An overview over the worldwide development of e-government

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15 September 2011

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[1] This paper presents itself as a state of the art over e-government development in the world.
The paper was made as background material for future Phd. Project, during a summer Erasmus training program at University of Rostock, Germany.
It also contains a literature review over open source use and open source applications in e-government in Europe.

Rostock 2011

Contents

E-Government is a term that is the short version of electronic government, also known as e-gov, online government, digital government or connected government.

1. Defining e-Government

The term is not yet a common one, thus many dictionaries don't offer an extended definition of it. One of the most simple is defining e-government as the provision of government information and services by means of the Internet and other computer resources [http://www.thefreedictionary.com/e-government].

The term can be defined also using a "what it's about" approach. E-Government is about using the tools and systems made possible by Information and Communication Technologies (ICTs) to provide better public services to citizens and businesses [European Commission, Information Society,http://ec.europa.eu/information_society/activities/egovernment/index_en.htm]. Aspects as rethinking organizations, re-engineering processes and delivering services more efficiently to the people are involved in effective e-Government.

A different perspective starts with what governments are supposed to do or to offer: delivery of government services to citizens, interact with business and industry, offer access to information, internal management, etc. In this context, e-Government refers to the use by government agencies of information technology(such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government in the sense of offering better delivery, improving interactions, increase efficiency [http://go.worldbank.org/M1JHE0Z280].

In analogy with e-Commerce, which briefly can be defined as marketing and sales via the internet that are bringing the customers closer to the business(B2C) or allows businesses to transact with each other more efficiently (B2B) [Gordon, T., ERCIM News No.48, January 2002, on http://www.ercim.eu/publication/Ercim_News/enw48/intro.html], e-Government aims to make the interaction between government and citizen(G2C), government and business enterprises(G2B), and inter-agency relationships (G2G) more friendly, convenient, transparent and inexpensive [http://go.worldbank.org/M1JHE0Z280]. Besides these three, we can add to the portfolio internal efficiency and effectiveness and lines of business [REPORT TO CONGRESSON THE BENEFITSOF THE PRESIDENT'SE-GOVERNMENT INITIATIVES, www.whitehouse.gov, 2011]. Governments do take part in activities of marketing and sales, both as buyers and sellers so we can speak of e-government apps for e-commerce because after all, governments do conduct business.

As the name states, the core of e-Government is not e-Commerce, but governance, the job of regulating society. In modern democracy, there are three powers in the state: one is the legislative

power, another is the executive power and last judicial power. In a very simple way of understanding the process, the legislature is responsible for making policy in the form of laws, the executive will implement these policies and enforce the law, and the judiciary will resolve legal conflicts. E-Government is about improving the work of all of these branches of government, not just PA's (Public Administrations) in the narrow sense. [Gordon, T., ERCIM News No.48, January 2002, on http://www.ercim.eu/publication/Ercim_News/enw48/intro.html].

Within the community there is a debate on the correct use of the term e-government and e-governance. Both of them are used to describe a government use of ICT's to render services to its citizens. E-governance can be defined as "the use of emerging information and communication technologies to facilitate de process of government and public administration" [Drucker, 2001]. E-government can be defined as "the use of information technology to support government operations, engage citizens, and provide government services" [West, 1996].

Gartner Group's definition for e-government is: "the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the Internet and new media."

The UNESCO definition of e-governance is: "E-governance is the public sector's use of information and communication technologies with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and effective. E-governance involves new styles of leadership, new ways of debating and deciding policy and investment, new ways of accessing education, new ways of listening to citizens and new ways of organizing and delivering information and services. E-governance is generally considered as a wider concept than e-government, since it can bring about a change in the way citizens relate to governments and to each other. E-governance can bring forth new concepts of citizenship, both in terms of citizen needs and responsibilities. Its objective is to engage, enable and empower the citizen."[www.unesco.org]

"E-democracy builds on e-governance and focuses on the actions and innovations enabled by ICTs combined with higher levels of democratic motivation and intent" [Clift, 2003].

It is clear that there is confusion when explaining e-government and e-governance. Some authors state that e-government is a subset (a major one) of e-governance. Many available definitions are overlapping. Taking it all under considerations, we observe that e-government's focus is on stakeholders and constituencies outside the organization, whether is the government or public sector at the city, county, state, national or international levels. On the other hand, e-governance focuses on administration and management within an organization, whether is public or private, large or small. E-Governance refers to how managers and supervisors utilize IT and Internet to execute their functions of supervising, planning, organizing, coordinating, and staffing effectively [Shailendra, 2007].

2. Delivery models of e-Government

The three main target groups involved in e-government are the citizens, the government and businesses/interest groups. The external strategic objectives are focused on citizens and businesses and interests groups, while the internal objectives are focused on the government itself [Backus, 2001]. In the following discussion we will include one more, government to constituencies (e - democracy) [Shailendra, 2007].

2.1. G2C –Government to Citizen

G2C are activities that provide on-line access to information and services to citizens. In this category we can include applications that enable citizens to ask questions and receive answers, pay taxes, file income taxes, make appointments for vehicle inspection, renew certain paperwork. Also through this channel government may disseminate information on the web, like laws and decisions available online for consulting, or provide downloadable form citizens can use, help citizens find employment, file flood relief compensation (like in the case of Hurricane Katrina in USA, New Orleans) electronically through the use of smart cards.

2.2. G2B – Government to Business

This relationship includes two way interactions and transactions between the two. B2G refers to selling products and services to government. In the e-gov context, the government deals with businesses such as suppliers using the Internet or other ICTs. The key areas are e-procurement and auctioning of government surpluses. Many government agencies auction equipment surpluses ranging from seized goods to vehicles or foreclosed real estate.

Business from the US and other countries can file income taxes and financial reports online, and also sales taxes and value added tax can be paid online.

2.3. G2G – Government to Government

These types of activities are aiming to improve efficiency and effectiveness of government operations. They deal with those activities that take place between different government organizations/agencies.

Government to Constituents (E-Democracy)

E-democracy refers to online activities of government, elected representatives, political parties, and citizens for democratic processes. This includes political or current affairs discussion and online consultation between representatives and their constituents [Shailendra, 2007]. Within the domain of e-

Democracy electronic voting is an important application.

2.4. Table overviews of delivery models

Table 1.Development phases in e-government

	External: G2C	External: G2B	Internal: G2G
Phase 1 : Information	Local/Departmental/ National Information (mission statements and organizational structure, addresses, opening hours. employees. telephone numbers, laws, rules and regulations, petitions, government glossary, news.	Business information, addresses, opening hours, employees, telephone numbers, laws, rules and regulations.	Knowledge base (static intranet,) knowledge management (LAN).
Phase 2 : Interaction	Downloading forms websites, submitting forms, online help with filling in forms (permits, birth / death certificates), intake processes for permits etc. e-mail newsletters, discussing groups (e-demoracy), polls and questionnaires, personalised web page, notification.	Downloading forms from websites, submitting forms online, help with filling in forms (permits), intake processes for permits etc. e-mail notification.	E-mail Interactive knowledge databases Complaint handling tools
Phase 3 : Transformation	Personalized Website with integrated personal account for all services.	Personalized website with integrated business account for all services	Database Integration

(Source: Backus, M., E-Governance and Developing Countries, Introduction and examples, Research Report, No. 3, April 2001)

An even more interesting perspective on the interactions that take place between governments, businesses and citizens is offered to us by a study of Jamali. He tried to synthetize different kinds of solutions according to the type of interaction. In the following table he is making an overview of the different kinds of applications that are offering e-government solutions, categorizing then by the type of interaction.

Table 2. Applications in e-government

	Gouvernement	Business	Citoyens
Gouvernement	**G2G** o International o Fédéral / Provincial o Municipal	**G2B** o Services o Information o Régulations	**G2C** o Services o Information
Business	**B2G** o Approvisionnement o Déclaration des impôts o Sondage électronique	**B2B** o Commerce électronique o Partenariats o R&D	**B2C** o Vente au détail o Service / Support o Sondage électronique
Citoyens	**C2G** o Déclaration des impôts o Passeports o Demande des services	**C2B** o Vente au détail	**C2C** o Vente aux enchères o Place de marché électronique

(Source: El Jamali, 2004)

Figure 1. An e-government model focused more on G2C and G2G.

(UN E-government Survey 2008)

3. Status of E-Government in the world

The United Nations Division for Public Economics and Public Administration developed one if de indexes that are used to assess e-government's status. The index indicates the progress that the 191 UN member countries have made in implementing e-government services. In the 2003, 2004 and 2005 report it is called the *e-Government Readiness Index* and it is a composite index, comprising of the Web Measure Index, the Telecommunication Infrastructure Index and the Human Capital Index [UN report, 2005].From the 2008 report the indexes name has been changed to e-government development index.

The Web Measure Index

This index is based upon a five stage model of e-government framework. The stages are similar to the ones in the three stage model presented before..

Stage 1. Emerging presence

E-government offers limited and basic information such as a web page, links to ministrie or/and local government, the constitution and maybe some more archived information; most of it is only static.

Stage 2. Enhanced presence

The citizens have acces to policies, laws and regulations, reports, and downloadable databases (basically a larger selection of public documents). Facilities as searches within the documents database, a site map and help are present. Information still has one direction, from government to the citizen.

Stage 3. Interactive presence

In this stage, online services of the e-government enter in interactive mode with offline services, thus they enhace convenience for the citizen (ex: downloadable form for tax payment, or licence renewal). Facilities would include audio and video capability for relevant public information which is updated with greater regularity, and multiple ways for contacting officials (email, fax, mail, and phone).

Stage 4. Transactional presence

This is the stage at which the two-way interactions apper between government and citizens. Options include but are not limited to applying for ID cards/passport, pay taxes, fees for postal services or other relevant public services. The business levels is also present here, hence providers of goods and services can bid online for public contracts.

Stage 5. Networked presence

This stage is characterized by an integration of G2C, G2B, and G2G services. The government would use interactive features such as online consultation mechanisms, or web comment forms to solicit the citizens view on law making, public policy, and democratic participatory decision making.

The key elements are collective decision making, participatory democracy and citizen empowerment as a democratic right.

Telecommunications Infrastructure Index

The index measures the country's ITC infrastructure capacity. There are six primary measures which are averaged to provide the index: PCs/1000 persons; Internet users/1000 persons; Telephone lines/1000 persons; online population; Mobile phones/1000 persons; TV's/1000 persons (UN report, 2008).

Human Capital Index

Relies on the education index, which is a composite of the adult literacy rate and the combined primary, secondary and tertiary gross enrollment ratio with two third weight given to adult literacy and one third to gross enrollment ratio (UN report, 2005).

3.1. E-government usage statistics

No matter how many facilities e-government is offering they are of no practical use and bring no gain unless they have a satisfactory usage rate.

Eurostat offers detailed statistics about e-government use in Europe. One of their indicators is e-government usage by individuals aged 16-74 using the Internet (percentages) for interaction with public authorities (obtaining information from public authorities websites, downloading official forms, sending filled forms). For each year, the data is gathered for three month before calculating the indicator.

Table 3. E-government usage by individuals (percentages)
(Source: Eurostat 2010 Statistics at http://epp.eurostat.ec.europa.eu/)

geo \ time	2005	2006	2007	2008	2009	2010
European Union (27 countries)	23	25	30	28	30	32
European Union (25 countries)	23	26	32	29	32	33
European Union (15 countries)	26	:	34	32	33	35

While the usage of e-government by individuals does not rise above a third of the users with Internet access, e-government proves its efficiency on the enterprise side. In EU the number of enterprises that are using e-government in their relations with public authorities (obtaining information, downloading forms, filling-in web-forms, full electronic case handling) is more than double in percentage than in the case of individuals. This shows that e-government is a tool that serves well the enterprises activity which is governed by economic rationality.

Table 4. E-government usage by enterprises (percentages)

geo \ time	2004	2005	2006	2007	2008	2009
European Union (27 countries)	51	57	63	65	68	72
European Union (25 countries)	52	57	64	67	70	73
European Union (15 countries)	50	56	64	66	70	74

(Source: Eurostat 2010 Statistics at http://epp.eurostat.ec.europa.eu/)

According to Eurostat, another important indicator to assess the state of e-government is e-government on-line availability. The EU has set a number of 12 basic public services for individuals and 8 for enterprises. The basic public services for individuals and enterprises are:

Table 5. Basic public services

Individuals	Enterprises
• Income taxes; • Job search; • Social security benefits; • Personal documents; • Car registration; • Building permission;	• Social contributions; • Corporate tax; • VAT; • Registration of a new company; • Submission of data to statistical offices;

• Declaration to the police; • Public libraries; • Certificates; • Enrollment in higher education; • Announcement of moving; • Health related services.	• Custom declarations; • Environment-related permits; • Public procurement.

(Source: Eurostat methodology at http://epp.eurostat.ec.europa.eu/)

The indicator shows the percentage of the 20 basic services which are fully available online for which it is possible to carry out full electronic case handling. For example if in a country 13 of the 20 services were measured as being 100% available on-line and one service was not relevant (e.g. does not exist), the indicator is 13/19 which is 68.4%. In the case of this indicator there are in Europe three countries that score a full 100% : Ireland, Italy and Sweden.

Table 6. E-government on-line availability (percentages)

geo \ time	2004	2006	2007	2009	2010
European Union (27 countries)	:	:	58.27	72.87	84.28
European Union (25 countries)	42.25	51.96	60.88	75.2	85.82
European Union (15 countries)	50.86	57.13	67.03	79.12	90.4

(Source: Eurostat 2010 Statistics at http://epp.eurostat.ec.europa.eu/)

In these conditions a good subject for improvements is increasing the usage rate of the citizens, taking into account that now is only a third of the number of those with Internet access. According to Eurostat, about 50% of those who use the internet did not use the internet or a mobile phone to contact a website in their last contact with government. The most common reasons for not doing so are that:

- They preferred contact with a real person;
- An online option was not available;
- The process could only be done in person;
- Usability: website navigation difficulties.
- Access: lack of familiarity with Internet this kind of tools;
- Security and privacy concerns;
- Awareness: they were unaware whether the task can be done online.

