Critical Success Factors and Key Performance Indicators for e-Government Projects- Towards Untethered Public Services: The Case of Ethiopia

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Abstract. The road to digital transformation of the governance system of developing countries has been a steep uphill climb- in addition to massive investment in ICT infrastructure and applications e-Government projects often require changes in legislation, major policy decisions and restructuring of the public sectors. In this paper, pertinent issues that stand in the way of digital government ascent of Ethiopia have been investigated. To give the issues addressed a context, an e-Service that enabled consumers to pay utilities bill for water, telephone and electricity in one-stop service center has been analysed with respect to metrics developed as well as on the basis of consumers rating of the service. The main findings from consumers response of the service ratings are that, e-Government projects success cannot be judged solely by monetary return of investments which could be obtained among other things by cutting down the work force required to run the service and improvements achieved compared to how the service was delivered in manual settings before it went electronics. In fact as evidenced by the findings, monetary return of investments might not be achieved. However, other metrics such as time to process transactions, service responsiveness, availability of government services or the ability to conduct transactions anytime and anywhere, and costs associated to getting the service weighs more significance.

Keywords: e-Government · e-Services · e-Government success factors
Performance indicators of e-Government · Untethered e-Services

1 Introduction

During the last decade, Information and Communication Technologies (ICTs) have emerged as critical tools for development processes worldwide. Their application has transcended almost all sectors including healthcare, education, agriculture and governance, to name just a few. With respect to the latter, the use of ICTs in governance processes has taken root in some countries. Governments in developed countries; central, regional and municipal; as well as political parties and campaigners are using the Internet as well as other ICT tools to interact with citizens. The concept of

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e-Governance is emerging as part of the governance vocabulary. Despite these developments, in much of the emerging economies, there is yet to be an effective environment to maximize the benefits from ICTs. There is therefore fear that the digital divide might deepen into other forms of divides.

World governments have recognized the immense potential of ICT tools and they have been progressively acting towards integrating them in the governance processes to achieve cost savings and greater operational efficiencies, among other purposes. The government of Ethiopia is one of those who invested significant sum of money in ICT for national development and public sector governance reforms- notably the development of the WoredaNet infrastructure[1]. However due to a plethora of factors e-Government services in the country are not just only limited in number but restricted in their pervasiveness as well. In this paper, the challenges that the government along with other actors, public and private sectors, academia and development partners need to address towards embarking on a harmonized e-Government ecosystem have been discussed; and accordingly a strategic considerations that need to be taken have been recommended.

The rest of the paper is organized as follows. Section 2 sets out the study objectives; Sect. 3 introduces the research methodology used; Sect. 4 discusses summary of the study findings; Sect. 5 discusses elements of untethered e-Government ecosystem. Section 6 finally presents recommendations or the way forward.

1.1 e-Service Description

Before 2013 bill settlement service for water, telephone and electric power consumptions were delivered separately in separate service centers established at the lowest local administrative unit of the city administration of Addis Ababa. Since 2013 Kifiya launched a software system named “Lehulu” to offer bill settlement service for the three utilities in a unified manner at more than 34 newly established e-Service centers. The newly established e-Service centers have been furnished with the necessary facilities with a significant amount of investment and it operates in a public private partnership model. The cost attached to establishing the e-Service centers and running them has been more expensive than what it was before. Hence transforming the service into electronics makes no financial sense, and the monetary return of investments might not be achieved. However, the electronic transformation of the service has brought fundamental and significant changes that might not be quantifiable in monetary terms.

1.2 The Research Questions

Though not to the required level, in Ethiopia, the widespread use of ICT tools in the various public and private sectors is gathering pace. The governance sector is one of those benefiting to a degree from the ongoing electronic transformations taking place in the country. Despite these ongoing developments, challenges that stand in the way of e-Government remain unaddressed. With those challenges remain unaddressed it would

[1] http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan034887.pdf.

be impossible to see the true effects of ICT in transforming government services. This paper through the e-Service named "Lehulu" show cases the challenges that lie ahead in untethered e-Government diffusion for providing improved public services.

