

An e-Government Assessment Framework for Service Delivery in South Africa's Municipalities: Rational Choice Theory Approach

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Abstract: While there is no doubt that assessment of the success of e-Government information systems is one of the most researched topics in the area of Information Systems' models, most of this is concerned with systems in the confinement of a work place. To this end, the systems are assessed in terms their efficacy as productive tools. On the other hand, researchers are in agreement that citizens' willingness to make use of e-services is the most dominating factor in successful e-Government solutions' implementation. To this end, competence, awareness and motivation of the citizens forms the key drivers. While focusing on the motivation/willingness aspect, the research reported in this paper applies Rational Choice Theory, as embedded within the Task-Technology Fit Model, to assess the effectiveness of e-Government solutions in supporting service delivery agenda in three municipalities in South Africa. In doing so, it is demonstrated that an effective e-Government solution provides a fit to the service delivery task and it is a precursor for minimising the ever-increasing service delivery protests in South Africa.

Keywords: Task Technology Fit, Rational Choice Theory, service delivery, local government, South Africa

1. Introduction

Research shows clear evidence that service delivery protests in South African municipalities are on the rise and have become more violent ([1],[2]). Although the reasons behind these protests are generally poorly understood, they are mostly galvanised by inadequate local services or tardy service delivery, the responsibility for which lies with a municipality. Most protests occur in informal settlements of metros; poor communication between representatives of the metros and communities is one of the main problems [3].

Invented in the 1990s, E-Government's main objective is to improve service delivery to citizens and in so doing, improve the efficiency of the governments activities [4]. Despite being the economic hub of the Africa continent ([4],[5]), implementation of e-Government projects in South Africa faces numerous challenges([4],[6]). One of these is the exclusive emphasis placed on ICT projects, "at the expense of careful analysis and consideration of the broader economic, social, and political elements that interact to improve the lives of individuals" [7]. Despite the fertile grounds (e.g. high penetration of mobile phones usage and sustained growth in internet usage) most e-Government initiatives being adopted by many municipalities take a top-down approach and they fail to meet the needs of municipalities due to reasons such as mismatch of technology characteristics versus the municipalities' and community members' tasks [8]. Other factor bogging down the implementation of e-Government projects, especially in the rural municipalities include ICT illiteracy, limited or lack of access to modern ICT devices, general (especially English) illiteracy, lack of awareness of e-Government services and limited funding to set up and maintain e-Government solutions [9].

2. Literature Review

2.1 The Task-Technology Fit (TTF)

Research in the broader realm of Information Systems (IS) has resulted in development of wide-range of user's evaluation models that measure the extent to which the information systems in place effectively meet business tasks that need to be executed. These models also assess how the use of the information system influences the user's performance and productivity ([10],[11]). To this end, user evaluations are described in variety of ways such as: user attitudes, information satisfaction, IS appreciation, information channel disposition, value, and usefulness. The most commonly used empirical factors in these models are system quality, information quality, use or intension to use, user satisfaction and the organisational impact. However, the authors know of no research that seeks to validate the choice of these factors in the context of South Africa's service delivery at municipalities.

The concept of fit is well accepted in the IS domain, where Task-Technology Fit (TTF) is examined to assess the extent to which technology provides functions supporting user needs. The TTF model, based on Rational Choice theory ([11],[12],[13]), assumes users will adopt technology provided it has the characteristics necessary to support their tasks. In [14], TTF is defined as *"the degree to which a technology assists an individual in performing his or her portfolio of task"*. TTF can also be defined as the degree to which the capabilities of the technology match the demands of the task. This implies that any technology will be used if and only if, it supports accomplishing the tasks the user is expected to perform. As shown in Figure 1 below, TTF is based on four constructs of task, characteristics, technology functionality and technology utilisation.

