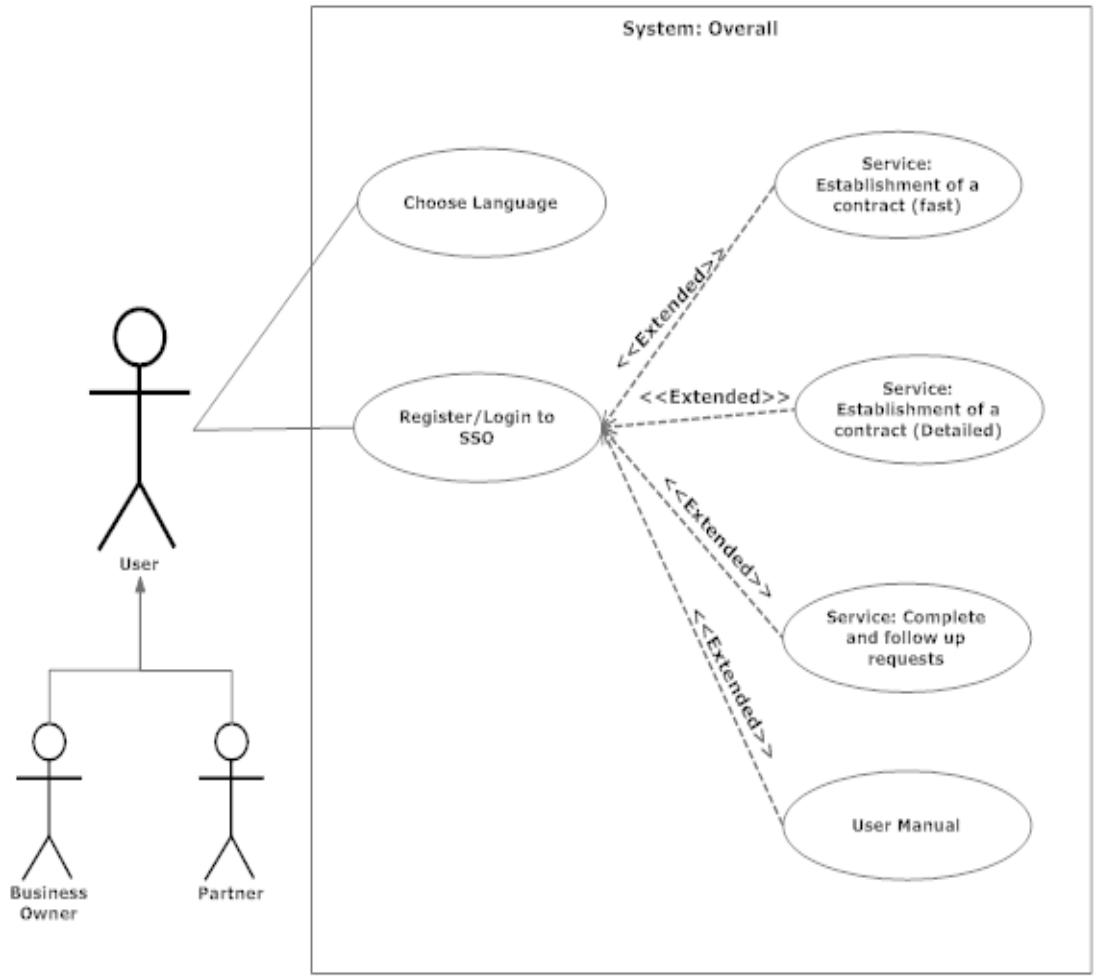


Table 26: System Overall [Source: own]

4.2.2.3 Establishment of a contract (Fast) service Use case Diagram:

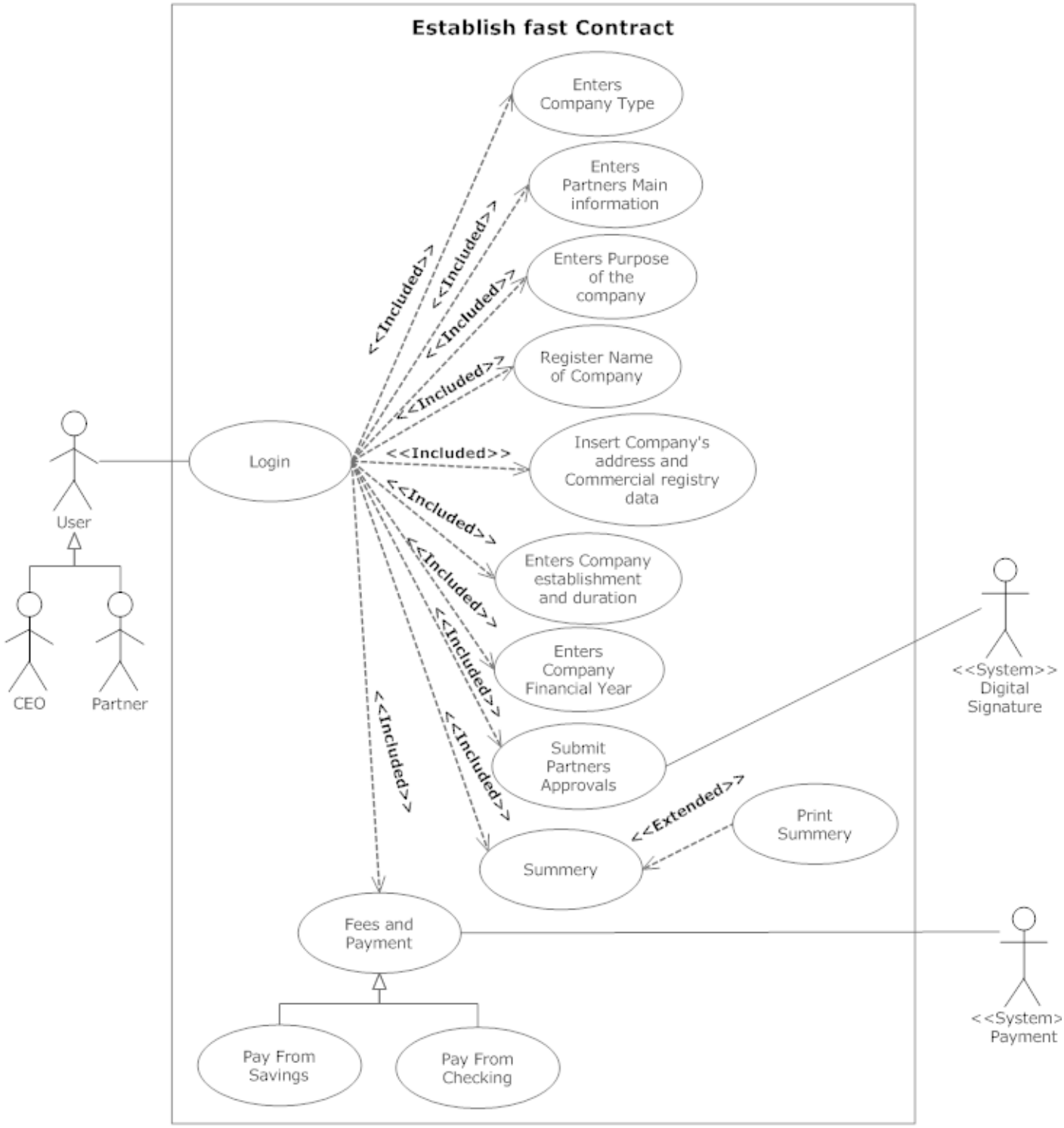


Table 27: Establish Business online use case diagram [Source: own]

Use Case: Establish fast contract

Primary Actor: User, System

Stakeholders and interest:

- User: Accesses the system in order to register a new business using the fast procedure.
- System: Allows the user to insert Digital signature for any documentation needed. It also enables the user to perform an online transaction to pay the fees required for registering business online.