The paper investigates the following interdependent issues:

- What are the key challenges of untethered e-Government in developing countries?
- How can the gaps towards untethered e-Government ecosystem be bridged?
- What are the factors that stand in the way of e-Government in its truest sense in developing countries?
- What are the Critical Success Factors and Key Performance Indicators for e-Government Projects?
- What strategic considerations are needed to mitigate the factors?

In order to be able answer the above set of research questions, primary data via questionnaire as well as secondary data from the e-Government implementation strategy [2] have been collected, and from the collected data actionable recommendations toward mitigating the challenges have been generated.

1.3 Methodology

A random sampling technique was used to collect questionnaire data at the e-Service centers by trained enumerators about service users' quality of experience of the unified utility billing system and the response rate was 100%. The distribution of respondents by sex was that 55% of respondents are male while the rest 45% are women. Since the respondents are selected randomly among the population or service users equal distribution of gender was not attained. It can be said that this small imbalance has not affected the outcome of the research.

2 Summary of the Findings

For services that involve payment, in Ethiopia, virtually there is no truly online service as services offered by the various organizations or institutions demand the physical presence of service users at service centers to at least effect payment. In this study, users quality of experience on the government service that went electronic very recently named "Lehulu- Kifiya", a unified utilities billing system available for residents of the capital, Addis Ababa has been analysed. The table below, Table 1, summarises service users response to questions asked in the scoring scale of 1–5 (using Likert scale), from strongly disagree(1) to strongly agree(5).

2.1 Respondents View on Service Delivery Improvements Compared to What It was Before

The average mean score of respondents' rating of service improvements in settling utility bills since the e-Service system named in Amharic "Lehulu- Kifiya" has become operational was 3.8, which in the scoring scale of 1–5 is nearly high indicating that there has been significant service improvements as a result of the utility billing services

Table 1. Users ratings of the e-Service "Lehulu-Kifiya"

	N	Average mean
Service delivery since the e-Service system get operational is better	100	3.84
With the e-Service system on average I get the service within 30 min time	100	2.74
With the e-Service system queuing up time for the service is small	100	2.85
After the current e-Service system got operational getting the service has become easier	100	3.85
After the current e-Service system got operational there has been significant waiting times reduction	100	3.00
After the current e-Service system got operational there has been times I was told to come another day as the service was not available due to connection related problems	100	2.35
I have no complaint(s) on the current service delivery process	100	2.97
The current e-Service system is prone to errors and it has caused me inconvenience as a result	100	1.97
The most important limitation of the service is its inaccessibility at places other than the service centers	100	2.76
Level of satisfaction with the e-Service system	100	3.59

going into electronic. Utility billings in the past have been handled by separate offices for that service users had to go to separate offices to settle bills for their monthly electric power, water and telephone consumptions, however through the current unified utility billing system consumers can settle their bill at same time at one service center for all utilities consumed, which is a lot more easier than what it was before. However this should not mask the reality that further improvements are needed in the service delivery process particularly consumers inconvenience such as the demand on physical presence at service centers to effect payments for consumed utilities needs to be eliminated- the achilles heel that needs immediate addressing to drive the creation of truly online government as well as other forms of services in Ethiopia is the lack of secured online payment systems.

2.2 Respondents Getting the Service in Less Than 30 min

The average mean score of respondents' rating on getting the service in less than 30 min time once they arrive at a service center was 2.7, which in the scoring scale of 1–5 is slightly above average. By any standard 30 min of service time is big for services that went online even for offline electronic, thus there is an indication that service rates at service centers lags significantly behind service consumers arrival rate and queue as a result builds up.