- Discoverability of content: ex.:The people in rural area did not know which department to look for online;

Within the interactions take takes place in the e-government process, there can be identified four types of activities that are taking place [Shailendra, 2007]:

- Publishing information over the Internet, e.g.: laws, regulations, notifications, etc.
- A two-way communication between government and citizens, businesses or another government agency. The users are engaging in dialog with the government, can comment, post problems or requests.
- Transaction: tax returns and payments, applications for different government services.
- Governance, e.g.: the active participation of the citizen in the governments' activity, by consulting the citizen. The citizen is no longer in the position where he has only passive access to information.

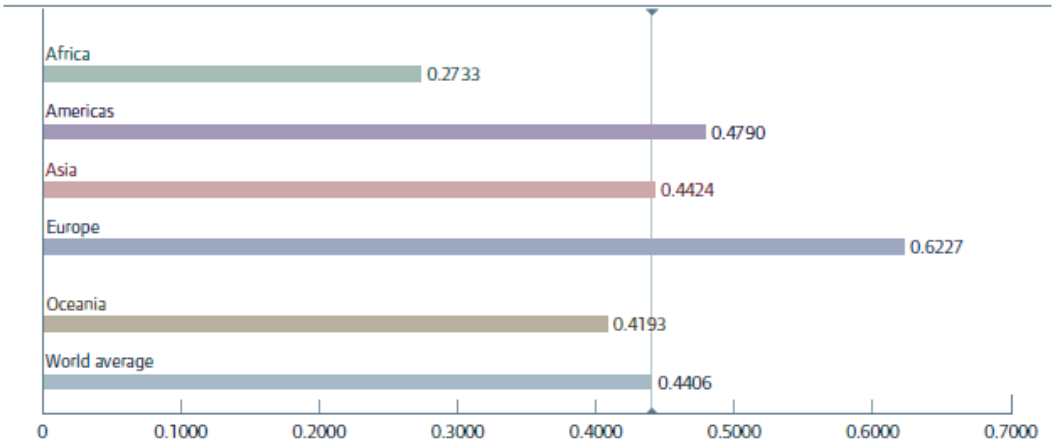
Table 7. Top 35 Countries in the e-Government Development Index

	2008		2010	
Rank	Country	Index value	Index Value	Country
1	Sweden	0.9157	0.8785	Republic of Korea
2	Denmark	0.9134	0.8510	United States
3	Norway	0.8921	0.8448	Canada
4	United States	0.8644	0.8147	United Kingdom
5	Netherlands	0.8631	0.8097	Netherlands
6	Republic of Korea	0.8317	0.8020	Norway
7	Canada	0.8172	0.7872	Denmark
8	Australia	0.8108	0.7863	Austratia
9	France	0.8038	0.7516	Spain
10	United Kingdom	0.7872	0.7510	France
11	Japan	0.7703	0.7476	Singapore
12	Switzerland	0.7626	0.7474	Sweden
13	Estonia	0.7600	0.7363	Bahrain

14	Luxembourg	0.7512	0.7311	New Zealand
15	Finland	0.7488	0.7309	Germany
16	Austria	0.7428	0.7225	Belgium
17	Israel	0.7393	0.7152	Japan
18	New Zealand	0.7392	0.7136	Switzerland
19	Ireland	0.7296	0.6967	Fmland
20	Spain	0.7228	0.6895	Estonia
21	Iceland	0.7176	0.6866	Ireland
22	Germany	0.7136	0.6697	Iceland
23	Singapore	0.7009	0.6694	Liechtenstein
24	Belgium	0.6779	0.6679	Austria
25	Czech Republic	0.6696	0.6672	Luxembourg
26	Slovenia	0.6681	0.6552	Israel
27	Italy	0.6680	0.6315	Hungary
28	Lithuania	0.6617	0.6295	Lithuania
29	Malta	0.6582	0.6243	Slovenia
30	Hungary	0.6485	0.6129	Malta

(Source: United Nations E-Government Survey 2008 and 2010, at http://www2.unpan.org/egovkb/global_reports/10report.htm)

Figure 2. Regional comparison chart



(Source: United Nations E-Government Survey 2008 and 2010, at http://www2.unpan.org/egovkb/global_reports/10report.htm)

Table 8. Regional comparison: E-government development index value

Region	2010	2008
Africa	0.2733	0.2739
Eastern Africa	0.2782	0.2879
Middle Africa	0.2603	0.2530
Northern Africa	0.3692	0.3403
Southern Africa	0.3505	0.3893
Western Africa	0.2156	0.2110
Americas	0.4790	0.4936
Caribbean	0.4454	0.4480
Central America	0.4295	0.4604
Northern America	0.8479	0.8408
South America	0.4869	0.5072
Asia	0.4424	0.4470
Central Asia	0.4239	0.3881
Eastern Asia	0.6470	0.6443
Southern Asia	0.3248	0.3395
South- EastemAsia	0.4250	0.4290
Western Asia	0.4732	0.4857

Europe	0.6227	0.6490
Eastern Europe	0.5449	0.5689
Northern Europe	0.7113	0.7721
Southern Europe	0.5566	0.5648
Western Europe	0.7165	0.7329
Oceania	0.4193	0.4338
World average	0.4406	0.4514

(Source: United Nations E-Government Survey 2010, at http://www2.unpan.org/egovkb/global_reports/10report.htm)

3.2. Trends in development

The following table contains the values of these three indexes for Europe during the years 2005 – 2010.

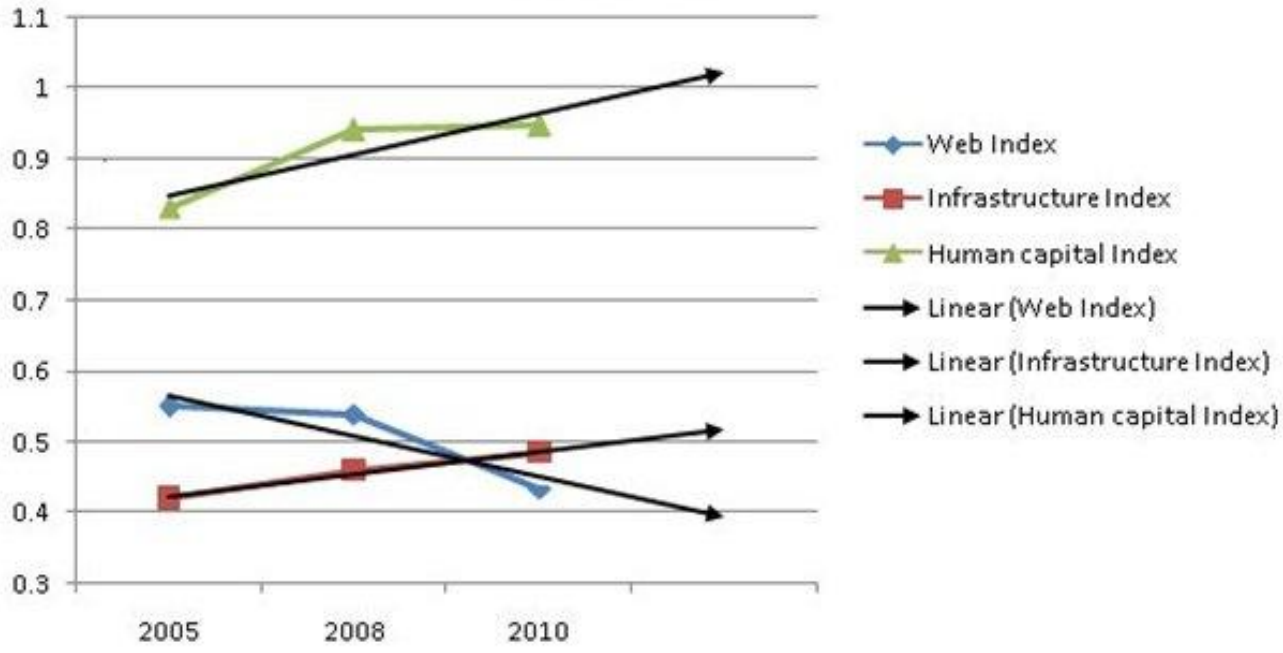
Table 9. Index values for Europe

Composition Indexes			
	2005	**2008**	**2010**
Web Index	0.55	0.54	0.44
Infrastructure Index	0.42	0.46	0.43
Human capital Index	0.33	0.94	0.95

(Source: United Nations Reports, 2005-2010)

As we can see at a first glance, the human capital index has the biggest values. The infrastructure index is registering a slow but constant growth while the web index is falling. We can get a better perspective on the situation from the following chart.

Figure 3. Index trends in Europe



(Source: United Nations Reports, 2005-2010)

The most obvious observation is that from 2005 to 2008 the human capital index resisted a significant growth of about 15%, with a small drawback after 2008. The right assumption to make in this case is that investments in education were made during the economic crisis. Hence the developed european countries already had high values when measuring the index, the growth comes most probably from less developed countries that are new members of the EU (European Union), countries known to have problems with school enrollment and literacy rate. This might have been caused by the different programs that the EU is running in these countries in order to increase the adult literacy rate and gross enrollment ratio. Also, aligning the policy of new member states with the EU policy, led to a set of reforms that changed the educations system in most east European countries.

Although the years after 2005 were known as a time of economic crisis, the infrastructure index registered growth. As expected for times like that, the growth was small, but constant. In conclusion, the population interest of spending money on mobile phones, computers, TV's or Internet did not diminished during the crisis, mainly because these goods are not luxury goods anymore and are seen as basic goods nowadays A good impact on this index was also brought by EU programs in east European countries, with programs in collaboration with local governments. These programs were supposed to bring television and Internet to remote places or make them available to a poorer individuals or enabling them to buy computers with a discounted price. Furthermore, from 2005 to 2010, the mobile phone market evolved in the sense that competition increased between providers, thus their services got cheaper and consequently available to more people.

The effects of the crisis are more obvious in the case of the web development index. From 2005 to 2008 this index had a small drop of 1% out of the total, this telling us that there were very few improvements on this subject during this period. Between 2008 and to 2010, the index registered a fall of 10% out of the total score. This suggests that no major investments were done during this period due to financial reasons. Also, it may be that other regions that might have not been affected so much by the crisis invested more in e-government, thus raising the standards, while Europe was defined by stagnation.

Governments are significant purchasers of IT, their decisions being able to influence the market. Policymakers should develop procurement policies that are neutral with respect to specific technologies or platforms and that allow the governmental decision maker to choose the best alternative in a particular situation based on reasonable, objective criteria.

3.3. The big picture

On a regional level, the highest ratings on e-government development index are received by Europe, followed by the Americas. Other regions (Oceania, Asia) are in close range to the world average while Africa is the only one far behind. By looking at the composition of the e-government development index, the first big impediment in Africa's development would be telecommunications infrastructure component (United Nations, 2010).

Romania is situated at about the same level with east European countries (Czech Republic, Hungary, Poland, Slovakia, Ukraine, Bulgaria, Romania, Belarus, Russian Federation, and Republic of Moldova) involved in the analysis. There are many considerations and potential implications in designing and implementing e-government. There are also a series of issues that can be listed as e-government disadvantages, though I consider them to be more of a weak points and subjects for improvements and good management, rather than disadvantages. Some of these may be the lack of equality in public access to Internet, reliability of published information, vulnerability to cyber-attacks, increased surveillance leading to lack of privacy, cost and a false sense of accountability and transparency.

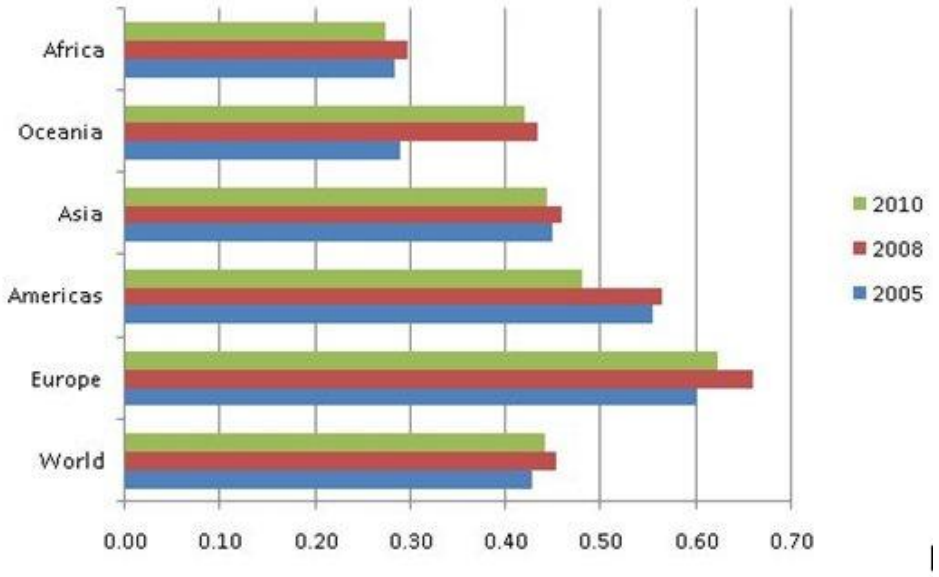
There is also a lot to debate on the subject of early adopters of e-government and how did the economic crisis influenced adoption. Mainly, some studies (Shailendra, 2007) show that early adopters are driven by the wish to solve problems, they want to use technology for improving an already existing process, while countries that adopt technology later, are firstly motivated by conformity issues rather than efficiency. In this context, some countries that are later adopters, also affected by the crisis, did not scored good on the web measure index due to lack of quality.