Preconditions: User must have a SSO account and has all the necessary details and documentations to register the business.

Success Guaranteed (Post condition): Business registration was successful.

Main Success Scenario (or Basic Flow):

1. User login via SSO method
2. User enters Company type
3. Enters all required details related to partners involved with the business
4. Enters purpose of the company
5. Registers Company name
6. If yes, proceeds with the next step
7. User inserts Company's address and commercial registry data
8. Enters Company establishment and duration
9. Enters company Financial year
10. User submit Partners approvals and digitally sign the submission
11. User checks all the entries via summery page
12. User is able to pay the fees for registration through secured payment method

Extension (Or alternative flow):

5a. in case that the company's name exists

1. System returns error that company name exists
2. User will have to submit a different name

11a. User can print the summery page

4.2.3 Sequence Diagrams:

4.2.3.1 Sequence Diagram for SSO registration:

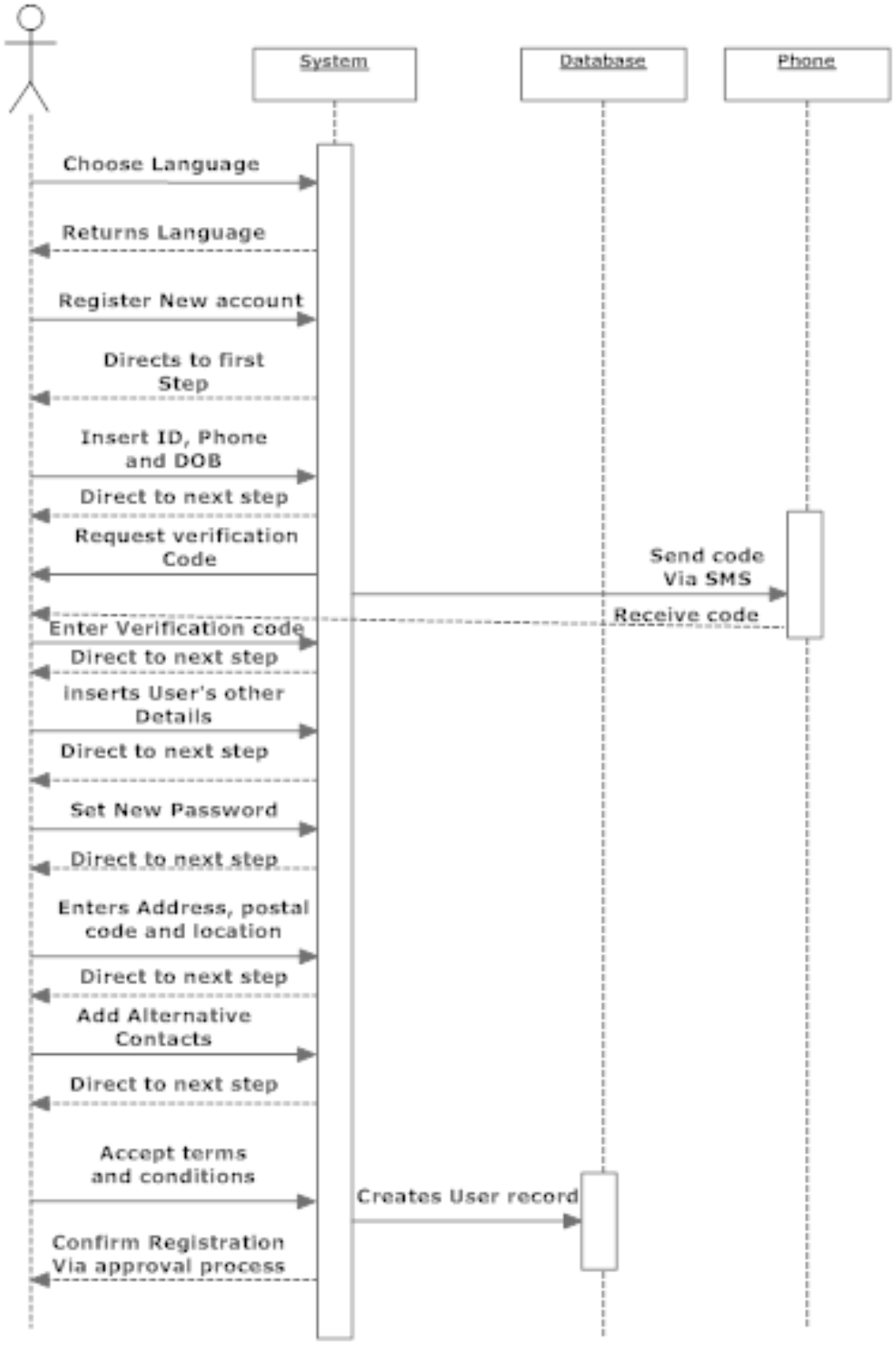


Table 28: Sequence Diagram for SSO Registration [Source: own]