2.3 Respondents Queuing Up Time for the Service

The average mean score of respondents' who think the queuing time for service is small was 2.8, which in the scoring scale of 1–5 is slightly above average. Respondents' compare the current service waiting time in light of what it was before the system going electronic, and their rating only has to be seen in that respect. However, it is common to find significant number of service users queuing up for the service at any time during working hours in any of the service centers.

2.4 Respondents' Perception of How Getting the Service is Easier

The average mean score of respondents' who think getting the service in the electronic unified billing system is much easier was 3.9, which in the scoring scale of 1–5 is nearly high. Respondents' compare the current service delivery improvement in light of what it was before the system going electronic, and their rating only has to be seen in that respect. However, it would be important to take account of service users experiencing several inconveniences such as traveling to nearby service center which could be a few kilo meters away and queuing up for the service - when taken together service users spend significant amount of time to get the service which could have been avoidable had the system truly been an online one.

2.5 Respondents' Perception of Waiting Time for the Service

The average mean score of respondents' who think there has been service waiting time reduction in the electronic unified billing system was 3.0, which in the scoring scale of 1–5 is above average. Respondents' compare the current service delivery process in light of what it was before the system going electronic, and their rating only has to be seen in that respect. However, service waiting time in the electronic unified billing system is still significantly high.

2.6 e-Service Availability

The average mean score of respondents' rating on service availability since the electronic unified billing system has been operational was 2.7, which in the scoring scale of 1–5 is slightly above average. Service availability of the unified billing system, as is the case in other e-Services, is not guaranteed in that the operation experience a glitch at times which could be mainly related to network connectivity that can last from a few hours to a day. This adds another burden on service users, as they have to travel to the service center for a second or more number of times to settle their bills.

2.7 Complaints on the e-Service

The average mean score of respondents' rating on their level of satisfaction on the service since the electronic unified billing system has been operational was 2.9, which in the scoring scale of 1–5 is above average. This needs to be put into perspective that despite the significant amount of time service consumers are required to spend for

travelling to a service center, queuing up as well as service time, a considerable part of the respondents are satisfied with the e-Service. However it should be noted that most service users have little or no idea of the degree to which the service could have been improved; certainly with the support of online payment system the service's accessibility and convenience for service users could have been significantly improved.

2.8 Degree of Unreliability of the e-Service

The average mean score of respondents' rating on the degree of error proneness of the e-Service was 1.9, which in the scoring scale of 1–5 is significantly below average. However, chances are still there for service consumers to experience inconvenience as in the current setting there is a possibility to commit errors that can happen in the form of misreading of consumed utilities.

2.9 The Most Important Limitation of the e-Service

The average mean score of respondents' who think the service inaccessibility other than places at service centers is its main limitation was 2.8, which in the scoring scale of 1–5 is slightly above average. The inconveniences like service consumers traveling a few kilo meters to get to a nearby service center, and the considerable amount of time spent on getting the service as well as queuing up have significantly dwarfed the e-Service impact.

2.10 Overall Respondents Rating of the e-Service

The average mean score of respondents' who rate the e-Service as satisfactory was 3.6, which in the scoring scale of 1–5 is significantly above average. However things need to be put into perspective that most respondents are satisfied with the e-Service for one obvious reason that they compare it with how the service was delivered before- when they used to go to three separate offices to settle for water, electric power and telephone bills separately. Otherwise the e-Service potential remains unexploited particularly the new system lack of online payment support is costing service consumers their time as well as money dearly.

2.11 Distance Service Users Travel and Queue Time

In the following tables the percentage distribution of distances respondents travel to get a service center and percentage distribution of time respondents queue up for the service are presented (Table 2).

As it can be seen from the table above, an astounding 67% of respondents travel more than 1 km to service centers (Table 3).

As it can be seen from the table above, an astounding 64% of respondents queue up longer than 30 min for getting the service.

Table 2. Percentage distribution on distance respondents travel to get the service.

	N	%
Less than 1 km	33	33.0
1 km–2 km	24	24.0
2 km–3 km	18	18.0
3 km>	25	25.0
Total	100	100

Table 3. Percentage distribution of time respondents queue up for the service.