Table 10. E-government development index – regional values

E-Government Development Index					
	2003	2004	2005	2000	2010
World	0.402	0.413	0.427	0.451	0.441
Europe	0.553	0.537	0.601	0.660	0.623
Americas	0.533	0.549	0.554	0.564	0.479
Asia	0.337	0.400	0.449	0.457	0.442
Oceania	0.351	0.301	0.239	0.434	0.419
Africa	0.246	0.253	0.233	0.296	0.273

(Source: UN Reports, 2003-2010)

Figure 4. E-government development index – regional chart



(Source: UN Reports, 2003-2010)

As we can see from the above bar graph, the regions in which e-government was most affected by the crisis are Europe and the Americas, as expected. In these two cases there is a high difference

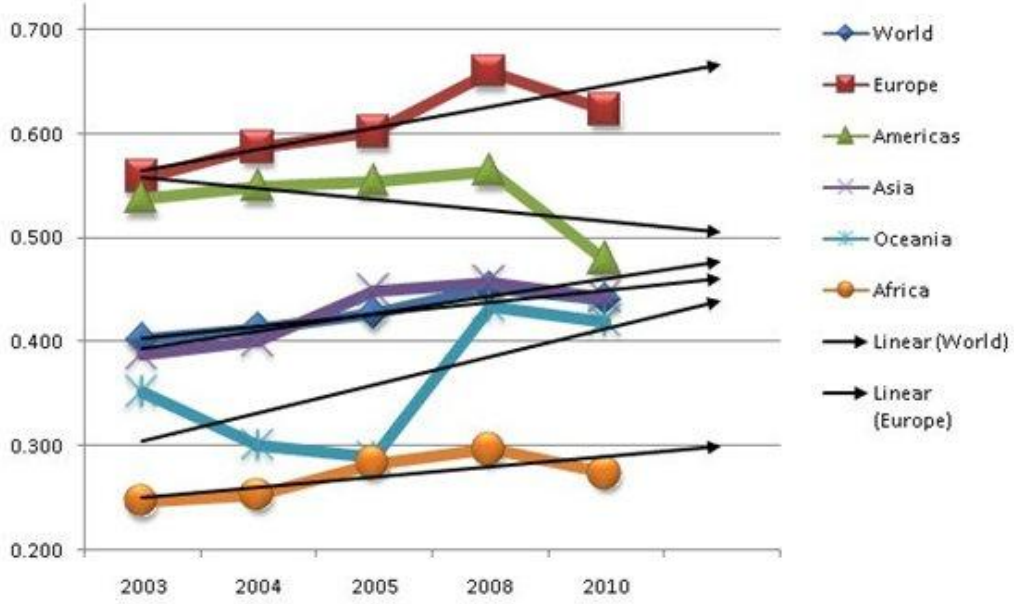
between the values registered in 2008, compared to the ones registered in 2010.

In what concerns e-government, Asia did not had much to suffer from the crisis. Asia's score remained mostly constant, with small variations, and very close to the world's average. This was expected because Asia is a big market for technology and also because the crisis, having American roots, affected more the economy of Europe rather than Asia's.

The crises affected also the EU funds that were granted for e-government research and development. From 2001 to 2006, there were two big projects aimed on e-government development. One of them was COSPA (Consortium for Open Source Software in Public Administration) and the other was FLOSS (Free/Libre and Open Source Software). These projects were aimed to develop methodologies, business models and frameworks for implementing and using open source software in public administration around Europe. Although the projects had many deliverables and successful implementations, there were no other similar projects funded after 2006.

After 2006 there are no big projects at European scale, but there are many local projects that benefit from the knowledge of the ones before them. Some cases worth mentioning are implementations made in Munich, Vienna or Extremadura region from Spain, where local governments leveraged the benefits of open source software to establish a solid e-government environment.

Figure 5. Regional trends in e-government development index



(Source: UN Reports, 2003-2010)

All European regions excel in the e-government development index and achieve scores above the world average. Western and northern Europe countries perform especially well in e-government development, drawing on the advantages of the well-developed telecommunications infrastructure and high human resources capacity. Many countries in Europe are high-income developed countries, and this advantage in reflected in the chart above. Even so, a decline is registered from 2008 to 2010, decline that can be correlated with the decrease of the web index for that period, but we cannot but notice that this did not affect the ascendant trend of e-government development in Europe.

In comparison with other areas, we see that the loss in the index value registered by Europe was smaller than in the case of the America, thus the crisis had more influence over e-government development in the Americas. While Europe still maintains on an ascendant trend, the economic crisis did put e-government development in the Americas on a descendent trend. Asia ranks very close to the world's average, registering a higher increase than the world average. Africa was and still is the least developed, some effects of the crises can be noticed from 2008, but this region has still a lot to suffer from poor infrastructure and very low score in human development index. Oceania registered the highest increase in e-government development during times of economic crisis, mainly because of a very low level development before 2005 and just achieving online government presence after 2005, boosted its web development index.

Given the actual state of the economy in Europe, e-government depends of a series of key factors that would enable it to reach higher levels of development. One of the factors is human capital, which should be a priority and a framework should exist to ensure education attainment in schools include teaching on ICT use to ensure that future generations are adept with technological advancements. Also, computer penetration rates are a subject for enhancing efforts and have strong potential for further development. Service providers should be able to offer high speed Internet connection at competitive prices. This will help bridge the gap in digital divide.

European countries that cannot afford proprietary software and applications for e-government should strongly consider either to outsource e-government or to use open source software.

Security and ease of use should also be desired and provided with affordable authentication technologies for making online transaction more reliable. Online transactions have to become more attractive to citizens so a good idea for e-government sites would be to provide incentives for users to complete their transactions online.

4. Controversies in E-Government

There are many considerations and potential implications in designing and implementing e-government. There are also a series of issues that can be listed as e-government disadvantages, though I

consider them to be more of a weak points and subjects for improvements and good management, rather than disadvantages. Some of these may be the lack of equality in public access to Internet, reliability of information published, vulnerability to cyber-attacks, increased surveillance leading to lack of privacy, cost, and a false sense of accountability and transparency.

When speaking about e-government, the appropriate way to regard the so called disadvantages is to treat then as risk. Although this section is mainly about advantages and risks (disadvantages), either of these two categories arises when we actually try to measure benefits. Finally, the whole purpose of an e-government initiative is to bring benefits. The e-government program of Australia has grouped e-government benefits into four categories: agency benefits, consumer financial benefits, social benefits and contribution to broader government objectives.

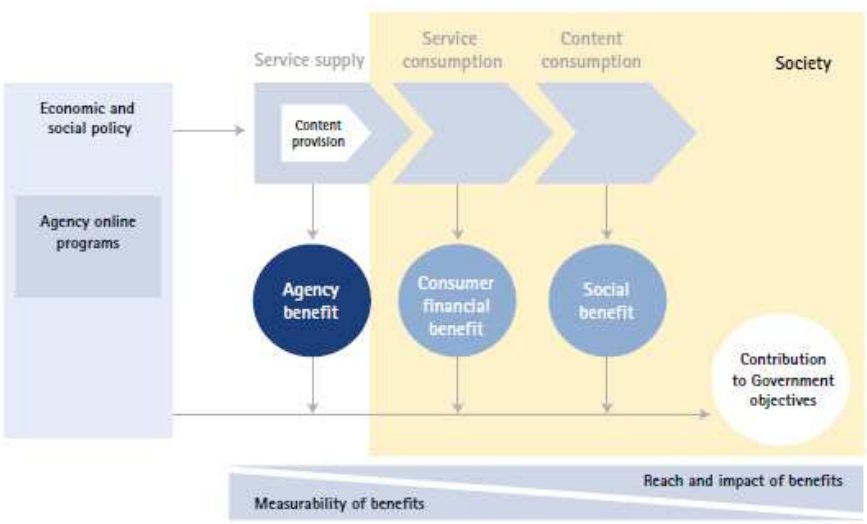
Agency benefits include cost reductions and increased revenues, improved price to output performance (efficiency), improved effectiveness (changing the demand profile for outputs) and improved service.

Consumer financial benefits taking shape as time saving for users, cost savings and revenue opportunities delivered to citizens, businesses or intermediaries; and financial benefits gained from leveraging improvements in government service levels, integration and effectiveness.

Social benefits are the category which is the hardest to measure in financial terms. In this category we find the contribution made by government online services to the quality of life of citizens, businesses and intermediaries. The social benefits are a result of the fact that information in easier to find and to use thanks to e-government. This information has the capacity of helping people, the community or businesses make decisions.

Contribution to broader government objectives is including macro-level improvements in economic, social and technological development, improvements in information availability and more open and democratic government.

Figure 6. Relation between benefit classes to service delivery elements



(Source: E-gov benefits study in Australia, at www.agimo.gov.au/archive/__data/assets/file/0012/16032/benefits.pdf)

4.1. Risks

While disadvantages state a clear state of lack of something, risks can be managed. A short summary of such risks can begin with:

- The risk of e-government not being accessible to certain categories of people (elderly persons, people affected by poverty, illiterate people, etc.);
- Implications on data security, such as protection of personal data, confidentiality, etc. ;
- Transferring a series of costs to the citizen: buying a computer, connecting to the internet, printing, etc. ;
- Citizens lacking access to Internet, thus to e-government (weak ICT infrastructure);
- Cultural barriers or lack of IT knowledge (ex.: in some countries electronic communications not considered trustworthy, meaning that the majority of people would choose to go in persons when having to deal with governance);

We will go into more details for a few of these risks.

Inacesibility

Since e-government is oriented firstly towards the citizens we can't but think of a few categories of people on which e-government might not have any effect. Because of limited access to Internet and technology, e-government cannot reach potential users that are living in remote areas or are homebound. Moreover, there are a lot of people with low literacy levels (there is a study stating that 40% of USA's population is at the limit of literacy) that are not able to interact with such technology or people that live on poverty line incomes [Becker, 2009]. Though some of these points are not problems for e-government to solve, them being more complex and involving social and economic development of certain areas and populations, they can seriously affect any e-government initiatives by limiting their efficiency and effectiveness, thus making it hard to assess whether to implement or not.

Cost

In any kind on investment, whether private or public, money is an issue to be discussed. In the public sector the money being spent are the money of the contributors, thus there is a high demand of transparency and accountability. By implementing e-government projects, the government also states that the implementation will lead to an increase of both those demands, but if the government finds itself in the situation of spending a prodigious amount of money and the outcome is difficult to gauge or unsatisfactory. Governments have mostly been using technology for projects where public support is likely to be strong and opposition low, like putting information online, simplifying tax administration, etc. Few have tried to tackle the big task: reshaping the government in order to take advantage of the possibilities that technology now permits [The pros and cons of e-governemnt, The Economist, athttp://www.economist.com/node/10638105?STORY_ID=10638105].

Transparency and accountability

Transparency and accountability are often listed as reasons for e-government initiatives. Viewed from the disadvantages side, they are addressed as a false sense of transparency and accountability. Since the government itself is the one maintaining online governmental transparency and information can be added or removed from the public eye to the government's convenience, governmental transparency becomes a dubious subject.

Although transparency and accountability are subjects for risk in e-government, they can also be viewed as benefits in the cases of good governance. For example, we have to keep in mind the value

brought by a few low-cost solutions in e-government. In California, the state spent about 21000$ for a public spending transparency website that costs 40000$ to run each year. Visitors to the website can report unnecessary spending to the government and after just a few months of operation, the website has already saved the state over $20 million. In a similar way, a transparency website from Texas, in just a few months from launching, had helped achieve savings of over $5 million (Baxandal, 2008).

Surveillance

The relations that established between government and citizens its becoming more and more to be a two way relationship, with the development of e-government services. The development of e-gov services and their increased sophistication are increasing the interaction level, so citizens are interacting with the government electronically on a larger scale. This interaction leads to more and more information about the citizen to be stored on governments computers and in time the government will have countless information about its citizens. This could potentially lead to a lack of privacy or even loss of privacy [Singel, 2007].

4.2. Advantages

E-government comes with the advantage of easy access to the most current information available without spending resources to get. Some simple task may be easier to perform through electronic government access. Many processes that are taking place while the government interacts with the citizen require an extended amount of time and a lot of paperwork for the citizen. More convenience is brought to the citizens by using e-government.

The policies that are being implemented and what is the government working on are subjects of interest for the great public, thus these are funded from the taxpayers money. Within this issue, government transparency is an important topic and e-government allows for government transparency, but whether or how it accomplishes it is at the government's choice.

Implementing e-government solutions has a series of potential advantages that cannot be ignored by government. A few of these advantages would be:

- Making services available on-line 24/7;
- Using new technology that is available to the citizens and that many citizens have (personal computer, Internet, printer, mobile phone, etc.);
- Increased comfort and efficiency (less tangible files to work with, more and easier to access information, no need for the citizen to go in person to solve his claims/problems/statements);
- Better speed in processing claims;

- Increased transparency and accountability;
- Information is widely available and are offered faster;
- Simplifying the public administrations (less forms to fill in);
- Involving the citizens in governance;
- Offering personalized services to citizens or businesses (tax calculations, personal file overview);

Speed, efficiency and convenience

For the citizens that have access to Internet and are computer literate, e-government eliminates the necessity for physical travel to government agents sitting behind a desk and allows interactions with the government to take place at any time and from any location. The management of information and the access to information are improved (improved record keeping and accounting, access to forms and information) because the information is stored in databases that can be easily queried and not in hardcopies stored in different locations. There are some categories of people with mobility problems that now can be active in governance from the comfort of their home, like individuals with disabilities or conditions.