4.2.3.2 Sequence Diagram for establishing company contract (Fast):

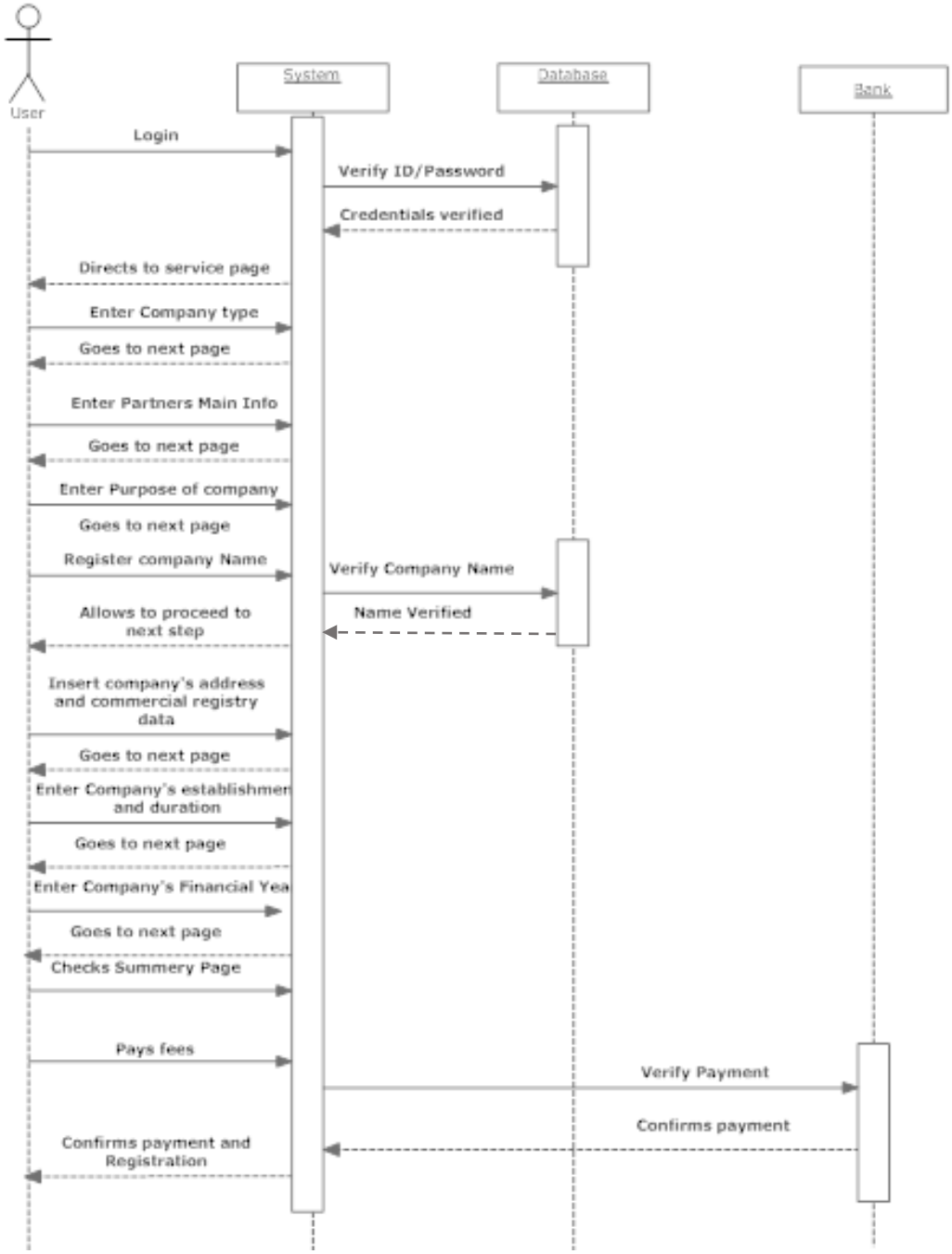


Table 29: Sequence Diagram for registering business online [Source: own]

4.3 Design

In this section the proposed solution will be designed using wireframing tool that will represent the skeletal framework for the e-service proposed. The purpose of using the wireframe tool in this research paper is to help in visualizing the interface design, navigation design and information. The following is the prototype for SSO registration interface that occurs before user is granted access to the system:

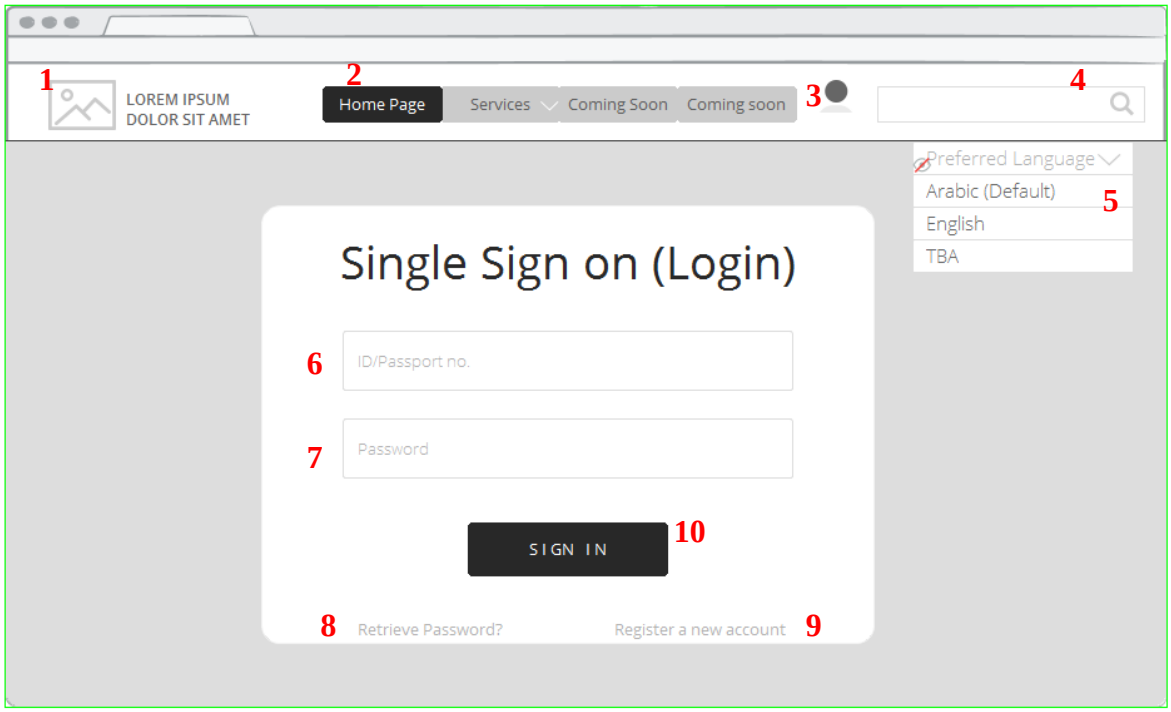


Table 30: Wireframe for login page [Source: own]

Elements:

(1) Is for logo and title	(6) Input text field where User inserts ID
(2) Navigation Menu	(7) Input text field where User inserts password
(3) User profile	(8) Retrieve password button
(4) Search bar	(9) Register a new account button
(5) Language dropdown menu	(10) Sign in button

When the user is a new user, they click “Register new account” and it will redirect them to the following page and the first step towards registering an account:

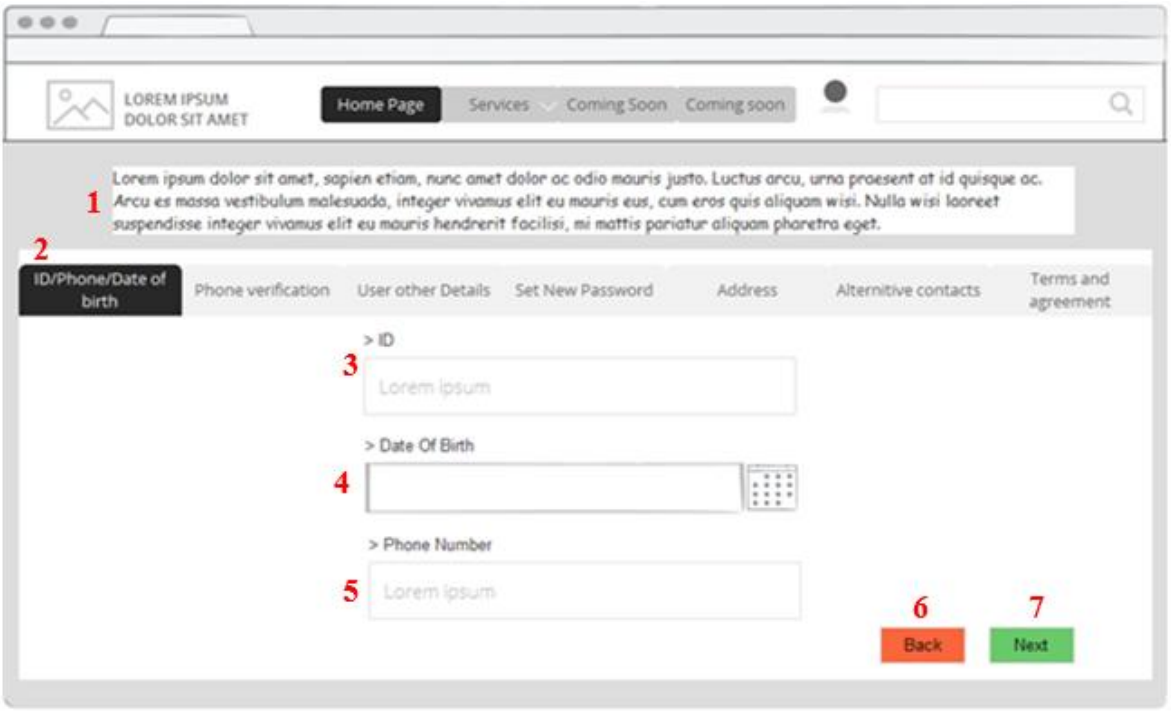


Table 31: Wireframe for SSO registration page - First Tab [Source: own]