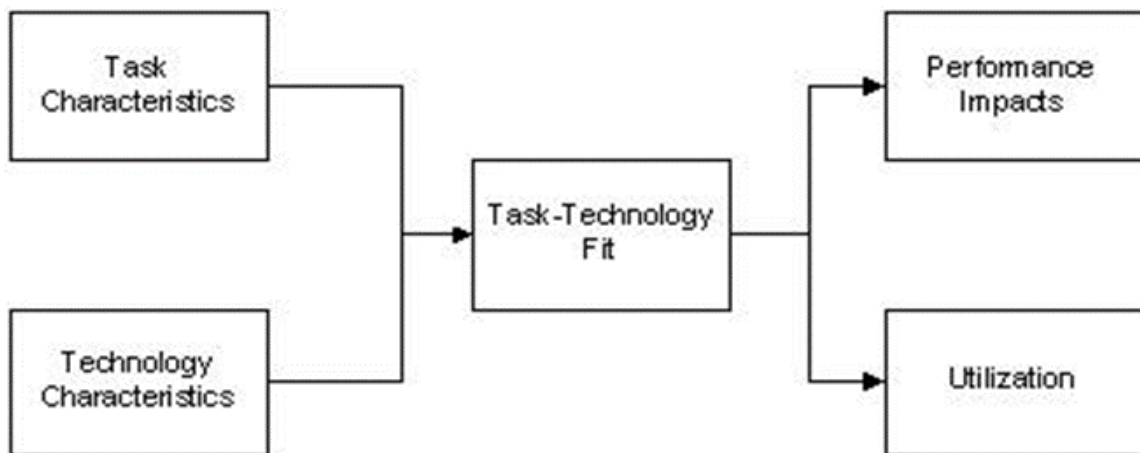


Figure 1. Conceptual Framework of the TTF Model

Source: [14]

2.2 E-Government

E-Government aims to provide citizens and business with more convenient access to timely and relevant government information and efficient service. It also provides greater opportunities to participate in democratic situation and processes [15]. Furthermore, the term *"e-Government is generally used to refer to the application of advanced information and communication technology (ICT) to deliver public services"* [16]. Defined broadly, e-Government is the use of ICTs to promote more efficient and effective government, facilitate more accessible government services, allow greater public access to information, and make government more accountable to citizens [3]. E-Government system implementations all over the world are employed in an attempt to utilise ICT to improve

government services provided to a range of stakeholders. In doing so, government aims to become more accessible, effective, efficient and accountable to their citizens [17].

E-Government is not meant to eliminate or replace interactions with humans but is more about providing citizens, businesses and employees with cleaner and more efficient public services at their best possible conveniences. Many of these technologies can serve a variety of different goals, such as better service delivery to citizens, improved interactions with business and industry, citizen empowerment through accessibility of information and more efficiency in government management. The resulting benefits can be less corruption, increased transparency, and increased convenience for citizens, increased revenues as well as cost reductions [18].

E-Government is essential in improving service delivery and much of South African news in the media recently has centred on service delivery issues in the municipalities. The majority of the issues relating to the protests are around housing, water, electricity, sanitation and road infrastructure ([2],[3],[15],[19],[20]). E-government can “facilitate access to information, contribute to freedom of expression, lead to greater equity, efficiency, productivity, and growth as well as social inclusion” ([12],[15],[21]).

2.3 e-Government in South Africa

The Department of Public Services and Administration (DPSA) drafted South Africa’s E-government policy in 2001. This was after an extensive consultation process which lasted for two years with various private sector representatives, community organisations and public services officials [22]. The policy outlines a ten-year e-Government implementation plan. Consequent to the 2001 policy adoption, the progress with e-Government beyond the policy statement is reported to have been regrettable [2]. The weak leadership has presented a serious obstacle to the implementation of e-government combined with other structural and operational constraints [3].

Substantial research relating to the challenges of e-Government within provincial and local government levels in South Africa is documented in literature ([2],[3],[4],[9],[15],[20]). The challenges range from universal (to developing countries) ones such as lack of funding and poor access to ICT infrastructure ([9],[15],[20]), to political ([2],[8]) and cultural [4]. The bottom line is that the success of e-Government, especially in non-urban municipalities has been dismal [8].

In this paper, we present a customised (to South African municipalities) e-Government model for assessing the ‘fitness’ of e-Government solutions and technologies to community members’ tasks. In particular, the tasks that relate to delivery of basic services such water, electricity and housing.

3. Objectives

The overall objective of this research was to develop a framework that municipalities in South Africa can use to evaluate the fitness of e-Government solutions. This was achieved through the following specific objectives:

1. To analyse e-Government implementation in three selected municipalities in South Africa;
2. To identify the salient critical success factors for e-Government solutions’ implementation for South African municipalities; and
3. To apply the Task-Technology-Fit model in modelling the factors in (2) above into a customised framework for South African municipalities;

4. Methodology

4.1 Research Design

Guided by the empirical aim stated above, exploratory/discovery case study [23] method was applied in the research. The case study was based on three government municipalities in South Africa: Mangaung Metro Municipality, Dr Kenneth Kaunda District Municipality and JB Marks Local Municipality. Quantitative data was collected using a questionnaire.