Environmental benefits

E-government will reduce the amount of paper used in public services because the use of electronic forms will lessen the need for hardcopy forms [Dezayas, 2008]. The United States government utilizes a website (http://www.forms.gov) to provide internal government forms for federal employees and thus produce significant savings in paper.

[http://www.whitehouse.gov/omb/assets/egov_docs/FY09_Benefits_Report.pdf].

E-democracy

In theory, with the proper application of e-government governments could move towards a true democracy. Transparency will give insight to the people on how decisions are made and hold elected officials or public servants accountable for their actions [Thorpe, 2009]. The public will become a direct and prominent influence in government legislature to some degree.

4.3. Technology specific e-government

There are also some specific technology-specific sub-categories of e-government, such as m-government (mobile government) and g-government (GIS/GPS applications for e-government)(ex:

Ministry of Agriculture from Romania).

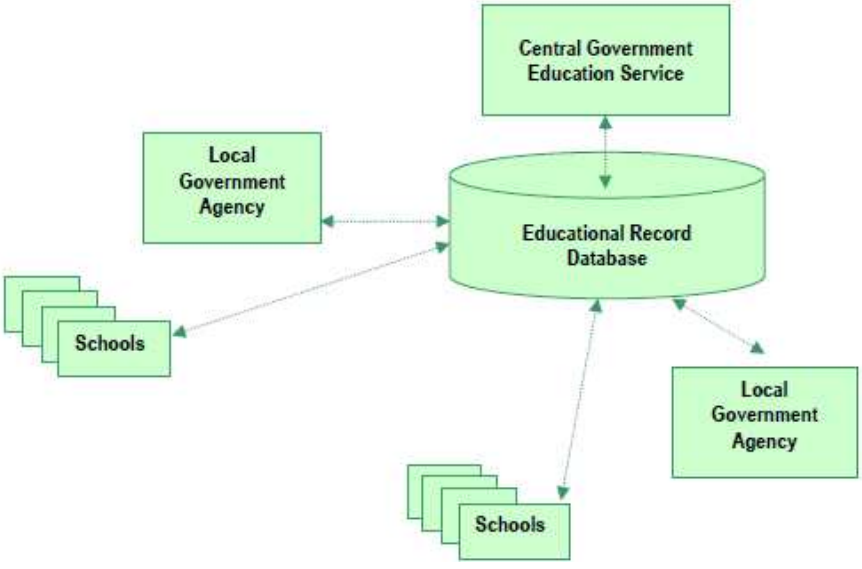
4.4. Integration issues in E-government

E-government can be defined as the use of ICT to improve the activities of the public sector organizations and their agents. These improvement efforts can be directed either to the "front office" (delivery of services to citizens) or to improve operational efficiency within the "back office". By integrating the back office functions operational efficiency can be improved.

The back office functions are those areas that support front line delivery of services. The European Commission has identified a few priority areas that will require back office integration at national and European level (vertical and horizontal alignment). These areas are:

- Making efficiency and effectiveness a reality which is achieved through high user satisfaction with public services through using ICT appropriately to reduce the administrative burdens of citizens and businesses;
- Implementing high impact key services for citizens and businesses. This includes establishing Pan-European electronic procurement processes using common platforms to achieve efficiency gains;
- Putting key enablers in place which includes promoting interoperability between e-government systems so that as an example e-signatures can be used along with other aspects of electronic identification management.

Figure 7. Example of vertical integration of Educational Records



(Source: UN E-government Survey 2008)

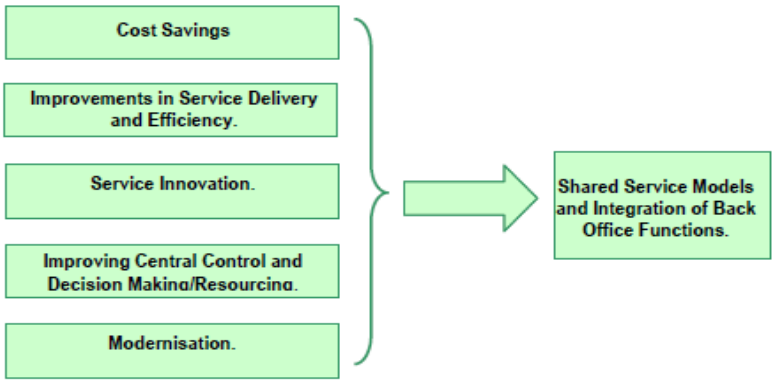
Vertical integration involves connecting different tiers of public administration for one or more functions. Horizontal integration takes place in a single organization, linking several functions, or between a number of agencies and public sector bodies engaged in delivering a specific function or group of functions. As an example of vertical alignment we can state a single electronic financial planning system used by both local and central government. A common example of horizontal integration would be a database populated and used by local and central government, private sector partners, community groups, NGO's .

For delivering back office integration there can be used three methodologies, each of them with its strengths and weaknesses:

- In-house delivery;
- Strategic partnerships;
- Outsourcing;

The key factors that are driving back office integrations are:

Figure 8. Back office integration



(Source: UN E-government Survey 2008)

In-house delivery means that the projects are developed and implemented by an in-house team that might or might not benefit of consultancy from the outside. Using this model the leadership and overall management of the project rests with the host organization. Most often the reasons behind choosing this methodology are either political or cultural or caused by the absence of a possible

strategic partner or a mature outsourcing market.

Table 11. In-house delivery

In-house delivery	
Strengths	Weaknesses
• Retains full control of the project; • Keeps ownership; • Flexibility in implementation; • Skills and knowledge develops in-house; • Can be cost-effective; • Can motivate the in-house staff.	• Possible lack of knowledge and skills that may lead to poor project design, control and delivery and expenses on consultants; • Allocating the in-house staff to different projects can have a negative impact on existing services and may cause the need to hire temporary staff.

Strategic partnerships are usually long term contracts (@10 years) in which an external partner brings specialist expertise as well as investment in technology. The contract involves a mutual commitment to develop innovative service delivery. The partnership element is seen as a plus in quality over the common relationship between a buyer and a supplier.

Table 12. Strategic partnership

Strategic partnership	
Strengths	Weaknesses
• External expertise, knowledge and skills; • Can bring capital investment in technology; • Clarity in objectives and deliverables; • Knowledge transfer between in-house and external staff; • Keeps control of the project/functions.	• Long term commitment and costs; • Potential mismatch in culture and expectations; • Dependency on partner; • Priorities cannot be chanced once on signed contract; • External environment can affect the partner (mother-child company)

Outsourcing means that a certain function or entity is transferred to another organization, most often to a private sector organization. The public body will no longer be responsible for implementing changes and relies on the output based on the contractual arrangement with the outside supplier. This option is viable when an analysis will show that the outsourcing supplier will deliver a service that is better that what the organization can deliver now or with in-house development, by maintaining outputs and costs. The most difficult aspect to concern about in outsourcing is the quality. Measuring volumes of output and costs reductions is easier that gauging the quality required. Outsourcing relies on good contractual documentation that sets out each party's rights and obligations and protections. In order to

outsource a function, there are a series of steps that should be done: having a methodology that can be used to determine whether outsourcing is appropriate for the function, establishing a framework to measure the benefits against the risks/costs of outsourcing, developing guidelines for implementations and management, preparing staff for a potential strategic alternative in the future.

Table 13. Outsourcing

Outsourcing	
Strengths	Weaknesses
• Passes the problems to a third party to solve; • External expertise; • Possible external investment; • Reduces demand organizational /management capacity.	• Control only on outputs; • Potentially high costs; • Contractual relationship may be inflexible; • Takes time and expertise to outsource; • Costs of contract management; • New skills required in contract management.

5. Regional examples of good practice

In the following pages there will be an overview of some of the world's leading e-government websites, structured by region. These initiatives can be taken as examples of good practice in e-government implementation, and they stand up from the total number of e-government websites by having high customer satisfaction rate. When assessing the customer's satisfaction rate, some of the aspects that are taken into consideration are functionality, navigation, look and feel, site performance, and content (Customer Satisfaction Index, USA).

One of the www.ssa.gov websites that according to its surveys has some of the highest satisfaction rates (90%) among its users is the United States Social Security Administration website.

According to the customer satisfaction index from the USA, the SSA website is the top government portal in terms of customer satisfaction. This portal receives a high number of repeat customers and is the primary resource for information on social

services in the US. The portal is constantly holding surveys to determine customer's needs, which led to an increase in loyalty and cost savings.

A fine example of using good practices to improve your own organization is given to us by the Kingdom of Bahrain, situated in the Middle East.

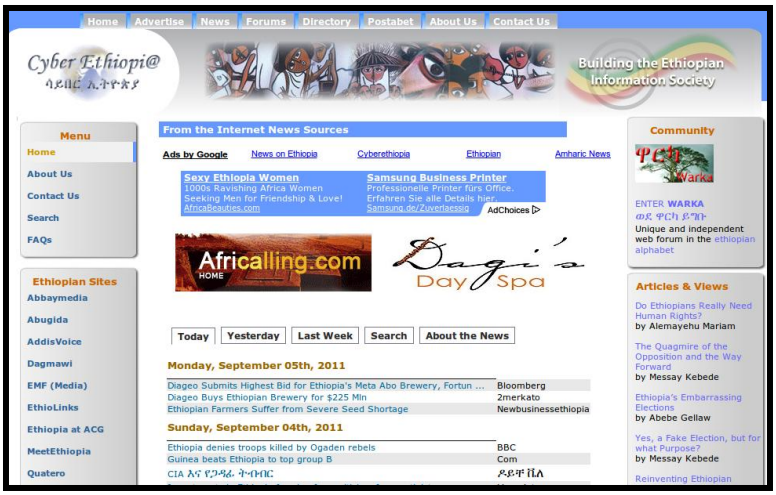
(http://www.bahrain.bh/wps/portal). The site is also available in English and has a similar map as the American SSA website. During implementation citizen involvement played a key role by obtaining continuous feedback. The e-government program is also present on social networks (Facebook, YouTube). In addition, the national portal provides open forums, blogs, live chats, online polls and e-newsletters in order to involve citizens in government decision making. In their last survey from may 2009, customer satisfaction was at around 85%.

5.1. Africa

In e-government rankings Northern Africa leads the region and is closely followed by Southern Africa (link). Despite the overall low scores of the e-government development index in the region, there are a few notable e-government initiatives in countries that improved their Web presence either by portals or ministry websites.

One of the initiatives that stand up is in Kenya. Seven of the largest health NGO's launched AfriAfya (the African Network for Health, Knowledge Management and Communication), that has the goal of using ICT to improve community health in rural areas of Kenya. Their network provides relevant up-to-date health information and supports a two-way communication with health care providers. (http://www.afriafya.org/)

One more example of e-government implementation is in Ethiopia. The website cyberethiopia.com owned by a NGO registered in Geneva is a good example of digital inclusion and participation in the information society because they have converted the Amharic language (one of the oldest in Africa) into a script that is web friendly, so a vast majority of the population can use the website.



The site provides accurate information about/for Ethiopia and Ethiopians, is not controlled by the government thus it is censored in some regions, and provides functionalities as chat, forums, blogs, web directory and a mail service.

The national portal of Algeria improved in the recent two years. They have also implemented an emergency national hotline for the H1N1 flu. This new portal has sections for both citizens and health care professionals, with links to information and medical resources, hotline numbers and symptoms and hygiene protocol.

The Western Africa region has the lowest ranking and is showing no improvements since 2008. Results in this region are mainly due to poor infrastructure and low human capacity. In the region broadband is almost non-existent and the best case in the region is Capo-Verde with only 1.48 subscribers per 100 inhabitants. Despite limited resources, there still are examples like the national website of Benin with pod-casting and online forums on a variety of topics or Ghana's incipient national website with links to Facebook accounts of government officials in the Ministry of Information.

5.2. Americas

In this region North America is a detached http://www.cyberethiopia.com leader in e-government, with South and Central America and Caribbean following at a big distance (link). There is a small improvement in the Caribbean region that in 2010 is ranked above the world average, while in

2008 was below it.

United States and Canada are ranked second and third in the world, by the 2010 UN report on e-government. Both countries have well-developed portals with a wide spectrum of e-services for their citizens. They have both created a favorable environment to encourage citizens to participate in decision-making around political issues and to provide feedback.

The leader in e-government is the national portal of the US. The USA.gov page provides links to over 100 government services and transactions. Its general information is available in 88 languages with extensive online service for foreigners that that want to conduct business, work, study or travel in the US. There is live chat assistance available and also a blogging platform. Besides the blogs, social media tools like YouTube, Facebook, and Twitter are used to share information and citizens can also share their own experiences. The main menu of the portal is divided into the following categories: information for citizens, business and NGO's, government employees, and visitors of the country. In then breaks down from these categories to relevant points of interest for each category.

The national portal of Canada links to Service Canada, an e-services portal for citizens, Canada Business for entrepreneurs and Canada International for Canadians living abroad. Citizens can open an account on the portal to have a single point of access to manage personalized information.

Central America is dominated by low scores, but there are a few projects that are starting to be promising.

One of the initiatives is in Panama. The First Lady's website is making an effort to support the poor and women. This site has a link from the national website and hosts a national campaign of non-violence against women. Another initiative promoted on this website is a micro-credit initiative to support rural women.

Guatemala has a good website for e-procurement that has very good visibility, being linked directly to the national website as well as the most ministry websites. It

offers registration and authentication, viewing of contracts awarded and provides information about the contracts and procurement system of the state. All opportunities for suppliers and products for buyers are listed.

The website of the Ministry of Labor from Peru is the only one in the South American region that has a page dedicated to unemployment in light of the global economic crisis. It presents a program on labor recruiting and government stimulus activities.