	N	%
Less than 15 min	12	12
15–30 min	24	24
30–45 min	22	22
45–60 min	19	19
Longer than 1 h	23	23
Total	100	100

3 Metrics and Key Performance Indicators

As there is no unanimous agreement among scholars on whether e-Government services without online accessibility are truly e-Government service or not, in this paper e-Government services online inaccessibility is treated as a deficiency and making e-Government services tethered. The primary data collected via questionnaire has been used to derive the key performance indicators. The following metrics and Key Performance Indicators (KPIs) have been developed to measure the effectiveness and efficiency of public sector services which are transformed to e-Government services and systems but with a lack of digital money or online payment system integration:

- Round trip distance to effect payments for settling utilities bill without digital money or online payment system integration;
- Time to travel and effect payments for utilities bill without digital money or online payment system integration;
- Service and queue waiting time;
- Time to respond to queries from service consumers;
- Time for service consumers to obtain information/guidelines;
- Service availability;
- Timely settlement of bills;
- and Costs of getting the service.

Particular cases have been observed and measured and the results of the observation have been analysed in the section below, Sect. 3.1.

3.1 Analysis of the Findings with Respect to KPIs

a. Distance Traveled to Effect Payments for Utilities Bill
In this paper the round trip travel service consumers make to effect payments for utility bill is considered as one of the metrics in order to equate the inconvenience that service consumers have to bear which for e-Government systems with digital or online payment system integrated is non-existent.

As evidenced by the study, the cost of round trip distance is a concern for e-Services that lack the integration of online payment system and the findings describe how far service consumers need to travel to get to a nearby service center.

- About 67% of service consumers travel more than 1 km on average to get to a nearby service center to effect payment and a total of 2 km on average for their round trip. Users physical presence is a must because of a lack of online payment system integration with the e-Service.

b. Time to Travel to Effect Payments for Utility Bill
Because of the same reason as above the round trip time metric which is about the time it takes for service consumers to reach to a nearby service center is significant.

- As it stands on average about 63% of service consumers spend on average 15 to 20 min of time to reach to a nearby service center.

c. Service and Queue Waiting Time
The amount of time that service consumers spend on average for queuing up as well as service delivery is 20 to 30 min. Service delivery as well as queue time are not uniformly distributed throughout the month and at the beginning of the month service and queue waiting time could even get longer than 30 min.

d. Time to Respond to Queries from Service Consumers
Service consumers submit queries when they have one in the traditional way, and follow up to their queries require physical presence and which is demanding and at times unbearable.

e. Time for Service Consumers to Obtain Information/Guidelines
Information or guidelines pertinent to the e-Service are disseminated via the traditional means such as printed broachers and flying papers which could have been made accessible more easily and cost effectively with online presence.

f. Service Availability
Service availability is a great concern for service consumers as it not uncommon to go to a service center and being told the e-Service is not available due to power outages and to come back on another time or day. This adds to the inconveniences that service consumers have to bear- mainly caused by a lack of digital money or online payment systems integration to the e-Service.

g. Timely Settlement of Bills
Due to inconveniences associated with the current e-Service system it is also not uncommon for service consumers to effect payments past settlement due dates. This could have been easily avoided with the integration of digital money or online payment systems with the e-Service.

h. Costs of Getting the e-Service
Costs associated to getting the service are generally categorised into two- those quantifiable in monetary terms and those non-quantifiable ones. Time spent for travelling to service center, money spent for travelling, queuing and service delivery time constitute the costs that can be quantified in monetary terms, and generally in conveniences caused by a lack of digital money or online payment systems integration to the e-Service such as the inconvenience of travelling to a service center, inconveniences caused by power outages or service unavailability or extended waiting constitute the non-quantifiable cost of getting the service.