While a research design provides the framework for collecting and analysing data, research method is the actual technique for collecting this data. Data collection methods include surveys and interviews while examples of research design includes case study, longitudinal, cross-section and experimental [24]. This research involved a detailed analysis of e-Government in use in three selected South African municipalities. It is for this reason that Case Study Design was selected. In particular, a descriptive intrinsic case study was applied. Further, in order to concentrate on the salient features of e-Government solutions' implementation for South African municipalities, ideographic approach [24] was applied.

4.2 Sampling Strategy

Sampling strategies are used to determine target population and the selected (smaller and representative unit of population) sample as well as sampling frame - the list from which the potential respondents are drawn [24]. In this research, the entire population of citizens in the three municipalities was targeted. Hard copies of the questionnaire were randomly administered (by research assistants). A total of two hundred and forty-three (243) useable questionnaires were filled. The 243 therefore represented the sample size for this research.

4.3 Data Collection and Analysis Methods

As mentioned above, the data used in this study was collected using a questionnaire. Further, empirical method was employed utilising the TTF theoretical framework, with the latter technique based on a factor analysis technique. Specifically, two principal component analysis models were constructed to empirically identify the latent (unobserved) components of the e-Government implementation in the three municipalities selected for the case study. This was done along the dimensions of TTF framework.

Our empirical multiple-pronged empirical approaches is justifiable on two grounds: First, the factor analysis allows us to identify common unobserved factors, measuring the effectiveness of the e-Government implementations; and secondly, the factor analysis validates the anecdotal evidence of the quantitative survey, in order to draw a conclusive inference on the strength and weakness these implementations.

We obviate spurious inferences, reduce error variance and subjectivity of the respondent's feedback; random questions measuring the same construct were included in the administered survey questions, while the Spearman rho correlation analysis, KMO and Cronbach Alpha tests was used to validate the internal consistency and sampling adequacy of the 33-item questionnaire designed based on a Likert scale approach.

In what follows, the nature of the linear association between the designed survey questions to determine the effectiveness of the e-Government implementation based on the TTF framework is established using the Spearman rho (ρ) ranked correlation analysis. The correlation measure is preferred since it measure the strength and direction of monotonic relationship between two ranked variables/ordinal indexes rather than the linear relationship that Pearson's correlation measures.

5. Conceptual Framework

5.1 South Africa's Municipalities Case Study

According to the Constitution of the Republic of South Africa, local government is charged with the responsibility to implement developmental local government as well as co-operative governance. The mandate of local government is to relate its management, budgeting and planning functions to its objectives as outlined in the Integrated Development Plan (IDP) prescribed by National Government [22]. South Africa has three levels of government: national provincial government and local government. The latter is made up of three types of government structures: (1) large urban metro areas known as Metropolitan Municipalities (Category A); (2) District Municipalities (Category B) which have several local municipalities (Category C) [15]. The following three municipalities formed the basis of the case study.

a) Mangaung Metropolitan Municipality

According to StatsSA [25], Mangaung Metropolitan Municipality is a Category A municipality. It is situated in the Free State province, in the central interior of South Africa. The Free State is bordered by Gauteng, the Eastern Cape, Northern Cape, KwaZulu-Natal and North West provinces, as well as the neighbouring country of Lesotho. The Municipality has a population of 747,431 and comprises 3 urban centres, namely: Bloemfontein, Botshabelo and Thaba Nchu. It also has a surrounding rural area characterised by extensive commercial farming and communal mixed farming [26]. In terms of services, 91.4% of citizens use electricity for lighting while 46.1% have access to Piped water inside dwelling. Weekly refuse removal is available to the 78.9% of the residents and 60.7% have flush toilet connected to sewerage.

b) JB Marks Local Municipality and Dr Kenneth Kaunda District Municipality

Formally known as Tlokwe Local Municipality (Category C) and located in Potchefstroom, North West province, JB Marks local municipality is part of Dr Kenneth Kaunda District Municipality (Category B). The Municipality acquired its new name in 2017 following the merger of Tlokwe Local Municipality and Ventersdorp Local Municipality. Dr Kenneth Kaunda District Municipality is made up of three local municipalities – in addition to JB Marks, the other two are: (1) City of Matlosana (formerly City Council of Klerksdorp) local municipality and (2) Maquassi Hills Local Municipality. The District has a population of 695,934 – 38% (243,527) of whom live in JB Marks local municipality ([25],[27]).