Colombia has the highest global ranking from the region in the UN 2010 Survey. The national portal of Columbia offers comprehensive information on procedures and services and allows citizens to search by department or region. They also have an initiative on digital literacy through which citizens can take courses and become certified.

http://www.guatecompras.gt/

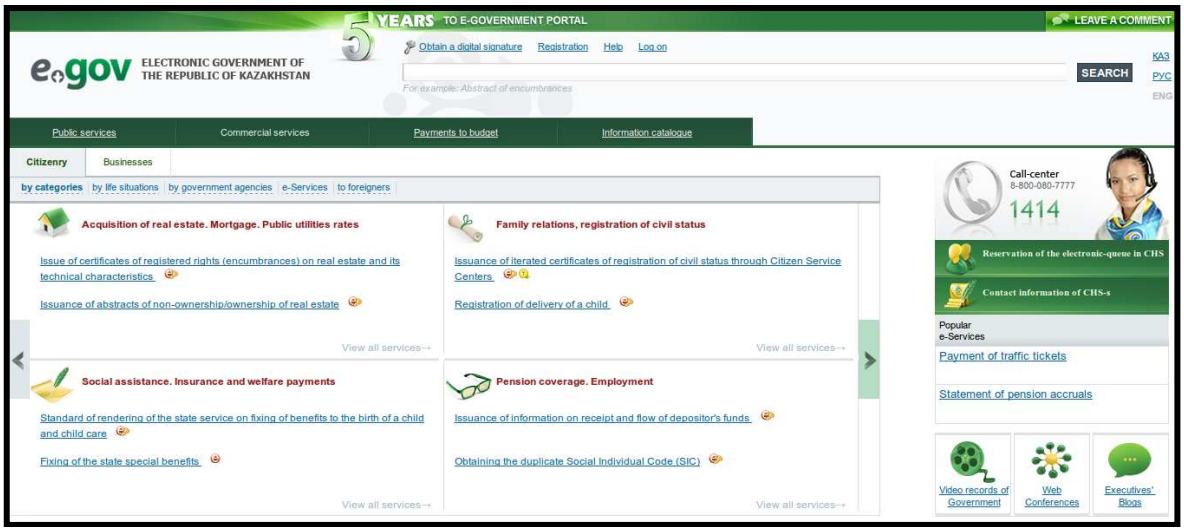
Argentina's Ministry of Labor dedicates sections of its homepage to special topics such as child labor, women in the workplace and war veterans. They also have an official page on the H1N1 flu virus with downloadable video and information pamphlets.

The Ministry of Health and Sports from Bolivia offers a portal (Promocion de la salud) that covers special topics ranging from gender violence to environmental health to disability.

5.3. Asia

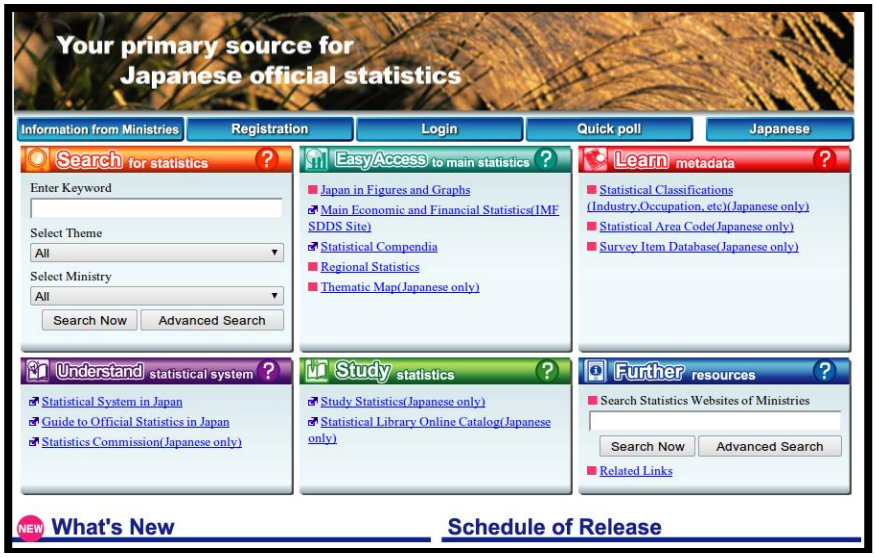
While Western Asia is above world's average, Central and South-Eastern Asia are slightly below average. Republic of Korea, Singapore and Bahrain are the topr three in the rankings from this region.

An initiative that stands out from the many available national websites is Kazakhstan's e-government portal which provides a comprehensive selection of e-services for citizens. E-services include e-payments, e-documents, e-registration, e-signatures, e-forms, etc. On the portal there are also videos and educational programs for children, online discussion and consultation, and other citizen's engagement tools. The government sees the portal as a tool to build citizens trust in government authorities.



(www.e-gov.kz)

Japan has developed statistical information portals. This portal also comes in English language and is available to mobile phones too, due to the high usage of mobile phones in Japan. While the national e-government portal (http://www.e-gov.go.jp/) is only available in Japanese and does not have a wide variety of features, the statistical portals have a user-friendly interface are providing users with options to gain access to official Japanese statistics, understand statistical systems and study about statistics. There are options to select statistics by ministries and government agencies. Users can also subscribe to RSS feeds on subjects of interest.



(http://www.e-stat.go.jp/SG1/estat/eStatTopPortalE.do) – English version

The republic of Korea's national website has one of the best designs in the world and a wide variety of features for its users. The main characteristic of Korea's system is integration. Citizens have

easy access to government information and there are features for mobile alerts, forms, transactions and online consultation. For e-participation, users are connected to E-people, which is a single online service that integrates the e-services of all government agencies. Its purpose is to improve transparency of government administration, diminish corruption by using reporting and engage citizens through petitions, proposals, and policy discussions.

(http://www.korea.go.kr/; http://www.epeople.go.kr/; http://egov.go.kr/)

In mobile e-government Singapore is the spearhead. The mobile phone's market in Singapore has a penetration rate of 136%, with 6.5 million mobile devices. The country's e-government plan includes mobile service delivery as a strategic initiative. At this time, over 300 public services can be accessed through mobile technology. The next wave of development in e-government in Singapore will support even more 24/7 transactions, including paying for train and bus fares, redemption of e-coupons, opening doors with the tap of a phone against a wireless reader.

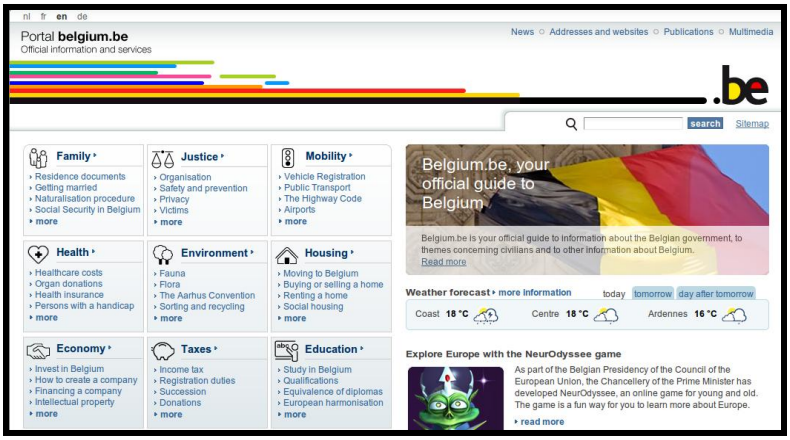
(http://www.ecitizen.gov.sg

An initiative from Oman is setting new trends in e-learning n has its own e-learning system that features virtual classroom and self-learning system (audio, video, text). They also employ a SMS feature for parents. Through Oman Mobile, they've set up a system that allows parents to follow their children's school performance on mobile phones. Parents can track

student attendance, receive grade reports, learn about temporary suspensions or receive calls to visit the school.

5.4. Europe

All European sub-regions excel in the e-government development index and score far abova world average. An overview of the most representative e-government implementation in East Europe would be the websites of the Ministry of Finance from Ukraine and Romania score high due to extensive content and a number of e-services.



The United Kingdom offers a user-friendly portal with 16 categories of information on the homepage. Citizens can subscribe to different feeds of information and receive them on their mobile phone.

The national portal of Belgium, which is available in four languages, has a link called MyBelgium that is a single point contact to government information and services. Over 9 million Belgians have an e-ID card that allows them to download authenticated certificates from their own file from MyBelgium.

(http://www.belgium.be/en/)

Austria has a website that supports gender equality. The government has a few new initiatives such as the "New child" law and "equal pay and revenue transparency for women", project on which they are providing information on this new website. The website promotes a program that provides parents with additional income for the first 14 months of the child's life, supporting mothers, fathers and single parents during difficult economic times (http://www.frauen.bka.gv.at).

The national portal of Portugal is informational and integrated and provides a clear gateway to service for citizens, including e-services. The site provides link to all ministries, including links to

various services for citizens, such as Emprego 2009 for access to educational and professional resources.

The website of the Ministry of Finance of Norway was ranked highest among ministries in the region in the 2010 Survey.

http://www.bundesregierung.de/)

The national portal of Germany has a link off the homepage to a website for children to learn how their government works, Regierenkapieren. It has tabs for interactive features titled such as "discover", "games" and "questions" and a daily news section. It captures the children's attention and gives them a better understanding of the process of government.

The national portal of the Netherlands offers a gateway to the municipalities of the Netherlands. It also harbors a substantive resource for elderly and disabled individuals wishing to locate online government services

5.5. Statistics on features

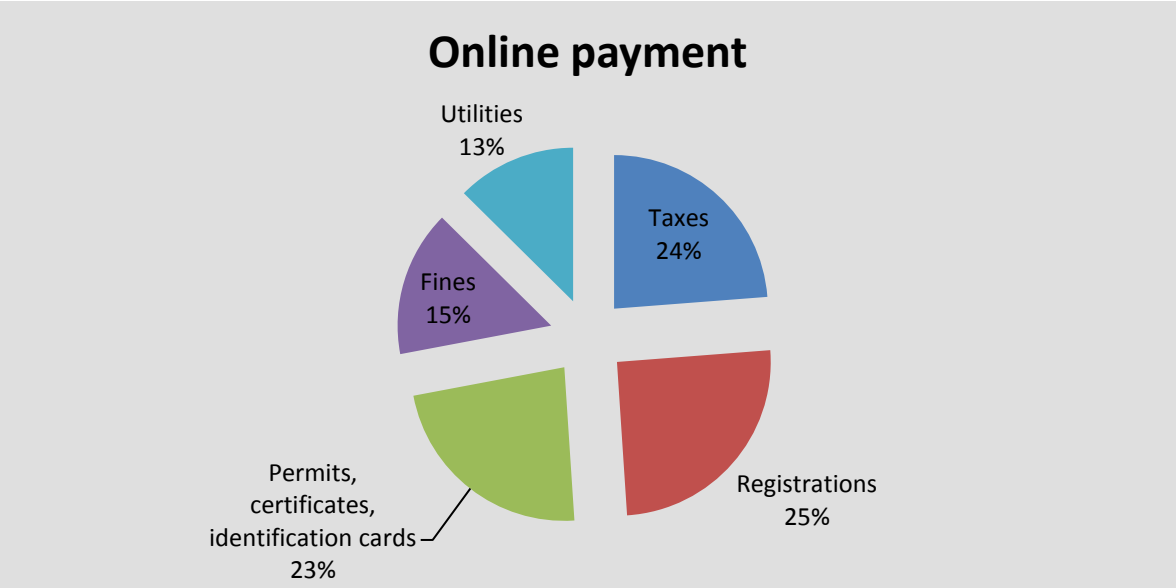
The UN 2010 Survey was made on a number of 183 countries. The following tables are illustrating the statistics that were obtained on different features that e-government is offering. These numbers can help us have a better idea on how developed e-government really is around the world.

Although in all the three tables the data is from the UN reports, the percentages, when put into Excel have different values that the ones in the table. This might be because in the tables the difference up to the total is made of a sum of other factors.

Table 14. Online payment

Payment type	Number of countries	Percent
Taxes	34	18
Registrations	36	19
Permits, certificates, identification cards	33	17
Fines	22	11
Utilities	18	9

(Source: UN 2010 Survey on e-government)

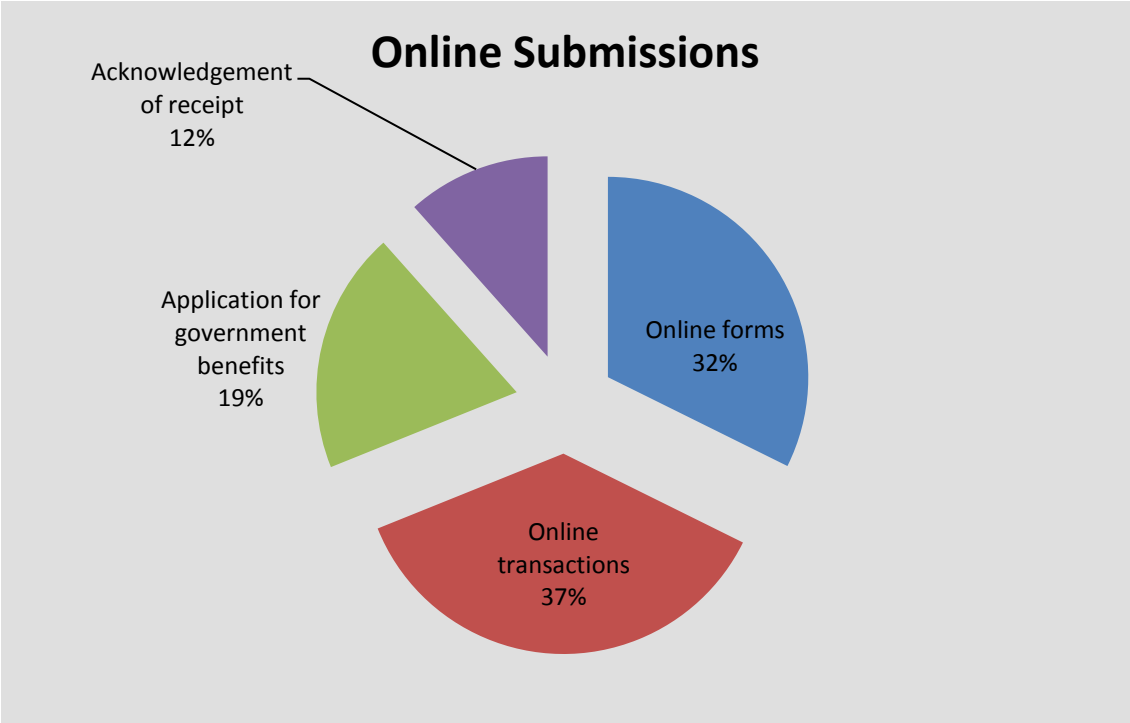


Online payment activities are mostly represented by registrations, paying taxes procedures and applying for permits, certificates and ID's. There are about 15% of users who find it confortable to pay fines online and about 13% of them are paying for utilities, which in my opinion is a very low percentage.