e-Government implementation frameworks proposed in the literature lack dynamism, and they have been too often slipping off the pace with the technology dynamics [2, 3, 5]. Thus, most of them have quickly outlived their usefulness. Due to emerging trends and continuous advancements in the technology sphere e-Government implementation frameworks need to embody characteristics such as adaptability as well as extensibility to elongate their usefulness thereby bringing in the desired outcomes such the realization of good governance constructs. In this paper, a conceptual framework for untethered e-Government ecosystem is proposed to address the major issues that surround adaptability and extensibility of e-Government implementation frameworks. The classification of issues into tethered and untethered in e-Government implementations is the distinguishing feature of this paper. It points out the key elements to bridge the gap from tethered to the untethered e-Government functional model.

4 A Conceptual Framework for Tethered and Untethered e-Government

In this paper, a conceptual framework for tethered and untethered e-Government with the metrics and key performance indicators (KPIs) defined above as the main distinguishing features have been proposed. The conceptual framework highlights the constraints that need addressing and it also informs the strategic considerations that particularly governments in developing countries need to pursue for transforming traditional public services into digital as well as online (Fig. 1).

e-Government services in the tethered setting are characterised by intermittent connectivity with low level of public or private access to Internet or ICT, mode of payments systems heavily conventional or at best semi-electronic, services requiring physical presence, low level of digital literacy rate (service consumers familiarity with the Internet and ICT tools is low), slow response to queries, unguaranteed service availability with services offered predominantly offline and the cost of getting the service for consumers is high. E-Government services in the untethered setting to the contrary possesses the necessary ingredients to provide impeccable services to citizens-pervasive Internet which enables service users to conduct transaction at the comfort of