5.2 Overview of the Conceptual Framework

An attempt to assess the effectiveness of an e-Government solution from the citizens' point of view is undoubtedly a daunting task. The context of a municipality in a developing country such as South Africa, complicates this assessment even more. The mostly complex information systems, imported from the 'Northern Designs' to the 'Southern Realities' [28], do not fit to the cultural environment of the municipalities [19]. Similar to the work presented in [11], our research looked into how to assess the fitness of an e-Government solution in supporting effective service delivery to citizens. This assessment has two aspects: from the citizens' point of view on one hand and the municipalities' employees' viewpoint on the other. The latter could be achieved through the task-technology fit eight dimensions [14]. These are: data quality, locatability, authorization, compatibility, ease of use/training, production timeliness, system reliability and relationship with users.

The thrust of our conceptual framework is that an e-Government that empowers the citizens is more likely to succeed in ensuring effective service deliver – especially by way of providing the citizens with relevant and timely information. This would by extension,

minimize the alarming service delivery protests. The framework is underpinned by TTF model which is in turn based on rational choice theory ([11],[12],[13]). From this, the conceptual framework showed in Figure 2 is proposed. It is anticipated that users will choose to use the e-Government solutions - Electronic Document Management System (EDMS) in this case - if it fits the tasks the related to service delivery.

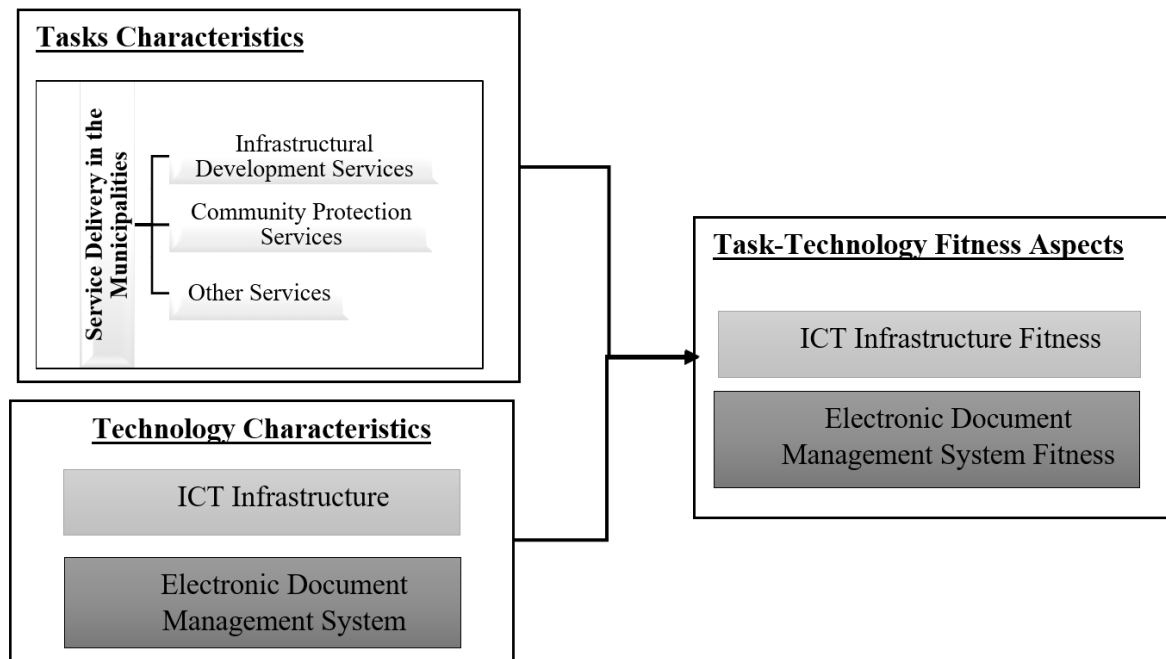


Figure 2. Conceptual Framework for Assessing e-Government Implementation in South Africa's Municipalities (source: Author)

Leveraging on vast work experience (of one author of this paper) at two municipalities, three categories of services were identified as: (1) Infrastructural Development Services; (2) Community Protection Services; and (3) Other Services. Further, given the fragile nature of the ICT infrastructure in most municipalities in South Africa ([3],[6]), this aspect, together with the EDMS, was included as part of the Technology Characteristics aspect of the TTF. The ICT infrastructure is also included in the Fitness aspect of the TTF. The various aspects of the Framework are listed in Table 1 below.