Table 15. Online submissions

Feature	**Number of countries**	**Percent**
Online forms	53	28
Online transactions	60	32
Application for government benefits	32	17
Acknowledgement of receipt	19	10

(Source: UN 2010 Survey on e-government)



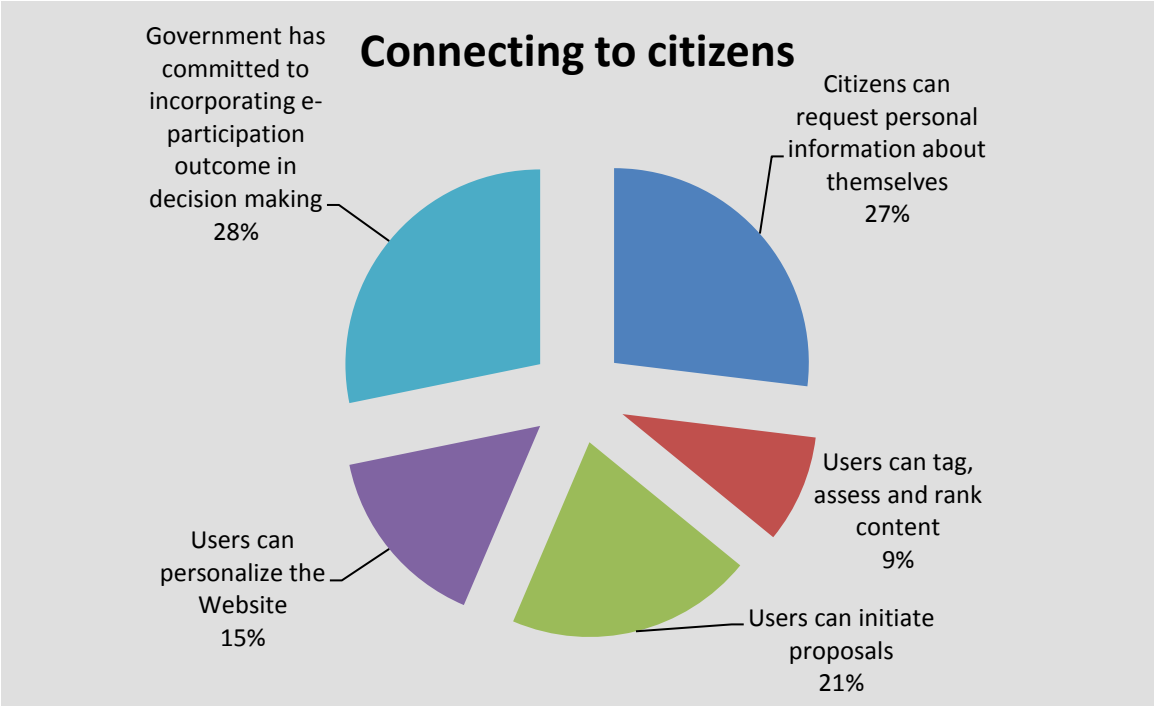
Most online submissions appear in the shape of online transactions which mostly involve registration or payment procedures. Online forms represent almost a third out of the all online submission which is a good reason to make this kind of service increasingly available because of its benefits for both parts. Citizen awareness is a subject to improve on in order to increase the 19% ratio for application for government benefits.

Table 16. Connecting to citizens

Feature	Number of countries	Percent
Citizens can request personal information about themselves	21	11
Users can tag, assess and rank content	7	4
Users can initiate proposals	16	8
Users can personalize the Website	12	6

Government has committed to incorporating e-participation outcome in decision making	22	11

(Source: UN 2010 Survey on e-government)



In the process of connecting to citizens one on the most important direction is incorporating e-participation outcome in decision making. Also transparency regarding the data that the government has about the citizen is a matter of high concern for the population. The ability to initiate proposals supports e-participation and the personalizing the website is leading to an increased ease of use.

6. Debate subjects in academic literature

Subjects to enhance on:

- OSS in E-government;
- Best practices when engaging in e-government;
- building a TCO and ROI calculation framework for OSS;

6.1. Harnessing E-government using Open Source Software

OSS (Open Source Software) adoption by PA's (Public Administration) is a highly debated subject by economists from both public and academic environments (Von Krogh &Spaeth, 2007; Federspiel& Brinker, 2010). For start, Lewis (2004, 2006, 2007, 2008) wrote and improved a set of public policies for supporting OSS adoption in the public sector. From his work, there are three observations to take into account:

- The most numerous initiatives of implementing OSS in PA's, that were also approved, come from European countries;
- The most common policies regarding the use of OSS in PA's are recommendation policies, followed by preference and research policies;
- The number of public policies to regulate PA's is increasing.

In the academic literature, when looking at e-government through the OSS lens, the accent falls on the role of PA's. The main questions of research in this area are: "Why should a PA adopt OSS?", "How should we implement such a migration?", "What impact has OSS in productivity?", "Is it possible for small to medium city to deliver services and conduct business using OSS?", "Do the basic IT capabilities of a city support adoption and deployment of OSS?", "Which are the characteristic of an organization that would adopt OSS?", "Does organizational culture plays a role?", etc. On this topic, Mukerji et al. (2006) wrote an essay that names many of the benefits and challenges that arise from implementing OSS in PA's in both developed and in course of development countries. Regarding the benefits of implementing OSS the most common in all the papers is the cost of software licenses, which is small or zero, but this is just a small part of the total cost of ownership. Another popular reason for adopting OSS in e-government is to diminish dependency on software providers. The improved scalability (OSS can run good on older hardware) in taken into account together with the possibility to customize the software due to access to the source code. Regarding challenges, PA's are most interested in the effects that OSS implementations has on efficiency, also on technical support and accountability. Besides all these, the total cost of ownership of an open source solution is not easy or clear to assess. Last but not least, among the most common barriers is the human capital, PA's in many cases do not have employees with the required technical skills to implement OSS.

Mukerji's essay offers us an overview on the topic and introduces us to this subject, but is not specific and is mostly descriptive in nature. A paper centered on specific case studies (Waring&Maddocks, 2005), researches on the use and implementation of OSS in the public sector from England, by studying the cases of six local PA's and two central PA's. There is a considerable variation from one case study to the other, but the authors find enough arguments to say that in these eight cases

the adoption was motivated by lowering costs, increased scalability and possibility to customize.

Based on these findings, Cassel (2008) researched on why a PA is choosing to migrate to OSS and which are the factors that have an influence over the implementation process. He made a comparative study on 4 local European PA's that migrated to Linux. The most important reasons behind these migrations were reducing dependency on software providers and lowering licensing costs. According to the findings of Cassel, the organizational structure of the PA and the opinions of the employees are the most important when implementing OSS. Similar results were found on a study on the implementation of OSS in the health system, were the main reasons behind adopting OSS were low acquisition costs and the possibility to customize (Fitzgerald & Kenny, 2004; Valdes et al., 2004). Another study (Kantor et al., 2004) brings to the front a totally different motivation: increasing interoperability between data standards. OSS uses ODS(Open Data Standards) for its output data, meaning the output is saved in a format that can be widely used because its specifications and characteristics are available. Among such formats of data we can mention the PDF files from Adobe, or the HTML language foe web pages, or JPEG/MPEG for pictures and videos.

Following this line, Simon (2005) evaluated the strengths of both OSS and proprietary software that are adopting ODS. Adopting these standards improves interoperability, avoids the vendor lock-in effect and brings flexibility. The author also states that it's not about choosing the better side when procuring software, neither OSS nor proprietary software have to be viewed as a salvation, but the decision has to be taken on a case situation. He accentuates than in the public sector where ODS are appreciated, OSS has a small advantage.

A case study from the health sector came up with results that are different from the ones we just stated. Munoz-Cornejo (2008) performed a survey to find the reasons behind OSS adoption in 30 hospitals from the US and their findings showed that software vendors had a positive effect on the hospitals choosing OSS, the vendors themselves being the triggers for this adoption by offering customization options of OSS to fit the hospital's needs.

In a recent case study from Turkey (Cankaya, 2010), we find an analysis of an OSS implementation in Turkey's biggest municipality, Cankaya Ankara. They've started the implementation at a municipal level in 2006 because the old system was 10 years old and obsolete. The municipality implemented Suse Server, workstations with CentOS Linux, OpenLDAP, Apache, Qmail, BindDNS and OpenVPN. Besides avoiding vendor lock-in, having customization capabilities or lowering costs they stated that the fact that proprietary software vendors needed too much time to customize their applications to fit municipality's needs was one more reasons to adopt. This study also brings up a few of the disadvantages they had to deal with such as the lack of hardware drivers, the small variety of Linux applications to replace the one's used under Windows and the fact that good programmers specialized on OSS are hard to find and to keep. The biggest problem that they have identified was the

employee's resistance to migrating to CentOS on the workstations. The first benefits that were registered were significant lowering of costs on the server side and a drop of 50% for technical support for CentOS compared to Windows.

Table 17. Largest OSS migrations

Region	Number of workstation	Type	Distribution
Extremadura	80000	Desktop/Server	GnuLinex
Munich	14000	Desktop	Debian
Vienna	7500	Desktop	Wienux (Debian/KDE)
Largo, FL	900	Desktop/Server	Linux KDE 2.1.1

Between the years 2003-2006 some countries in the UE, USA and South America introduced laws that were regulating procurement policy by favoring the adoption of OSS in municipalities (McLean, 2008). We have to acknowledge that municipalities are important buyers of software and laws that can are favoring OSS or proprietary software have the power of changing the software market. Many of these laws were canceled in a court of law by trials started by proprietary software vendors on reasons of discrimination, proving the laws as being illegal. Most of the laws were changed to suggest a recommendation of OSS while stating that the superiority of a product over the other has to be clearly visible.

By far the biggest OSS implementation that ever took place is the one in Extremadura, one of the poorest regions from Spain where they have installed Linux on about 80.000 workstations. The municipality worked on a project and developed its own customized Linux distribution called gnuLinex. According to their IT department the savings were estimated at about 18 millionEuro (Marson, 2005). They had almost no ICT development in the region, but they had a minimum of infrastructure so they've decided to enter this world directly with OSS. They opened public libraries in every village in the region, every school has a computer for every 2 students and there are public internet access points in every village with a 2mb connectivity speed. Pensioners, unemployed and housewives received free digital literacy training courses (78000 citizens trained within this program).

Another case that registered success is the one in Largo, Florida where there were migrated about 900 workstations with savings estimated at around $300000 - $400000 US Dollars (Miller, 2002).

A paper that has the Belgian public administration as an analysis unit (Ven et al., 2007) is

documenting the migration from proprietary operating systems to open source operating systems in the Ministry of Justice. This study emphasized on the importance of policies regarding software procurement. They bring into discussion the recommendation of the Belgian government to use ODS when procuring software for ministries or departments in public administration. In a different study also about the Belgian government adopting OSS as a first choice for office productivity suites a similar argument sustains the decision.

The American state of Massachusetts decided in 2005 that starting with 2007 the state will choose the ODS and will have convert most of its CDS(Closed Data Standards) documents until then. They have started the data conversion in 2005 with office documents and data that is used by more than one system. The decision led to an improvement of the relationship between state and federal administration (Palmer 2005). After just a few months after this decision was made, Microsoft decided to enlarge the data formats used by its office application suite, including most of the ODS used in OpenOffice.

In a case study made over an OpenOffice implementation (Rossi, 2008) the main findings stated that the new office suite did not reduced the number of files that were processed daily and didn't extended the time required to complete the tasks. Most users involved in the study stated that they managed to do the same tasks in the new office suite but it took a little bit more effort and they considered important to implement in large numbers in order to benefit of the know-how of other colleagues. At that time, the users perceived the functionalities of OpenOffice as being lower towards equal compared to Microsoft Office that they were using before.

Sharing data according to the recommendations regarding sharing governmental data leads to an increase in transparency can make public service more efficient and encourages the private sector in using governmental data than can be of interest to them (Alonso et. al., 2009). Using Alonso's findings, Ngwenya (2010) studies the logic of adopting OSS in e-government. Some of his findings show that behind OSS adoption there are also motivations regarding digital inclusion, trust and confidentiality, reducing the digital divide, increase transparency and accountability. Behind the adoption decision there are two different approaches. The first has its roots in the economic culture based on rationality. In this case, adoption is motivated by a wish for gaining an advantage, solving a problem, growth and efficiency, shortly increasing economic performance (Katz &Shapirom 1987; Teece, 1980; as quoted in Ngwenya, 2010). The second approach in based on a sociological perspective and is seeing adoption result of some municipalities to appear legitimate in front of the community or other municipalities (DiMaggio & Powell, 1983; Abrahamson, 1991; as quoted in Ngwenya, 2010).