Elements:

(1) Normal text Area with note to users
(2) Navigational tabs
(3) Input field for ID
(4) Date of birth field with calendar embedded to enable the user to pick the date without worrying about date format
(5) Input field for phone Number
(6) Back button to go to previous tab
(7) Next button to go to next tab

Once the user enters the ID, date of birth and phone number, they can proceed to the next tab which is phone verification as once the user hits the next button the system send an SMS to the phone number entered in previously in order to be used for the phone verification step as shown in the following:

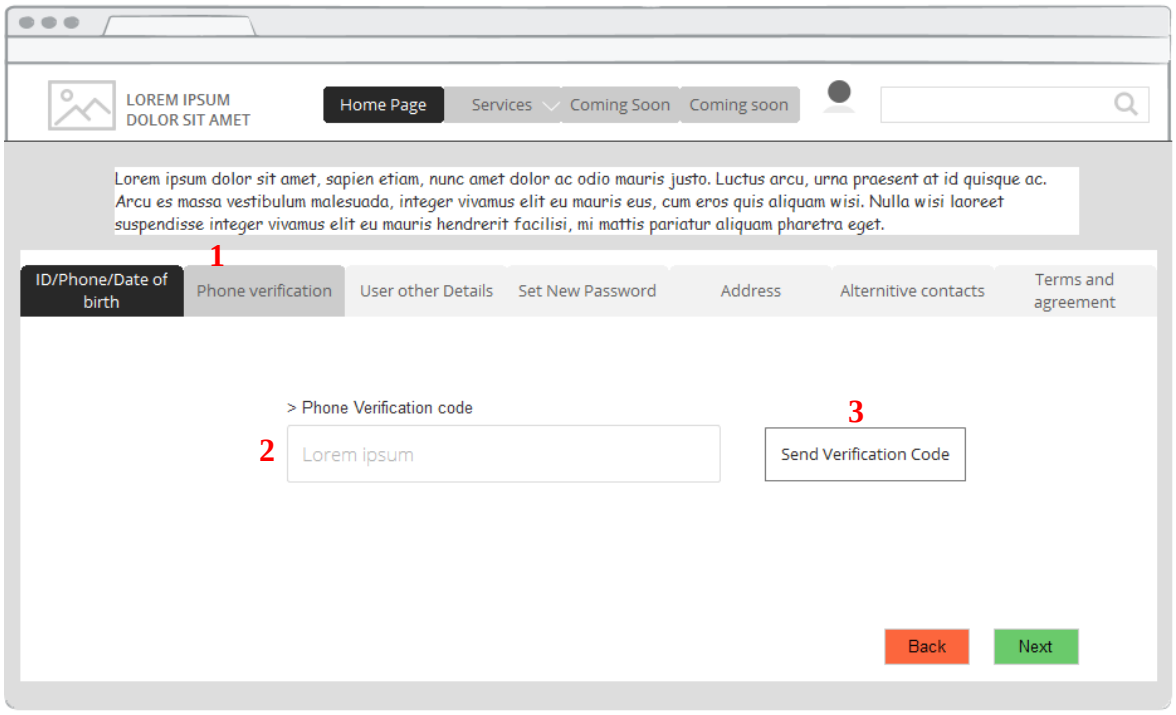


Table 32: Wireframe for Phone verification tab [Source: own]

Elements:

(1) Highlighted tab to point out location
(2) Input field for phone verification code
(3) Send verification code button

Once the user receives the verification code via SMS, he can proceed with the rest of requirements as shown in the navigational tabs, however in case the user doesn't receive an SMS, user can force send the code through the button "send verification code" otherwise, user can go back to check if the phone number inserted is correct.

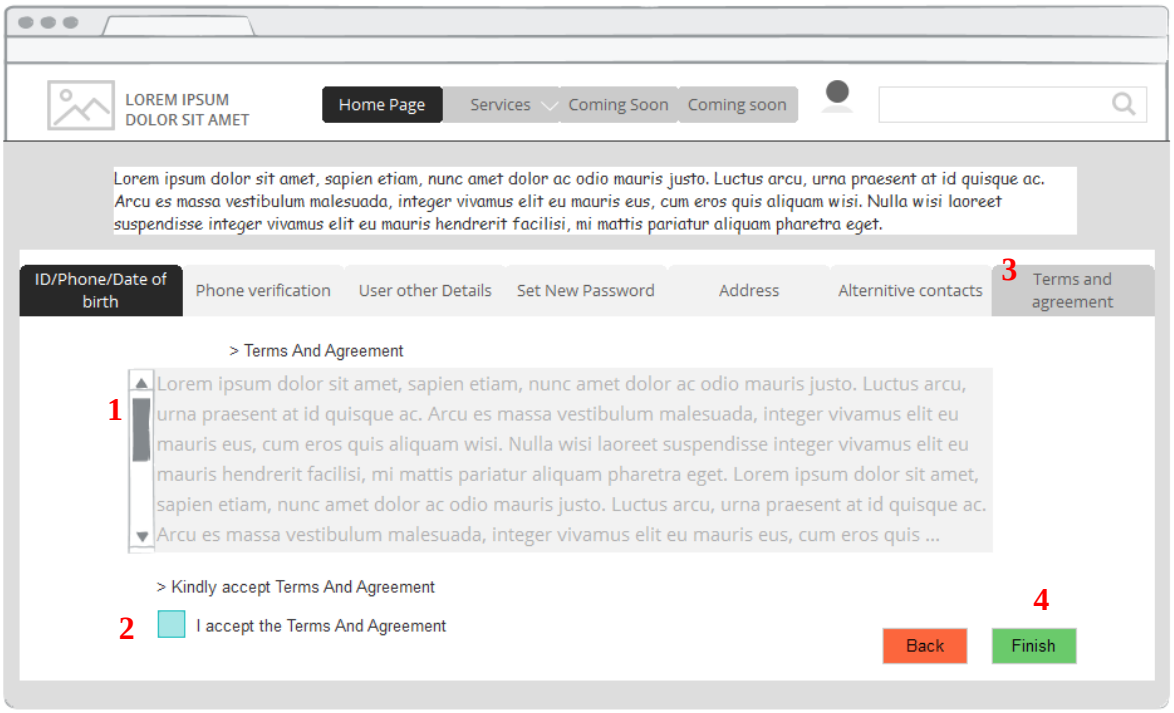


Table 33: Wireframe for Terms and agreement tab [Source: own]

Elements:

(1) Paragraph container with vertical scroll
(2) Checkbox to accept terms and agreement
(3) Highlighted tab to point out location
(4) Finish Button

After the user have completed all the steps what is left is to accept the terms and agreement by marking the check box and clicking the finish button. Once completed a confirmation message is displayed and confirms user SSO registration is successful and directs user to login page to log on the system and access the E-service.