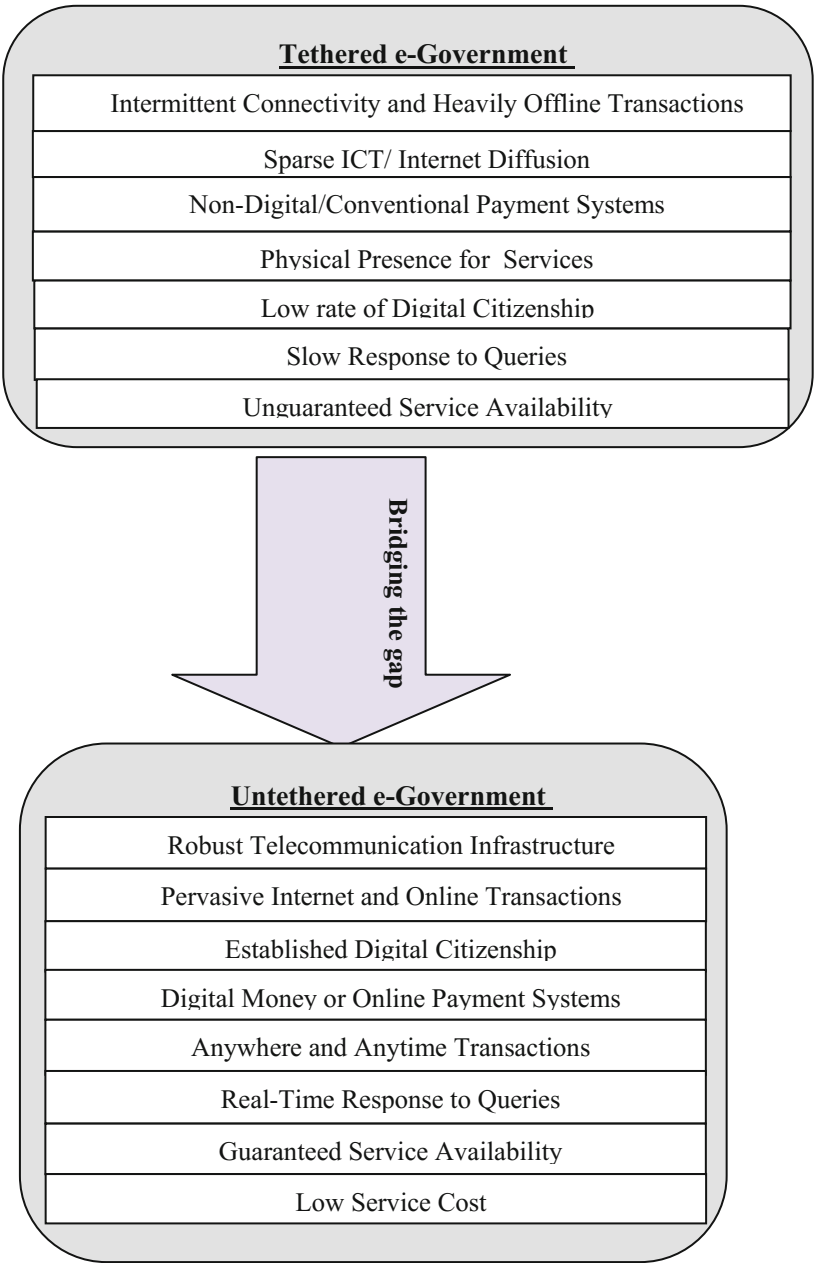

Fig. 1. Bridging the gap to untethered e-Government ecosystem.

being anywhere and anytime, services require no physical presence, citizens are capable of using the Internet and ICT tools to interact with the government, real-time responses for queries, with high services availability and reliability, and the cost of

getting the service is low (just Internet connection fee). In the untethered setting citizens have the luxury of getting services in several outlets and their involvement in decision making as well as other processes are highly enhanced. The ultimate goal in untethered e-Government is to use current or emerging digital technologies for better public services to citizens as well as better use of resources with less impact on the environment via the use of ultra-low power sensors, wireless networks, and web and mobile-based applications [6, 7].

The unified utilities billing system (Lehulu-Kifiya) investigated as a case study in this paper falls under this category. In the tethered setting e-Services offered mostly involve the physical presence of service users at least to effect payments. Given the diverse as well as complex nature of the constraints and governments in developing countries operating with restricted or limited resources or fiscal wherewithal, addressing them in the shorter term might look unviable and hence a strategic consideration to leverage the power and pervasiveness of mobile phones has to be the priority aim of developing country governments. To this end, there needs to be a strategic focus on the expedition of more mobile government (m-Gov) services and indigenous innovations or solutions for current challenges- for instance transforming existing payments systems to support digital money or online transaction like m-pesa[2], localizing e-Service systems and mitigating connectivity slowness and unreliability related problems.

5 Recommendations

In this paper, a conceptual untethered e-Government has been designed primarily to inform policy makers on the strategic considerations that need to be pursued in order to mitigate issues or constraints that surround the e-Government sphere of developing countries, particularly Ethiopia. It points out the strategic considerations in enhancing existing e-Services with respect to the KPIs developed. Accordingly, the following actionable recommendations have been generated on the basis of the KPIs developed to inform policy makers on what needs to be done to unleash e-Services.

- **Scaling up ICT or Internet penetration** - in order to unlock the full social, political and economic benefits of the Internet as well ICT towards improving e-Services outcome, besides the government, all stakeholders, the private and public sectors, the academia and development partners should contribute their bits towards bridging the digital divide gap in rapidly broadening and deepening capacity;
- **Indigenous solutions to local problems** - beyond being technology consumer and adopters, crafting innovative solutions to mitigate tethered e-Services problems needs to be the main strategic considerations of the academia and ICT practitioners in the private sector;
- **Telecommunication regulatory reforms** - rigidity in telecom regulatory frameworks are to blame for some of constraints that stand in the way of untethered e-Services and reforms in telecom regulatory are critical.

[2] https://www.mpesa.in/portal/.