Starting from 2002, the municipality of Haren from Holland started using PostgreSQL as a solution for databases, giving up Oracle. This was only the beginning of a project which founded systems based on Linux servers that is running most of its applications from the server. The reasons

behind this implementation were subject for a paper (Nagler, 2005). The municipality had interest in avoiding vendor lock-in because of the cyclic nature of their demands for upgrades and thus investment. Also, the municipality wanted to upgrade only if necessary and at a convenient time for the municipality, thing that wasn't happening because of the rules that were contractually imposed by software vendors. Another argument that led to the migration was the incertitude over the life cycle of proprietary software solutions and the licensing costs that were low for open source. Similar with the implementation from Ankara, the city adopted ODS hoping for advantages in the future from cooperating with other municipalities. Haren's municipality study showed that in their case OSS had smaller costs with installing and research than in the case of choosing a proprietary solution. The project was considered to be successful and they moved to migrating from Microsoft Office to OpenOffice.

There are also cases for which a migration to OSS did not proved to be efficient. This is the case of the municipality of Nurnberg, where according to their migration study, a migration from Windows 2000/Office 2000 to Windows XP/Office XP proved to be 4.5 million Euros less expensive than a migration to Linux/OpenOffice (Rossi et al., 2007).

The analysis of the effects of ODS and adoption of OSS (mainly operating systems and office productivity suites) in European PA's were studied in a large project called COSPA (Consortium for Open Source in the Public Administration) between 2003 and 2005, within the 6th Framework Programme of the EU. The project involved 15 participants from 8 European countries. The 15 participant were municipalities from Europe that at some point implemented OSS in their information system, most of them choosing an open source operating system or office productivity suite. As a result of the analysis of the 15 case studies, COSPA delivered a series of papers that would support municipalities that would like to follow a similar initiative. On the COSPA website there is a catalog of OSS and ODS, documentation guiding the analysis stage, a frameworks for evaluating benefits and calculating costs, a guide for identifying the need for training the users, a database migration guide and a series of papers that address particularities from each case.

Huda(2010) makes an overview of the migrations to OSS or free software and categorizes the migration challenges in technical and non-technical. Among the technical challenges he names ease of use, interoperability and integration, software development, technical support, data security and data conversion. Among the non-technical challenges the most important is represented by the human factor, followed by the public procurement policies, support in native language and aspects regarding licensing.

One of the most interesting migration cases to OSS and ODS is represented by the migration taking place in Munich, Germany. In the year 2001 Munich was in the situation of making a software procurement decision. At that time the municipality was running workstations with Windows NT and Office 1997-2000 from which Microsoft ceased to offer any more support and recommended an

upgrade. The IT system in Munich consists of 14000 workstations, has about 16000 users, about 170 apps and is using about 300 software products. In this system there are 17 units with their own IT department, the IT staff totaling 850 employees. The municipality decided to give up on Microsoft products and migrate to OSS as solution for operating systems and office productivity suites, while running Microsoft products in parallel during the implementation process. Another milestone in this development was a decision about the applications that the municipality is using. They've decided to move as many apps as they can on web server platform, so the clients could access the apps from a browser. The study was conducted from 2001 to 2004 when they've started work on customization, prototyping and converting data. The migration started in 2008 with 22 areas of interest that were supposed to be migrated first, starting with the less critical ones. An operating system based on Debian/GNU Linux was build, that is using KDE user interface, has OpenOffice, Thunderbird, Firefox and GIMP embedded in it. Between 2006 and 2009 a third of the costs of the project went on employee training. The migration to OpenOffice proved to be the next most costly activity because of the large amount of work required for data conversion. In March 2011 the situation was the following: 6000 workstations have been completely migrated, OpenOffice is present on about 15000 together with Mozilla and Thunderbird. 10 of the 22 areas of interest have been completely migrated. From 2010 an optimization process is taking place for the workstations that are currently running Linux. The municipality states that the project will completely migrate about 80% of the municipality's workstations, now being at about 40% of completely migrated workstations.

A smaller migration than the one in Munich is taking place in Vienna. The municipality is using about 20000 workstations, from which according to a local study 7500 could migrate from Microsoft Office 2000 to OpenOffice, 4800 of these stations being also able to change Microsoft Windows2000 for Linux. They use a different migration method, called by them a soft migration that will be decided on the internal “market” of their departments. In Vienna PA's, the IT systems is being paid from the budget of the departments that are depending on IT and using IT, basically the more IT infrastructure a department has the more it will pay for IT. The IT department developed a Linux distribution based on Debian that they've called Wienux. The IT department offers free training for the departments choosing to use Wienux or OpenOffice and will implement the changes in the department, while the department's contribution to the IT department will be lower compared to only using Windows and Office 2000. Due to the development in office productivity suites, the plans for Vienna changed a bit from the initial one, the municipality having OpenOffice 2 installed on about 15500 of its workstations and from which about 1000 also have Wienux.

Least but not last, an EU funded project that ran between 2004 and 2006 researched on OSS(5^{th} Framework EU Programme). The project was called FlossPolls (Free/Libre/Open Source Software: Policy Support), and was coordinated by University of Maastricht in collaboration with University of

Cambridge and other partners from the private sector. The project had three areas of interest: governmental policies regarding OSS, peoples (developers) involvement in OSS development, OSS efficiency as a collaborative system. The project gathered data on existing use of OSS in EU municipalities from 13 countries and draw potential future developments. The research path was focused on the effect that policy has on OSS in PA's, in order to improve such polices for the best interest of the municipalities. To satisfy the first interest area they've done a survey research to analyze interoperability issues and users(citizens) needs that use e-government. The second interest area, individuals involved in OSS development, revealed that females are very low represented among this community and also found open source software development to be a way for improving technicalabilities. These findings led to a series of recommendations to improve the existing policy. The last interest area was focused on building data sharing models between agents that either prefers to freely share information or to sell it. This area was followed because of the emergence of companies that are using OSS to gain benefits (selling customization services for OSS, or technical support, or implementation activities, data conversion services, etc.).

Paper	Theoretical perspective	Method	Location	OSS type	Subjects	Unit of analysis	Findings
Cassel(2008)	Why governments choose to migrate to OSS and what factors affect the implementation	Comparative case studies (semi-structured interviews and documentary evidence)	EU	Linux	Migration managers	4 European municipal governments (Vienna, Munich, Schwabish Hall, Treuchtlingen)	Reasonsto migrate: cost savings, independenceFactors affecting migration: political Support, personnel views, organizational structure,
Huysmans et al. (2008)	Reasons for not adopting OSS desktop software	Descriptive case study (interviews)	Belgium	OpennOffice	Chief information officer,project manager and accountmanager	Belgian federal public service economy	Reasons to adopt: cost, government guidelines Reasons not to adopt: dataintensive nature of the tasks
Mukerji et al. (2006)	Role of OSS in fostering e-government	Literature review	Governments in developed anddeveloping countries				Benefits: costs, vendor lock-in,customizability, scalability Challenges: customer support,high variability in quality,accountability, TCO, legalcomplications, users' technicalskills

Munoz-Cornejo et al. (2008)	How and why is OSS adopted within the health care system?	Survey and semi-structured interviews	US (Baltimore, Washington and Northern Virginia area hospitals)	Both general purpose and domain specific software	IT managers	Hospitals	Limited adoption mainly of general purpose OSS Pivotal role of software vendors in facilitating OSSadoption Perceived disadvantages: lack of in-house development, security, quality and accountability
Rossi et al. (2008)	Evaluation of themigration to Openoffice in a PA	Experimental design (22users)	na	Openoffice			Adoption increased reachingthe 25% of total officeautomation tasks Impact on productivity is minimal Lack of functionalities is a minus
Tapia and Maldonado (2009)	Mandated OSS policyto remedy digitaldivide and to build up a skilled ICT workforce	Descriptive case study (30interviews and documentary evidence)	Venezuela		Government officials	Policies and institutions relating to OSS	Strongly centralized nationwith predominant role ofgovernment Establishment of software companies for several purposes (software development, educational andtraining duties)

Ven et al. (2007)	Reasons for undertaking a desktopmigration in a largePA	Descriptive case Study(interviews)	Belgium	Linux and Openoffice	Director of the IT department	Belgian federal government of Justice	Cost, vendor lock-in, government guidelines
Waring and Maddocks (2005)	OSS use and implementation in theUK public sector,together with therealized benefits	Case studies (documentary evidence)	UK			6 local governments and 2 central governments	High degree of variability inOSS implementation Long and short-term savings ,reliability, scalability,customizability
City of Munich (2010)	OSS migration in a large PA	Case study (documentary evidence)	DE	Linux and OpenOffice	IT managers	Local government	OSS migration comes with lowering external costs but an increase in internal costs. Most of the development done in-house. Training personnel and converting data are the most expensive activities. Delays in implementation.
Miller (2002)	OSS migration in a small PA	Case study (descriptive)	Largo, FL USA	Linux and OpenOffice		Local government	Significant cost savings with licensing

City of Vienna (2010)	OSS migration in a large PA	Case study	Vienna	Linux and OpenOffice	IT managers	Local government	Soft migration, in-house development. High absorption rate for OpenOffice, Linux meets user's resistance.
COSPA (2006)	Use of OSS in public administration	Case studies (15) from different types of public institutions	UE	Operating systems, OpenOffice, free or OSS	Project managers, users	Local public administrations	Deliverables: OSS catalogues, analysis of information system framework, framework for measuring costs, database migration guide. Documentation that would support similar initiatives to the one's analyzed.
Rossi et.al. (2008)	Analysis of benefits for an OSS migration	Case study (descriptive)	Nurnberg	Operating systems, Office productivity suite		Local government	Description of a study made by the city of Nurnberg which concluded that a migration to OSS would be more expensive than a proprietary solution.
Extremadura (2005)	Large OSS migration in PA	Case study	Extremadura, Spain	gnuLinex, Linux Server		Regional government	In-house development. Analysis almost nonexistent. Forced migration. Significant cost

							reductionson the server side. Hard to measure effects and TCO to due lack of initial planning.
FlossPolls	Analysis of policies regarding OSS	Surveys, interviews	EU (13 countries)	Free and OSS	Policies, developers		Recommendations for improving OSS policies, data sharing models for OSS

6.2. Best practices when implementing e-government

E-government is not a discrete initiative. Its purpose is to assist governance using the strengths of ICT. The best practices have a cyclic nature (Georgescu, 2008). In syntheses, best practices for successful local government are:

a) Evaluate whether to offer e-government or not

- Have a strategic way of thinking when addressing the e-government topic;
- Find the services that are suitable for online delivery;
- Assess the government's readiness for e-government;
- Involve all of the participant departments and superior management and officials;
- Try to assess participation (does the public has internet access?) to see if the public can be engaged in this initiative.

b) Evaluate any collaboration opportunities

- While planning evaluate other similar initiatives;
- Join intergovernmental networks of e-government professionals;
- Explore partnership with other public or private agencies.

c) Prepare for execution and funding

- Make plans on implementing e-government;
- Identify the needed funds, people and hardware&software;
- Analyze the full costs (there may be hidden costs);
- Develop a funding strategy.

d) Provide security

- Decide on the security and monitoring software;
- Install security and monitoring software;
- Develop procedures for incident response and disaster recovery;
- Manage access to data.

e) Set a policy framework to guide e-government

- State the purpose if your e-government website;
- Establish policies on public access to online data records and set a data archiving policy;
- Establish privacy policy;
- Determine marketing strategy;

- Review and update e-government policies.

f) Make the website function optimally

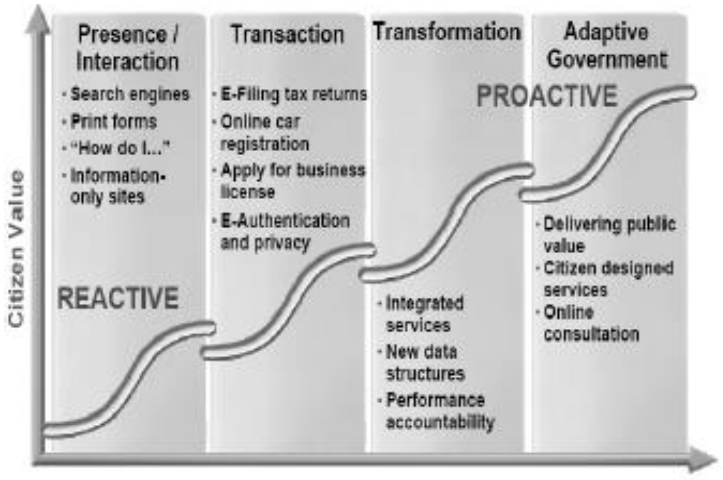
- Check national governmental recommendations for e-government website compliance;
- Design the website with ease of use in mind while remembering your objectives;
- Follow industry guidelines for websites development and content;
- Always test locally or a small user group before releasing to the main public;
- Plan for ongoing site maintenance.
- Promote your website to the potential users;

g) Evaluate e-government

- Evaluate how the website is meeting e-government goals;
- Determine participation an plan on improving it if it's not meeting expectations;
- Obtain feedback from users and from the e-government community;
- Revise the website based on evaluation results and other feedback.

The concept of connected government is derivedfrom the whole-of-government approach which isincreasingly looking towards technology as astrategic tool and as an enabler for public serviceinnovation and productivity growth. Connected ornetworked governance revolves aroundgovernmental collective action to advance thepublic good by engaging the creative efforts of allsegments of society. It is about influencing thestrategic actions of other stakeholders (Atkinson, 2003).