Once the user registers an SSO account they will be to login to the system and access the E-services provided, the following is a prototype for how to register a business online (Fast) Process:

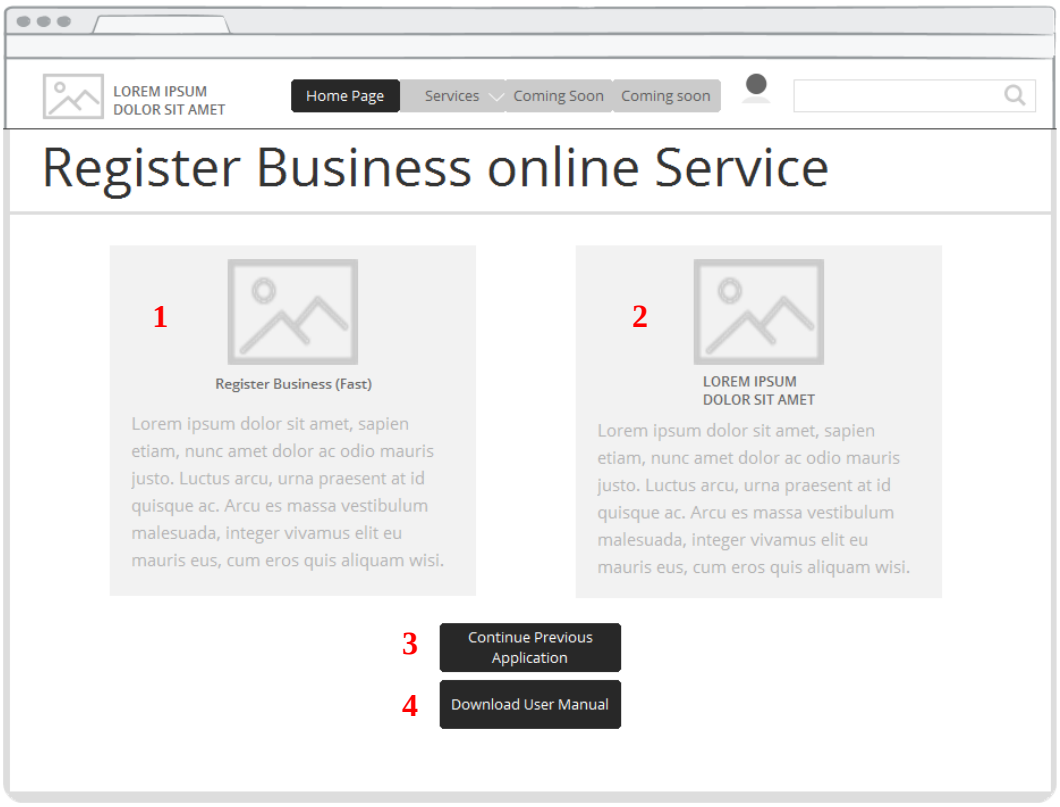


Table 34: Wireframe for Register Business online Service Homepage [Source: own]

Elements:

(1) Clickable Section that directs to “Register business (Fast)”
(2) Clickable Section that directs to another service provide
(3) Button to retrieve last incomplete registry session
(4) Button to download User Manual

The user will have the choice to click Register business fast to begin the registry process, they also have the option to continue their last registry attempt as the system saves the progress automatically, In addition to a downloadable PDF user manual that would guide the user throughout the registration process.

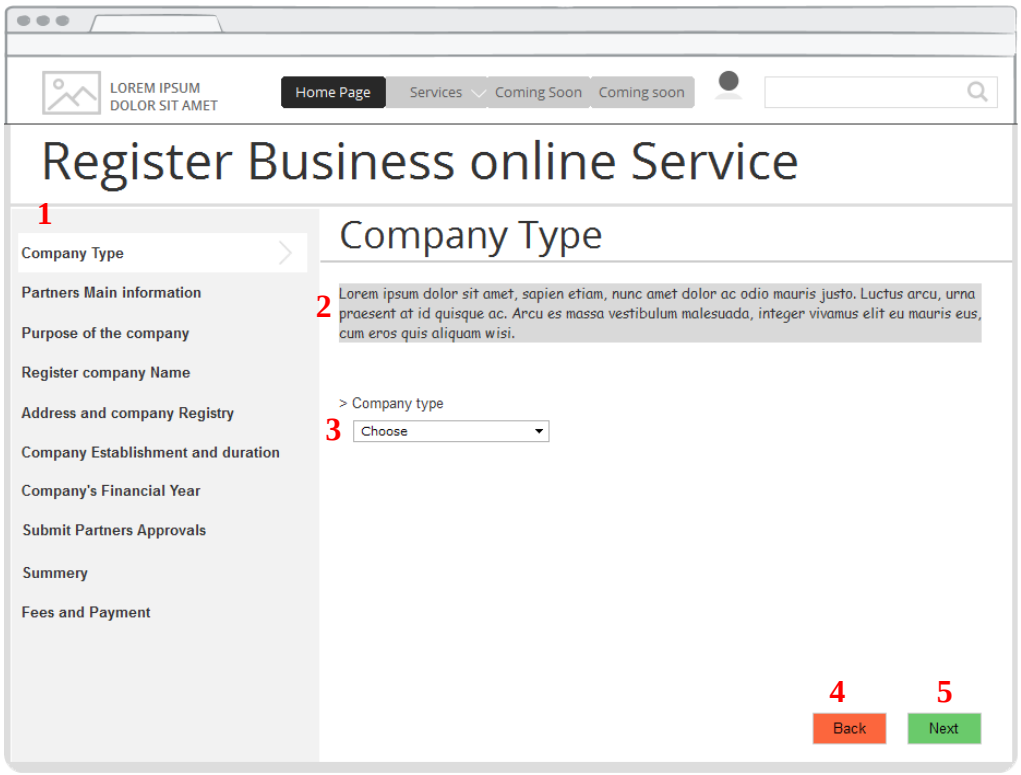


Table 35: Wireframe for First Tab - Company type [Source: own]

This is the first step towards registering business online, choosing the Company type.

Elements:

(1) Side Menu to track all steps
(2) Page note to guide the user
(3) Dropdown list to select company type
(4) Back button to return to previous page
(5) Next button to move to the next page

After the user goes through several steps they will come by a very important step which is choosing the company name, if the name type determines if the name chosen is a new name which pushes the system to search the database if that name is already taken or reserved via check name button. Otherwise if user had already registered the name before they would have a reservation number that they can insert instead.