Table 1. Elements of the Conceptual Framework for Assessing e-Government Implementation

Tasks Characteristics	
A. Infrastructural Development Services	B. Community Protection Services
Q1. Water	Q1. Refuse Removal
Q1. Sanitation	Q2. Municipal Parks and Playgrounds
Q2. Electricity Supply	Q3. Municipal Sports Fields and Stadiums
Q3. Residential Streets, Roads, Sidewalks and Pavements	Q4. Complaints Regarding Community Service
Q4. Housing	Q5. Fire Department
Q5. Building Plans and Land Use Applications	Q6. Civic Protection
C. Other Services	Q7. Environmental Protection
Financial Services	Q8. Protection of Historical Heritage
Other (Specify)	
Task-Technology Fitness	
A. ICT Infrastructure Fitness	B. EDMS Fitness
Q1. Reliable and effective dissemination of information from the municipalities to the citizens	Q1. EDMS that enhances service delivery in the municipality
Q2. Organised and automated record keeping (e.g. of houses, rates, financial statements)	Q2. EDMS that complies with the ever-changing regulations

Q3. Employee's/community members in the municipality that are equipped with necessary ICT skills and will therefore utilise e-Government solutions	Q3. EDMS that improves staff morale by enabling them to retrieve files easily from their computers
Q4. Availability of ICT training programme that are necessary to reskill municipal employees	Q4. EDMS that can be used to ensure that documents coming in are sent to the correct people for action and track the process
Q5. Existence of ICT monitoring and evaluation procedures to monitor whether employees utilise the ICT skills they have learned after training	
Q6. Existence of network connectivity (bandwidth) of the municipality that is fast and reliable	
Q7. Ability of the municipality officials to understand their role	

6. Results

6.1 Introduction

The main data relating to this research consisted of three sections – depicting the three sections of the conceptual framework shown in figure 2: (1) task characteristics; (2) technology characteristics; and (3) task-technology fitness. While Confirmatory Factor Analysis (CFA) was carried out on these top-level categories of the data, Exploratory Component Analysis (ECA) ([29],[30]) was carried on the individual elements within these categories. Out of the 243 respondents, 72 from Dr Kenneth Kaunda, 80 from JB Marks while 91 were from Mangaung Metro Municipality. For each sub-set of the data, data reliability was determined using Cronbach's Alpha test based on standardised items [31]. To further ascertain the coherencies of a dataset, standard deviations as well as inter-items covariance/correlation matrices were also considered. Finally, ANOVA with Friedman's [32] reliability tests were performed.

6.2 Descriptive Statistics

The gender and race composition of the respondents is shown in table 2 below.

Table 2. Respondents' Gender and Race

		Race									
		Indian		White		Black		Coloured		Total	
Gender	F	7	2.9%	29	11.9%	42	17.3%	6	2.5%	84	34.6%
	M	10	4.1%	44	18.1%	100	41.2%	5	2.1%	159	65.4%
	Total	17	7.0%	73	30.0%	142	58.4%	11	4.5%	243	100.0%

Table 3 below shows the results of other demographics aspects of the data. It also shows the statistics of access and ownership of two critical ICT devices: mobile phone and computer. It is not surprising that all (except 1) the respondents had access to a computer – they all worked for the municipalities that are the focus of this research.

Table 3. Respondents' Demographic Statistics

		Count	Percentage
Age	Under 20	3	1.2%
	20-29	18	7.4%
	30-39	74	30.5%
	40-49	95	39.1%
	50-59	53	21.8%
Language	English	156	64.2%
	Afrikaans	63	25.9%
	Others	24	9.9%
Education	None	20	8.2%
	Primary	20	8.2%
	Secondary	103	42.4%
	Tertiary	100	41.2%
Years worked	less than 1 year	5	2.1%
	1-5 years	63	25.9%
	6-10 years	109	44.9%
	More than 10 years	66	27.2%
Access and Ownership of Mobile Phone	Do not own a phone	1	0.4%
	Own a non-smart phone	135	55.6%
	Own a smart phone	107	44.0%
Access and Ownership of Computer	do not own and do not	1	0.4%
	Do not own but I have	146	60.1%
	Own a computer	96	39.5%

Overall rating of service delivery (see table 4 below) at the three municipalities indicate that only 23.8% were happy.

Table 4. Respondents' Overall Rating of the Service Delivery

Overall Rating of the services by Municipality					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1: Strongly Disagree	43	17.7	17.7	17.7
	2: Disagree	92	37.9	37.9	55.6
	3: Neutral	43	17.7	17.7	73.3
	4: Agree	43	17.7	17.7	90.9
	5: Strongly Agree	22	9.1	9.1	100.0
Total		243	100.0	100.0	

6.3 Factor Analysis

a. Infrastructural Development Services

The communalities for this category is shown in table 5 below:

Table 5. Factor Analysis for Infrastructure Development Services

Communalities		
	Extraction	Statistical Mean
Water	0.450	3.35
Sanitation	0.524	3.71
Residential Streets. Roads. Sidewalks and	0.694	3.52
Housing	0.533	2.39
Electricity Supply	0.498	3.46
Building Plans and Land Use Applications	0.645	2.48

With a Kaiser-Meyer-Olkin Measure (KMO) of Sampling Adequacy value of 0.530 and Bartlett's Test of Sphericity (Approx. Chi-Square) value of 12.00, this was considered significant. Three components were extracted; these explained 55.72% of the variance. The optimal scaling of two dimensions of these components is shown in Figure 3. While three of the services (water, housing and Residential Streets, Roads, Sidewalks and Pavements)

are in both components – with water being significantly very strong. Electricity Supply is under one component while the remaining two are in the other component.

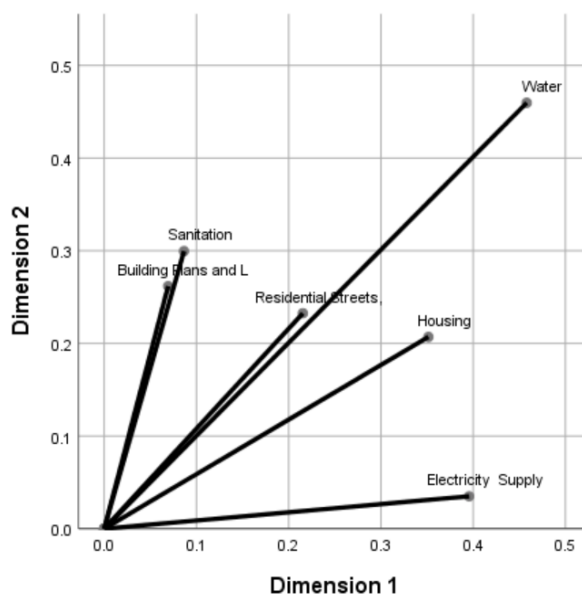


Figure 3. Variable Principal Normalization for Infrastructure Development Services

b. Community Protection Services

The communalities for this category is shown in table 6 below. Prior to generating these, two elements (*‘Municipal Parks and Playgrounds’* and *‘Response to complaints regarding community service’*) were found to be insignificant and therefore removed from the final list.

Table 6. Factor Analysis for Community Protection Services

Communalities	Extraction	Statistical Mean
Municipal Sports Fields and Stadiums	0.558	3.10
Fire Department	0.772	3.40
Traffic Services	0.607	2.30
Civic Protection	0.744	2.35
Environmental Protection	0.557	3.06
Protection of Historical Heritage	0.578	3.65

This category yielded four components which explained 64.82 of the variance, although with a lower KMO value of 0.5. Optimal scaling of the components along two dimensions (see figure 4 below) indicate the commonality of the elements – they are all included in the two components.

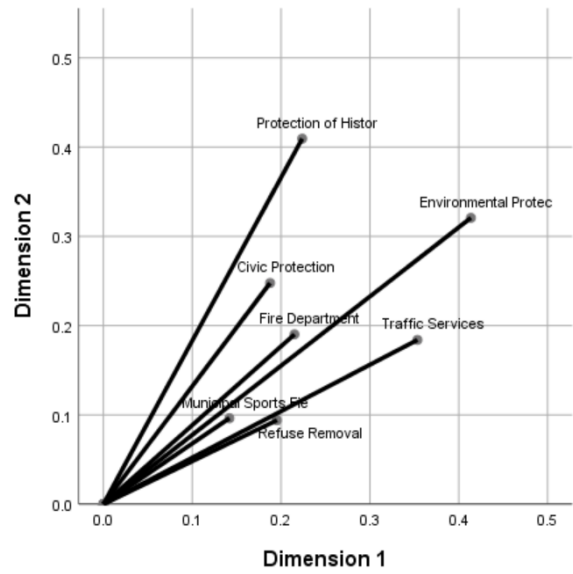


Figure 4. Variable Principal Normalization for Community Protection Services

c. ICT Infrastructure Fitness

The elements “Reliability of the dissemination of information from the municipalities to the citizens is reliable and effective” had a lower extraction value of 0.426. Upon its removal, significant improvements, especially in the components extraction variance explanation from 53% to 60%. A total of three components were extracted.