- **Following the opportunities insight** - planning ahead to maximize the benefits of the ongoing telecom infrastructure expansion project is critical [4]. The 3G plus and 4G mobile networks infrastructure deployment can be used to great effect in terms of bridging the digital divide gap within the society at both urban and rural areas. However, endowing infrastructure access to citizens amounts to addressing only one facets of the digital divide problem which can impact e-Services delivery because of service users lack of access to ICT or inability to use ICT tools effectively. More is required to use the infrastructure to its full potential for better government services provision as well as citizens full participation. To this effect, developing localised mobile-based applications for mobile-based government services needs a strategic consideration.
- **Digital Citizenship** - Ethiopia is known for the lowest rate of digital literacy. The low rate of digital literacy is one of the most difficult hurdles the country needs to cross in order to dispense the benefits of e-Services to a wider segment of the society. Thus, conducting digital literacy campaigns sooner rather than later in broadening and deepening capacity needs a strategic consideration.

6 Conclusion

Globally, efforts to transform government services in to digital or electronic are gathering pace; however electronic transformation of government services in developing countries are yet to exhibit the true effects of the Internet and ICT tools potential in the realisation of good governance constructs- effectiveness, efficiency, responsiveness, participation in decision making, accountability and transparency are not taking roots. Besides service consumers convenience to get government services at the comfort of anytime and anywhere have become elusive as existing e-Government systems lack pervasiveness as well as support for digital money or online payment systems. In this study, in order to capture the look and feel of e-Government landscape of developing countries (with Ethiopia as a case study), one popular and widely used e-Service, the unified billing system named “Lehulu” was chosen. The e-Service is designed to help consumers pay their utility bills for electric, water and telephone in a nearby service center in a unified manner. With the current setting service consumers physical presence to effect payments for utilities bills is a must. About 67% of respondents travel more than 1 km to get to a nearby service center and 64% of respondents claim they spend more than 30 min for queuing up as well as service time. These inconveniences consumers experience once in every month could have been easily avoided with the creation of an enabling environment for the use of digital money or online payment systems.

The transformation of the fragmented utility bill payment services into electronic as well as being served under one-stop centers has brought significant benefits to utility consumers. The cost attached to establishing the e-Service centers and running them has been more expensive than what it was before. There is significant cost attached to recruiting computer literate skilled man power and furnishing the e-Service centers with

computers and related devices. Hence transforming the service into electronics makes no financial sense, and the monetary return of investments might not be achieved.

References

1. Beardsley, S., von Morgenstern, I.B., Enriquez, L., Verbeke, W.: Towards a new regulatory compact. The Global Information Technology Report 2003–2004: Towards An Equitable Information Society, pp. 71–86. Oxford University Press, New York (2004)
2. Clement, D.: The Ethiopian National Electronic Government Implementation Strategy and the ICT4D-2010 E-Government Action Plan, May 2006
3. Roslind, K.: Malaysian e-Government implementation framework, May 2006 http://www.shebacss.com/docs/ecompo001–10.pdf
4. Ongoing and Completed Telecom Services Initiatives in Ethiopia - Translated from Documents available in Amharic Language
5. van den Berg, L., van der Meer, A., van Winden, W., Woets, P.: e-Governance in European and South African Cities: The Cases of Barcelona, Cape Town, Eindhoven, Johannesburg, Manchester, Tampere, The Hague, and Venice. Ashgate Publishing, Ltd., Farnham (2006)
6. Maria, N., Constantina, C.: Agricultural e-government services: an implementation framework and case study. Comput. Electron. Agric. **70**(2), 337–347 (2010)
7. Ruthbea, Y.C.: Smart Cities and the Internet of Everything: The Foundation for Delivering Next-Generation Citizen Services, October 2013. https://www.cisco.com/web/strategy/docs/scc/ioe_citizen_svcs_white_paper_idc_2013.pdf
8. Michael, B., Kay, A., Giannotti, F., Alexei, P., Armando, B., Monica, W., Georgios, O., Yuval, P.: Smart Cities of the Future, October 5. ISSN 1467-1298. https://www.bartlett.ucl.ac.uk/casa/pdf/paper188