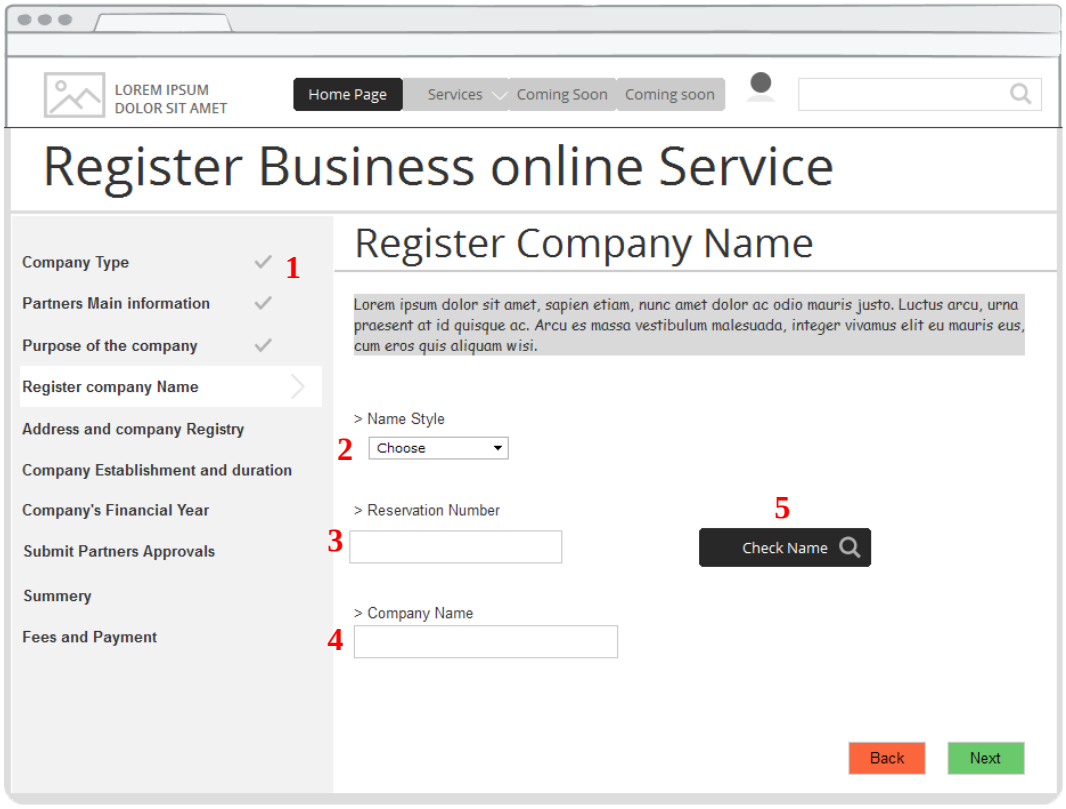


Table 36: Wireframe for Register company name tab [Source: own]

Elements:

(1) Check Mark to Identify steps completed
(2) Dropdown list to choose Name style
(3) Input text field for Reservation Number
(4) Input text field for company name
(5) Check name button to verify if name already exists

Going through different steps the user comes by Submit partners approval, in this step the user can upload documentations that proves partners approvals or if they have power of attorney documents. User will also be able to access the list of documents upload. In addition an interactive table designed for partners to log on the system and they will have an overview of the steps and the table will allow them to submit their approval electronically with the help of digital signature. On the other hand the User responsible for the registry process will be able to track the partners' approvals, however all approvals must be on "Approved status" in order for the user to continue with the registration process.

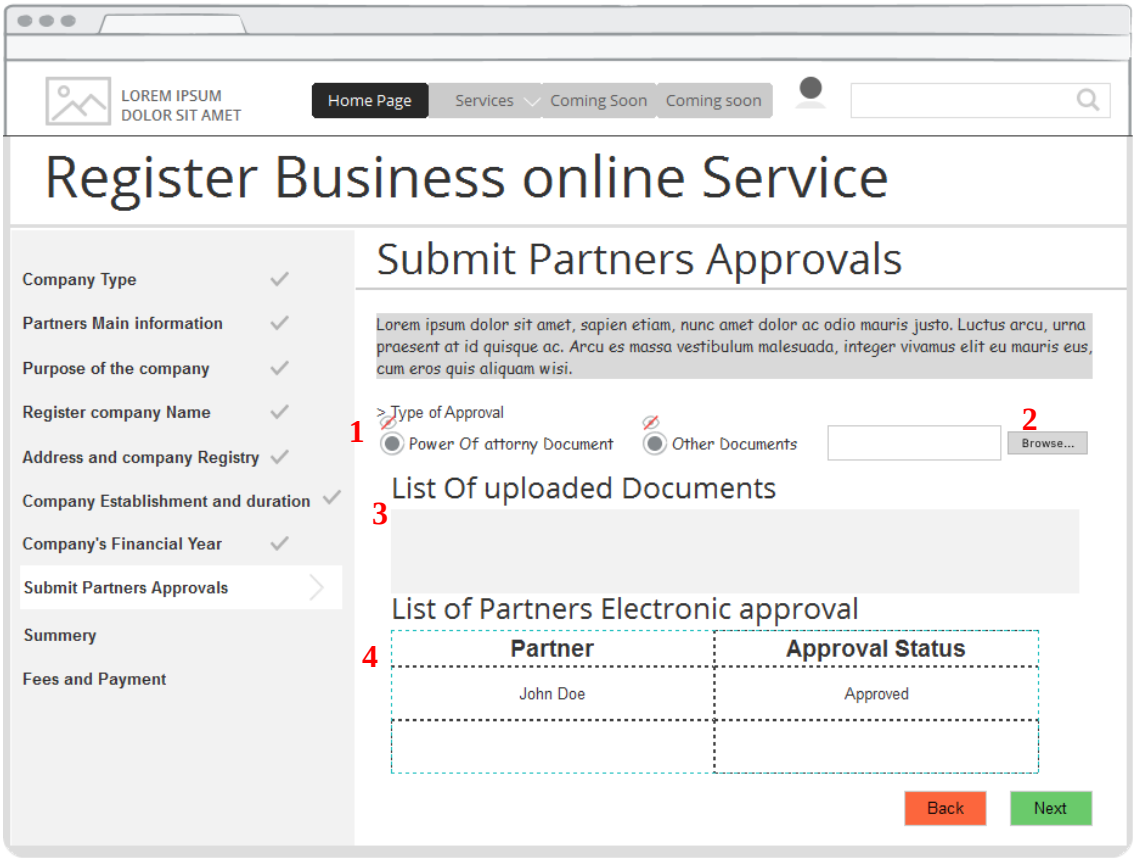


Table 37: Wireframe for Submit Partners approvals [Source: own]

Elements:

(1) Radio button to choose the type of document to upload
(2) Browse button to upload documents from desktop
(3) Container to Display list for uploaded documents
(4) Interactive table for partners to access and submit their approval

Next is the summery page were user can go through all the steps status and the overview of the whole process, in addition to the ability to download the summery page.