Figure 9. Public services in connected governance



(Source: Badger, 2007)

ICT-based connected governance efforts are aimedat improved cooperation between governmentagencies, allowing for an enhanced, active and effective consultation and engagement withcitizens, and a greater involvement with multiple stakeholdersregionally and internationally.

6.3. A minimalistic approach to calculating TCO and ROI on open source platforms

In the literature that addresses traditional operating systems, application vendors and open source advocates, perhaps the most strong debates are on how to calculate the TCO (total cost of ownership) and ROI (return of investment) for these two very different software models.

When calculating TCO and ROI for Linux and other open source solutions it's not nearly as clear like when calculating them for Windows where things are pretty straightforward, involving mostly annual licensing costs, per-user charges, application licenses, hardware depreciation and administration costs.

Firstly, let's get a clear feel on what TCO and ROI are meaning.

According to the businessdictionary.com TCO is an estimate of all direct and indirect costs associated with an asset or acquisition over its entire life cycle. In the case of computer systems, the same source says that TCO is represented by the total of direct capital investment in hardware and software plus indirect costs of installation, training, repairs, downtime, technical support, and upgrading.

The same dictionary defines ROI as he earning power of assets measured as the ratio of the net income (profit less depreciation) to the average capital employed (or equity capital) in a company or project.Expressed usually as a percentage, return on investment is a measure of profitability that indicates whether or not a company is using its resources in an efficient manner. For example, if the long-term return on investment of a company is lower than its cost-of-capital, then the company will be better off by liquidating its assets and depositing the proceeds in a bank. ROI is also called rate of return, or yield.

In the context of these definitions TCO is addressing a rather complex question: how much will it cost to run a system (ex: Linux server or Linux workstations) from the time the machines are set up until they are out of service? ROI addresses a relative simple question: Are we making/saving or losing money by running a something?

Cost of ownership in a sum of many things, but a starting list would comprise at least the following:

- Initial investment in hardware or lease start-up costs;
- Monthly lease payments;
- Electricity;

- Network bandwidth charges;
- Server room charhes or office charges;
- Overall infrastructure costs (networking items);
- OS annual license cost plus periodic upgrades;
- Per-user license cost for the OS;
- Base cost per application;
- Additional annual per-user application costs;
- System admin costs and staff retraining or new hires;
- Cost of backups and offsite storage;
- Portion of business insurance, if any.

The statement that can fe find on some OSS forums, according to which TCO must be zero because OSS is free, is wrong in a couple of profound ways. The developers' community, when it refers to free software, which is also the case of OSS, accentuates that the term free used in there is less about its actual cost of running it and more about the option it gives to the user to use the software as they see fit. Linux comes with the advantage of being highly portable compared to other OS, so it gives more options to the user.

A start point to help determine the TCO for open source projects compared to traditional deployment would contain:

- Hardware cost (initial);
- Monthly hardware lease;
- Base software cost;
- Additional per user;
- Application base cost;
- Additional per user;
- Data center cost (space, bandwidth);
- Staff retraining;
- System admin costs;
- Router/port/cabling charges;
- Insurance.

To calculate TCO, once identifying the initital investments then we add them to the multiplied monthly costs against the life of service to calculate TCO for that service. A particularity of Linux when calculation TCO, would be that, with Linux, you can get better performance on older equipment so you can save on the hardware. This can help stop being trapped in an endless hardware upgrade cycle. This kind of analysis often falls outside of traditional TCO calculations.

One intesting saving with OSS when calculating these costs is that typically there isn't a per-user or per-CPU charge. So Linux will run no problem on a 1 CPU system and a 8 CPU system. Even in the case of Linux distirbution that you pay for, like a copy from RedHat or Ubuntu, which does charge an annual fee for upgrades and support, it doesn't charge on a per-user or per-CPU basis. So, unlike Windows, you could run 100 users on your 16 processor system or have 1000 connections to your database for the same cost as a single user/single CPU machine.

TCO is a guideline for operating costs, but it also informs us about something more important: the ability to achieve a return on your investment. A simple way of looking at ROI is that if you make more money than the basic purchase or lease price of the hardware, and the cost to run it (operating cost from start to finish of life cycle) then you have a positive ROI. If you are running at a loss, you will have a negative ROI.

As noted already, with OSS, you can get more of your hardware instead of being catched by the endless appetite for more and better performance required by OS's like Windows. Unless the hardware support contracts cost more that the new hardware cost, this is a win from a ROI perspective.

Hardware vendors typically change almost their entire product lines every 12 to 14 months. A business decision to be made is whether to keep running the older system, whose TCO would pile up at the far end of the life cycle of the hardware, or set some sort of swap-out policy that allows your hardware to remain reasonable current but still try to maximize the value. Open source allows the investor to have more flexibility in determining the software to deply and where to allocate IT dollars. In a favorable environment, the TCO for open source will generally be lower for both initial deployment and for ongoing administration and operations, but facts have to decide this on a case by case evaluaton, TCO having more the role of a guide.

There are a lot of intangibles when going into financial details with OSS. Just a few of them would be:

- What's the cost of retraining your professionals and users or hiring new staff?
- What's the cost of keeping then up to date and certified?
- What's the cost for office automation?
- What's the cost of disruption while you implement?
- What's the cost of minimising the disruption?

A study performed by Yankee Group from 2004 to 2006, made a comparison between TCO's of Linux and Windows came up with a few interesting findings:

- Linux shows measurably improved TCO compared to Windows is small to medium forms;
- Organizations with customized vertical application are a good environment for Linux

deployments;

- In the situations where there is no software infrastructure (similar with Extremadura case study) Linux comes with significant improved TCO.
- In a survey of 300 large enterprises (>10000 users), 90% indicated that a total swith from Windows to Linux would be prohibitevely expensive, extremely complex and time consuming and would not provide any tangible business gains;
- 25% of the enterprises stated that they would add Linux Web servers for specialized applications, and a majority of them said that Linux is under evaluation or that they do have pilot deployments.

The study identified the biggest disadvantages of the Linux environment from a customers perspective:

- Fewer of-the-shelf applications;
- Difficulty in finding skilled administrators;
- A 20-30% salary premium for skilled administrators;
- OSS increases liability and exposure in data sensitive networks;
- Limited and conditional product warranties and indemnification.

From the same perspective, the biggest drawback of UNIX is the expensive hardware, while when concerning about Windows, licensing costs and ongoing security issues are the biggest perceived disadvantages.

References

1. "Report to Congress on the Benefits of the President's E-Government Initiatives ("Business Gateway," p. 50)". 2009, at http://www.whitehouse.gov/omb/assets/egov_docs/FY09_Benefits_Report.pdf
2. Backus, M.,E-Governance and Developing Countries, Introduction and examples, Research Report, No. 3, 2001
3. Baxandall, P. and B. Magnuson. 2008. Transparency.gov 2.0: Using the Internet for Budget Transparency to IncreaseAccountability, Efficiency and Taxpayer Confidence. Boston: Masspirg Education Fundationd
4. Becker, Shirley A., Bridging Literacy, Language, and Cultural Divides to Promote Universal Usability of E-Government Websites, Northern Arizona University, 2009
5. Cassell, M. (2008). Why Governments Innovate: Adoption and Implementation of Open Source Software by Four European Cities. International Public Management Journal 11(2), 193-213.
6. Clift, S.,E-Governance to E-Democracy: Progess in Australia and New Zealand toward Information-Age Democracyhttp://www.publicus.net/articles/edempublicnetwork.html, 2003
7. COSPA Project (2004-2006), The Consortium for Open Source Software in the Public Administration at http://www.cospa-project.org/
8. Dezayas, Heidi, So, how much paper does our local government use?, Penn-Trafford Star, 2008
9. DruckerPF.,Electronic Governance in Context, Electronic Governance and Electronic Democracy: Living and Working in the Connected World: Commonwealth Centre for Electronic Governance, 2001.
10. El Jamali, T., Plaisent, M., Benyahia, H., Bernard, P., Maguiraga, L., La France à l'heure du e-gouvernement , http://www.aim2004.int-evry.fr/pdf/Aim04_El-Jamali_Plaisent_Benyahia_Bernard_Maguiraga.pdf
11. Federspiel, S. B. & B. Brincker (2010). Software as Risk: Introduction of Open Standards in the Danish Public Sector. The Information Society 26 (1), 38-47.
12. Fitzgerald, B. & Kenny, T. (2004). Developing an Information Systems Infrastructure with Open Source Software. IEEE Software 21(1), 50-55.
13. Haefliger, S.; Von Krogh, G. &Spaeth, S. (2008). Code reuse in open source software. Management Science 54(1), 180-193.
14. Huda, M. (2010). Migration to FOSS: challenges. Nile Center for technology research, Sudan
15. Huysmans, P., Ven, K. &Verelst, J. (2008). Reasons for the non-adoption of OpenOffice.org in a data-intensive public administration. First Monday 13(10).
16. Kantor, G.; Wilson, W. &Midgley, A. (2003). Open-source software and the primary care EMR. Journal of the American Medical Informatics Association 10(6), 616.
17. Kennedy, S., &Fiss, P 2009, 'The symbolic management of corporate strategy: Framing, decoupling, and strategic change', Academy of Management Journal, vol. 49, pp. 1173-1193.

18. Lewis, J. (2004). Global Policies on Open Source Software. Technical report, Center for Strategic and Internationl Studies (CSIS).
19. Lewis, J. (2006). Global Policies on Open Source Software. Technical report, Center for Strategic and Internationl Studies (CSIS).
20. Lewis, J. (2007). Global Policies on Open Source Software. Technical report, Center for Strategic and Internationl Studies (CSIS).
21. Lewis, J. (2008). Global Policies on Open Source Software. Technical report, Center for Strategic and International Studies (CSIS).
22. Marson, I. (2005). Linux brings hope to Spain's poorest region. Retrieved July 10, 2011, from ZDNetUKWeb site: http://insight.zdnet.co.uk/software/linuxunix/0,39020472,39197928,00.htm
23. Massachussets State. (2005). Enterprise Technical Reference Model. Retrieved on August 2011, at http://www.mass.gov/portal/site/massgovportal/
24. McLean, S. (2005). Choice in government software procurement – a winning strategy. Journal of Public Procurement, Volume 8, Issue 1, 70-97.
25. Miller, R. (2002). Largo loves Linux more than ever. Retrieved July 2, 2011, from Newsforge Web site: http://www.newsforge.com/print.pl?sid=02/12/04/2346215
26. Mukerji, B., Kumar, V. & Kumar, U. (2006). The Challenges of Adopting Open Source Software in Promoting E-government. In Bhattacharya (Eds). Technology in government. GIFT Publishing.
27. Municipality of Munich, Munich Study,
28. Municipality of Viena (2010), OSS Study.Open Source Studyon the PC-Workstation of Viena City's Administration, la adresa http://www.wien.gv.at/ma14/pdf/oss-en.pdf
29. Munoz Cornejo, G., Seaman, C. & Koru, A. (2008). An empirical investigation into the adoption of open source software in hospitals. International Journal of Healthcare Information Systems and Informatics 3(3), 16-37.
30. Nagler, M. (2005). Dutch Municipality of Haren Migrating to Open Source Software. Open Source Observatory and Repository, www.osor.eu/studies/docs/dutch-municipality
31. Ngwenya, B., Lubbe, V., Klopper, R. (2010). Institutionalisation, Framing, and Diffusion: The Logic of Openness in eGovernment and Implementation Decisions (a Lesson for Developing Countries).
32. on Krogh, G. & S. Spaeth (2007). The open source software phenomenon: Characteristics that promote research. The Journal of Strategic Information Systems 16 (3), 236-253.
33. Rossi, B., Russo, B., Succi, G. (2007). Evaluation of a migration to Open Source Software.CASE (Centre for Applied Software Engineering) - Free University of Bozen-Bolzano, online at http://www.inf.unibz.it/~gsucci/publications/images/EvaluationOfaMigrationToOpenSourceSoftware_RossiRussoSucci.pdf

34. Shailendra, C., Sushil S., E-Government and E-Governance: Definitions/Domain Framework and Status around the World, 2007

35. Simon, K.D. (2005). The value of open standards and open-source software in government environments. IBM Systems Journal Volume 44, Issue 2.

36. Singel, Ryan, Analysis: New Law Gives Government Six Months to Turn Internet and Phone Systems into Permanent Spying Architecture, 2007

37. Thorpe, Stephen, Facilitating effective online participation in e-government. E-government in New Zealand, 2009

38. United Nations, UN Global E-government Readiness Report (2004), Towards access for opportunity, United Nations publication

39. United Nations, UN Global E-government Readiness Report (2005), From E-government to E-inclusion, United Nations publication

40. United Nations, UN Global E-government Survey (2003), United Nations publication

41. United Nations, UN Global E-government Survey (2008), From E-government to connected governance, United Nations publication

42. United Nations, UN Global E-government Survey (2010), Leveraging e-government at a time of financial and economic crisis, United Nations publications

43. Ven, K., Huysmans, P. &Verelst, J. (2007). The Adoption of Open Source Desktop Software in a Large Public Administration. Proceedings of the 13th Americas Conference on Information Systems (AMCIS2007), 9-12.

44. Waring, T. &Maddocks, P. (2005). Open Source Software implementation in the UK public sector: Evidence from the field and implications for the future. International journal of information management 25(5), 411-428.

45. West AP, Wind J. Beyond the Pyramids: Designing the 21st Century Enterprise: The Wharton School and MG Taylor Associates, 1996

46. Atkinson, R. (2003), Network Government forthe Digital Age, Progressive Policy InstituteReport, available online athttp://www.ppionline.org/ppi_ci.cfm?knlgAreaID=140&subsecID=290&contentID=251551

47. Badger, M. (2007), Going beyond projects, atwww.etransactions.gov.sa/arabic/downloads/Session%2011%20Presentation%204.pd