Table 7. Factor Analysis for ICT Infrastructure Fitness

Communalities	Statistical Mean	
	Extraction	
Current Record Keeping is automated	0.670	3,47
Lack of ICT humpers ICTs utilisation	0.740	3,78
Employees at this municipality do not have ICT skills	0.508	3,62
ICT training programme for reskilling	0.544	3,74
Development of ICT monitoring and evaluation procedures	0.499	3,48
Network connectivity is Fast	0.678	3,19

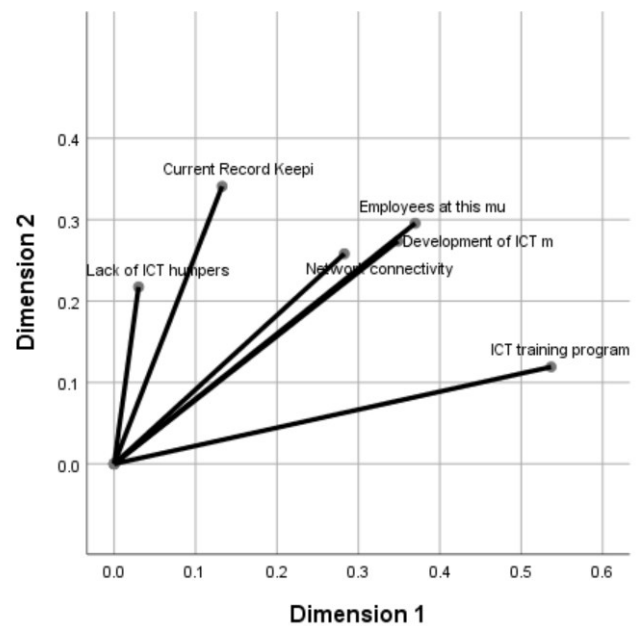


Figure 5. Variable Principal Normalization for ICT Infrastructure Fitness

d. EDMS Fitness

Factor analysis for the EDMS Fitness yielded the results shown in table 8 and figure 6 below.

Table 8. Factor Analysis for EDMS Fitness

Communalities		Statistical Mean
	Extraction	
EDMS enhance staff morale	0.750	3.42
EDMS to ensure document delivery to correct people	0.380	3.80
EDMS to enhance service delivery	0.514	3.62
Implementation EDMS to enable complying ever-changing regulations	0.697	3.49

A KMO value of 0.543 was generated. The two components, explaining 58.52% of the variance were extracted as shown in Figure 6 below. The small number of elements for this category is considered as a weakness of the framework. This has been resolved through further work on the model that entails analysing the fitness of the EDMS along the entire bouquet eight dimensions [14] mentioned in section 4.2.

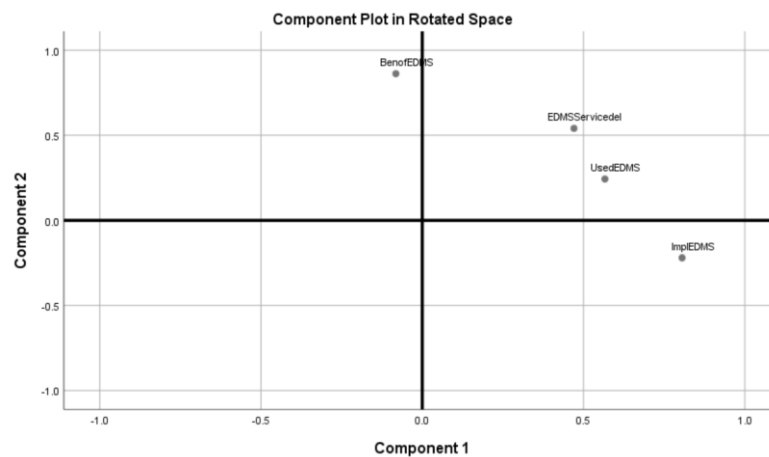


Figure 6. Component Plot in Rotated Space for EDMS Fitness

6.4 Proposed E-Government Assessment Framework

From the results presented above, the final e-Government assessment framework for service delivery in South African's municipalities is shown in figure 7 below.