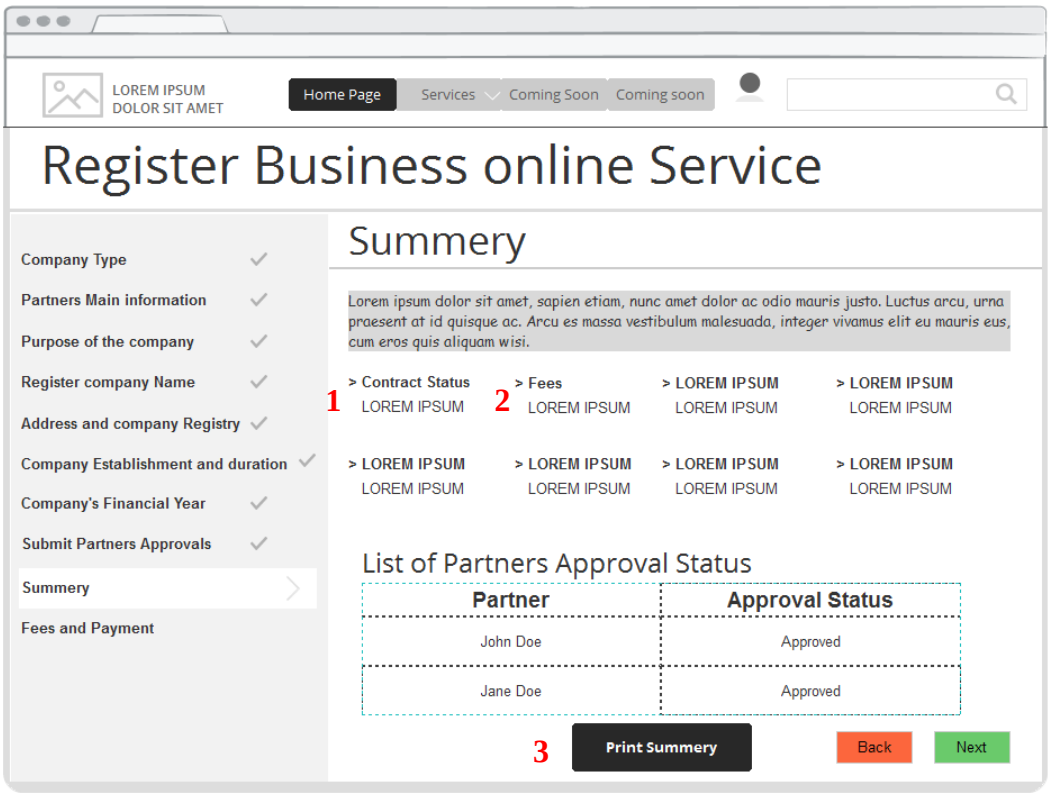


Table 38: Wireframe for Summery tab [Source: own]

Elements:

(1) Contract status overview text
(2) Total fees needs to be paid
(3) Print summery button

Last step to complete the business registration process is the payment for all fees required. User will have access to secured payment method with the option to pick the type of card payment that they will perform. In addition to the list of fees and the total amount required and once the payment is through, the payment status will display payment successful.

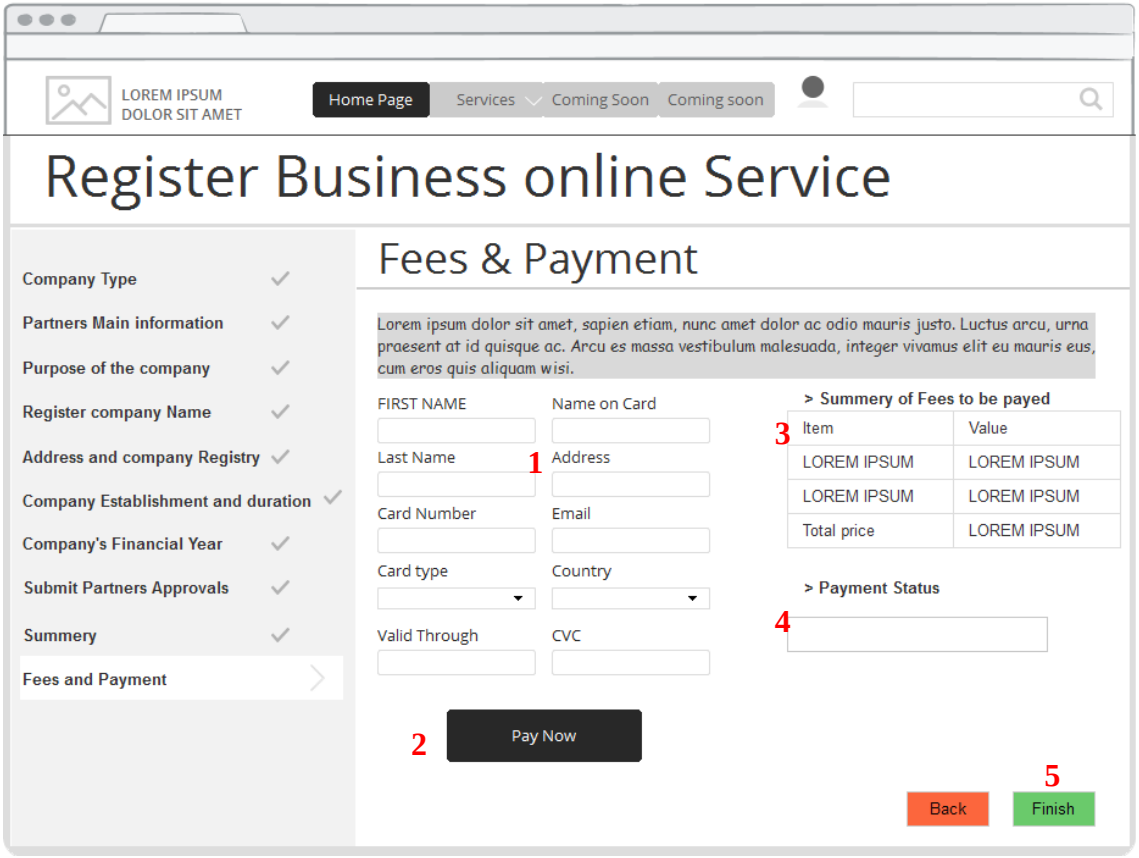


Table 39: Wireframe for Fees and payment tab [Source: own]

Elements:

(1) Card details input text fields and dropdown lists
(2) Pay now button
(3) List for all fees required to be paid and total
(4) Payment status text field that updates upon payment
(5) Finish button to finalize the registration process

Once user pays the required fees and click the finish button, the registration process is complete and government employees will be able to process the submitted request and provide the user with feedback.

5 Results and Discussion

5.1 Comparing between Estonia's solution and the proposed solution

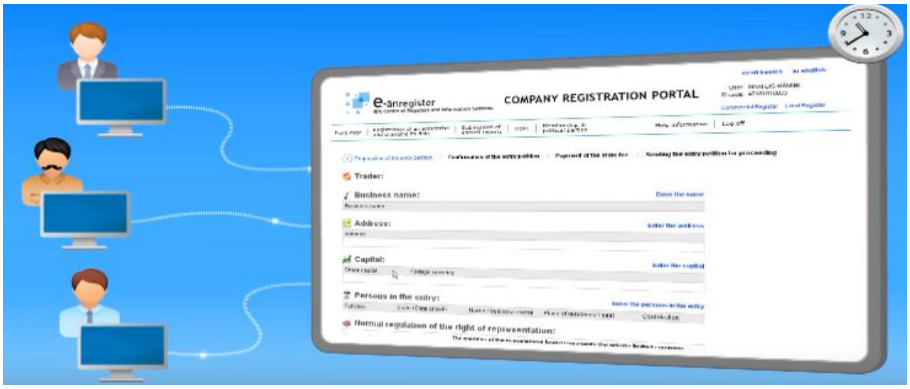


Table 40: Illustration of E-Estonia company registration portal [Source: YouTube video]

E-business Registry in Estonia is a secured and technologically advanced tool. It is considered to be one of the top most successful e-service for businesses that the Estonian government implemented. It allowed more than 98% of business to be registered online, 99% of online banking transactions were performed and 98% of tax declarations filed online. Not only does it facilitate the process of registering the business online but it also integrates E-tax and e-banking through one system. It gives the user complete control their company. There is no doubt why Estonia is one of the countries with the most start-ups lunched per capita than any other country in Europe (e-Estonia, 2019). Comparing between this successful implementation and the proposed solution for Egypt would benefit greatly the concept of why to implement a similar solution and would help the new system to prepare for the upcoming challenges.

Attributes	Estonia E-Business Registry	Proposed E-service
Requirements to access the system	E-Residency registration which is the digital ID needed to access the e-services.	SSO registration which grants access to all e-services integrated to it.
Allows Business Registration online	Yes	Yes
Online transactions enabled	Yes	Yes
Estimated time to Register business online	2-3 hours	1-2 hours
Ability to Pay taxes online	Yes	No
File Annual reports	Yes, already implemented	Not implemented yet but

		possibly in the future
Process time before Solution	5 Days to register business	4 weeks (healyconsultants, 2019)
Who can use the system	Business owners, business partners, foreign investors, board members	Business owners, business partners
System implementation	Is implemented as a web service in addition to xml services that is intended for certain users that requires to make bulk inquiries about business registry and store the received data in their database.	System has not been implemented yet, however it is recommended that the system to be implemented as a web service integrated with SSO authentication method, e-payment and e-signature methods

Table 41: Proposed Solution vs. Estonia online business registry solution [Source: Own]

5.2 SWOT analysis for the propose solution:

SWOT ANALYSIS	
Strength	Weakness
- Business owners will have the ability to register their business online. - Users will have the power to navigate and access multiple services at the same time using the SSO authentication method. - System grants the users the ability to digitally sign documents online without the need to go to a certain entity to perform the action. - System allows the users to perform online transactions for any fees required to be paid. - Allowing users to save their progress and resume later on. - System is equipped with a user guide manual and an instructional video that would guide the users throughout the process of registering a business.	- Complexity for new users. - Decreased Security if system not implemented properly. - System Availability, since it is web based, it follows the same structure as a website and may not be available 100% of the time. - Users will have to apply for digital signature certificate through the investment service centre in order to have access to the digital signature feature.
Opportunity	Threats
- Can integrate future e-services to increase the amount of users accessing the system. - As a cloud based web service, file storage will cost less given the current market trend. - Adding dashboards to track the registration process and needed requirements such as missing documentations or needed signatures.	- As a new service, users might be reluctant to use the system. - Security misconfiguration and lack of maintenance can poses a real threat that can keep the web service from running properly. - Laws and legislation changes can have major effect on the continuity of the service provided. - Lack of government funding to the development and service operational costs can disrupt the service.

Table 42: SWOT Analysis for proposed Solution [Source: own]

5.3 Identify Stakeholders

Stakeholders	Purpose
Amazon	Amazon have the responsibility to implement the AWS solution based on all the requirements needed. As it will provide scalability, low cost and high reliability for the infrastructure platform. Also to provide end to end security and privacy for both product owner (Government) and its users (business owners) by using best security practices. In addition they will provide technical support and maintenance for the solution implemented.
Government Employees (GAFI)	Are responsible for processing and analysing the registrations performed by users. In order to provide feedback, confirmation and submit other needed documentations that are relevant to the registration process such as Chamber of Commerce Certificate and the notification of incorporation.
Investment service centre	To provide Users with E-signature means to perform a digital signature that is integrated with the solution such as A hardware token, a sealed pin number slip, a CD with the installation software and user manual and an original copy of the digital signature contract.
Business owners	Are responsible for accessing and using the web service in order to register their business online, it is also within their responsibility to acquire all necessary documents, E-signature tools and all required information in order to complete the registration process.
Business Partners	Are responsible for the partners' approval section in the registration process, they will have the ability to sign electronically as a method for approval and consent. Which is an important step in order for the business owners to complete the registration.

Table 43: Stakeholders [Source: own]

6 Conclusion and Future work

This research paper focuses on the E-services in Egypt specifically for business and what the government have implemented in means of proper online services for businesses, the case study showed that although the government has strategies and plans for establishing e-services that is not just limited to businesses but also to the citizen, however the active e-services for businesses are not properly implemented yet, most of which are still a concept or a vision. Services such as start business online, or Customs Clearance are not yet functioning in a way that serves their purpose, it only provides public knowledge about the process and procedures, although it mentions that users can perform these services online but in reality it is merely just information displayed on a web page with the minimum action required from users, as users can only register an account with no extra features, or electronically request an appointment.

The strategy of the Egyptian government in developing e-services was taken into consideration as well. Several Programs are to be executed in the near future these programs include but not limited to: E-signature activation program, E-commerce program, E-signature activation, Healthcare services, agricultural services, educational services, cyber security program, digital identity management program, financial sector development program and development of financial sector activities. Such programs helps in establishing a strong efficient e-government if implemented properly. These programs involves the cooperation between different ministries, government entities and MCIT.

The ICT comparison performed between Egypt and European countries assisted this research paper in understanding the nature of these countries in what affects their ICT index and the differences that separates them apart given the fact that Egypt, Czech Republic and Serbia have a complete different economic development. One of the key points that were observed is the percentage in which the households lack computers and internet access (53.12% - 43.32%) respectively that would definitely present a challenge for the Egyptian government in successfully implementing and providing E-services. Another point was the E-government development index of Egypt that show E-GDI value of 0.4880 which is lower than the world average value of 0.5491. Which means that the

government should start adopting proper strategies on how can they establish an effective e-Government and to initiate in implementing these strategies.

Interviews were conducted in an attempt to identify the gaps and obstacles that businesses face and what solutions can be offered to overcome these obstacles, the interviews revealed that the most demanded E-services that is required for conducting and managing their businesses effectively is E-tax and registering business online. The findings in this research paper revealed several opportunities for improvement and the cultural concerns that represents the most challenging obstacles that is faced by the government in implementing e-services such as E-signature framework, E-payment, computer illiteracy and employee resistance to new technological tools. In addition to their vision of solutions that could facilitate their business needs and what they would like to see in the future.

A Solution to starting business online was analysed and designed. Throughout the interviews conducted, it presented a new perceptiveness to what the system requires in addition to researching the Egyptian start a business process. The solution was proposed as a web service and designed using wireframe tool in order to visualize the service provided. In addition to the analysis part that involved Different UML diagrams that illustrates how the system works and what the users can accomplish through the solution.

In the future work for this research paper, surveys can be conducted on a wide scale to understand more what other solutions businesses are looking for to be implemented by the government. In addition to identifying what types of integrations can be implemented to the proposed system in a perspective of interconnected services that are dependent on each other. E-services project certainly take a major role in e-government as it highlights the nature of the relationship of the government and its citizens, and business entities. The research performed in this thesis aspires to add contribution in that specific area in which it can facilitate the process of introducing Strong effective E-Services to the country such as Egypt.

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8 Appendix

List of Interview Questions:

- What are the current E-services you are using for your business?
- What Sort of E-services you wish the government would provide to support your business?
- Would you support the Idea of paying your company's taxes online?
- Given the new investment law, it introduced the idea of starting or expanding business online. What is your opinion towards such service?
- What is the main problem that your company usually face when going through procedures that requires government services or paperwork?
- The government have made several announcements lately including transforming their service to be online based, are these projects already initiated?
- Are the government initiative projects introduced still active?
- As a potential user what is the feedback around using these services?