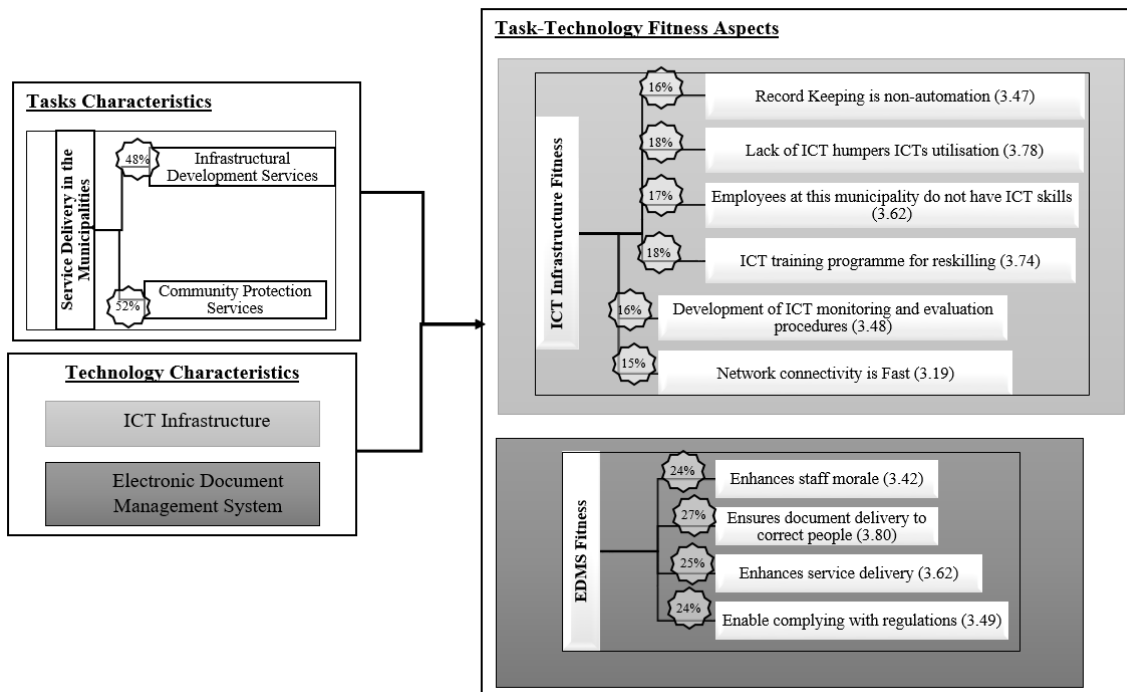


Figure 7. E-Government Assessment Framework

a) Task Characteristics

A total of 12 tasks are included; 6 under infrastructural development and 6 under community services. The table 9 below shows the significance of each, based on their mean. The total weighting for each category is 48% and 52% respectively.

Table 9. Tasks Characteristics Component of the e-Government Assessment Framework

Service	Mean	Percentage
Water	3.35	9%
Sanitation	3.71	9%
Residential Streets. Roads. Sidewalks and Pavements	3.52	9%
Housing	2.39	6%
Electricity Supply	3.46	9%
Sub Total		48%
House Plans	2.48	6%
Refuse Removal	2.48	6%
Municipal Sports Fields and Stadiums	3.10	8%
Fire Department	3.40	9%
Traffic Services	2.30	6%
Civic Protection	2.35	6%
Environmental Protection	3.06	8%
Protection of Historical Heritage	3.65	9%
Sub-Total		52%

b) Task-Technology Fitness

For this components, the various weights (based on statistical mean) associated with each element are shown next to the respective elements in figure 7. The sub-categories (EDMS and ICT Infrastructure) were assessed separately and therefore the weights for the categories add up to 100%. Further, the weights for elements in each sub-category are generally equally weighted – implying their equal importance in meeting the citizens task of service delivery.

7. Conclusions

In this paper, a framework for assessing the e-Government solution in its efficacy in enhancing effective service delivery to citizens is presented. Unlike other assessment models and frameworks presented in literature, our framework addresses citizens' context. Working from the Rational Choice Theory approach, the framework factors in the aspects that drive individuals in making various decisions [11]. The rationale for this approach was the fact that municipalities in South Africa continue to experience unrelenting high levels of service delivery protests and the hypothesis that empowering these citizens through e-Government could minimize these protests. The Task Technology Fit's [10] implementation of Rational Choice Theory is adopted in creating a 3-component assessment framework that is presented in section 5. The Task Characteristics Component contains three categories of the basic services that citizens expect to receive from the municipality. The second component, the Technology Characteristics, looks at two dimensions: the ICT infrastructure and an example of an e-Government solution – an electronic document management system (EDMS). The third component is the Task-Technology Fitness where the fitness of both the ICT infrastructure and EDMS to the service delivery task is assessed. The percentage significance weight of each element in the framework is provided. This makes it possible for the framework to be applied on any other e-Government solution (not just the EDMS) for municipalities.

For further work, the framework will be expanded to further assess the EDMS along the 8-dimension of the TTF. This will address the instances where the values of Kaiser-Meyer-Olkin Measure (KMO) of Sampling Adequacy were below the required 0.6. Given that the respondents of the questionnaire used for this research worked at municipalities, this may have introduced some bias in some responses. In the next phase of the Framework evaluation, the questionnaire will be expanded to the general public.

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