



A Study on E-government Service Quality and Effectiveness of E-government Services in Selected Divisional Secretariats

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Acknowledge to the rapid global growth of internet and information technology, many governments around the world have transformed their services from traditional services to electronic means. Using the internet, nowadays governments are offering more convenient and faster access to their services and information. This has been achieved by the use of e-government services. Even though, the concept of e-government is still in its early stage, it has become an important issue in recent years. The main purpose of introducing e-government services is to effective services to the citizens. However, many governments have been developing the e-government services without

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paying full attention to the effectiveness of the e-government services and the requirements of citizens. Accordingly, the main purpose of this study is to identify the relationship between e-government service quality and effectiveness of e-government services. This study conducted based on quantitative method and the primary data collected through the structured questionnaires. In total, 112 questionnaires were distributed to citizens who accessed e-government services in 14 divisional secretariats in Batticaloa District. From that, total of 100 completed questionnaires were gathered, representing 89.26% response rate. The collected data was analyzed with the aid of SPSS (22.0) software. The data analysis method is specially focused on the bivariate and multi variate analysis due to the specific research questions. Major findings indicates that there is a positive significant relationship between all the dimensions of e-government service quality and effectiveness of e-government services. Further simple regression analysis between e-government service quality and effectiveness of e-government service results also explicit e-government service quality has a positive significant influence on effectiveness of e-government services. The results of this study will assist the government entities in proper development and implementation of e-government services in the divisional secretariats to provide quality e-government services to the citizens. Future research can cover local e-government projects in national level.

Keywords: E-government; service quality; effectiveness of e-government services; divisional secretariats; Sri Lanka.

1. INTRODUCTION

1.1 Background of the Study

Continuous development in information technology (IT) and computer usage plays a vital role on the functions of government organizations. Nowadays, governments are realizing that they need to upgrade their services in order to accommodate public participation via the internet. Accordingly, many governments throughout the globe have converted their services from conventional to electronic means [1]. This is being done through the development of e-government services with the help of tremendous worldwide expansion of the internet and information technology. e-government can be described as the use of information communication technology (ICT) within government to make operations more efficient, improve quality of service and offer an easy access for citizens to government information and services [2].

e-government service is the methodology using ICT for carrying out the main functions of the government such as providing products and services to the citizens, maintaining law and order, foreign affairs, defense, and welfare more effectively. e-government helps mainly to increase the efficiency and effectiveness of the public sector and provide the services in a more friendly and convenient manner. The goal of e-government is to create new internal and external communication channels, to streamline administrative operations, to increase the

accessibility of government actors and services, and to improve information availability [3]. The popularity of e-government is due to the significant benefits it provides to governments, citizens, and society [4]. These benefits include such as the delivery of quality public services, the convenience and accessibility of public services, the reduction of communication and information costs, the bridging of the digital divide, facilitating the active participation of citizens in government, broadening reach and eradicating distance with citizens living in remote or sparsely populated areas, and the elimination of distance with citizens living in less densely populated areas [4].

The current emphasis of e-government is on leveraging information technology to improve the efficiency and quality of public services [5] The degree to which an e-government website supports the competent delivery of effective services to assist residents, businesses, and agencies in accomplishing their governmental transactions is referred to as e-service quality [6]. Quality e-services may provide an online firm a competitive edge by boosting its performance and customer happiness [7]. As a result, the quality of e-government services has the potential to significantly improve the effectiveness of e-government services while also raising citizen happiness [1].

In 2005, the Sri Lankan government began the e-Sri Lanka development project [8]. Sri Lanka's e-government policy is undoubtedly one of the most extensive in the South Asian area. In this

context, it is notable that the Sri Lankan government in 2002 initiated the reengineering government program under the e-Sri Lanka Road map [9] and this might be the initiative for implementing the existing e-government, where the ICT Agency of Sri Lanka (ICTA) was appointed as the main regulatory body to implement the e-Sri Lanka Road map under the guidance of the Presidential Secretariat. The main purpose behind this implementation is to introduce the e-government services in Sri Lanka. As this study attempts to investigate the effectiveness of e-governments services in Batticaloa district including all fourteen (14) divisional secretariat areas.

1.2 Problem Statement

The concept of e-service quality is derived from the concept of quality of traditional services. e-service quality can be classified as the key determinants to the success or failure of online organizations. According to Lee and Lin [10], many online organizations fail because of poor e-service quality. e-service quality can be defined as overall consumer evaluations and opinions about the excellence of e-service delivery in the virtual marketplace. Collier and Bienstock [11] describe e-service quality as user's perceptions of the outcome of the service delivery along with service recovery perceptions if service failures happened. For e-government user, a high-quality service is measured by which potential advantages of the internet are realized. Research has often referred to e-government service quality as the degree to which an e-government web site facilitates the competent delivery of efficient e-services to help citizens, businesses, and agencies in achieving their governmental transactions.

"E-government policy of Sri Lanka identified and defined five main objectives that are to be achieved throughout the e-government journey. It includes (1) provide more convenient and better services to citizens, (2) participation of clients (3) use of social media for providing better services (4) better relationships with clients, (5) good governance" [8]. "Even though e-government has been in place since 2012, it is critical to assess how well e-government services are being implemented in Sri Lanka. It is also feasible to question if a suitable environment and space have been established for the successful deployment of e-government services in the public sector. In order to expedite the higher standard of service quality it is very important to

understand the requirements of users and define relevant quality standards accordingly for a better evaluation" [12].

Generally, any country that implements e-government projects should follow a well-established localized e-government model to achieve better results. Sri Lanka has been following an e-government model under the ICTA reengineering government program [13]. As the "Mahinda Chinthana" project aims to be successful in implementing the e-government services all over the nation by 2016, it is notable that there is not any constructive initiative to implement e-government services in Batticaloa district. This makes questioning whether the aim of "Mahinda Chinthana" in relation to e-government can be achieved throughout the nation.

Thus, at this moment it is very essential to evaluate how far e-government practices in Sri Lanka enjoying effectiveness in its processes. To elaborate this understanding, the present status of service quality based on the recommended dimensions need to be carried out. By this study can foresee the achievement of the objective as well as required improvements for future endeavor. Thus, it is important to verify whether this e-government model is fully adapted to the local context, particularly in Batticaloa district. Accordingly, the main research problem of this study articulated as "how e-government service quality impacts the effectiveness of the e-government services in selected divisional secretariats in Batticaloa district?"

1.3 Research Objectives

- To identify the relationship between e-government service quality and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.
- To identify the influence of e-government service quality on effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

1.4 Research Questions

- What is the relationship between e-government service quality and effectiveness of e-government services in selected divisional secretariats of Batticaloa district?
- What is the influence of e-government service quality on effectiveness of e-

government services in selected divisional secretariats of Batticaloa district?

1.5 Scope of the Study

One of the key national projects that the National Physical Policy and Plan 2030 propose the Metro City Development Project in Batticaloa [14]. Accordingly, this study has the scope of investigating the level of e-government service quality in all 14 divisional secretariats office at Batticaloa district. In this context, the variables are measured with their respective dimensions. The service quality measured with 6 dimensions: tangibility, reliability, responsiveness, personalization, information, and ease of usage, among the citizens of selected. The responding services were chosen from the e-government service application divisional secretariats office in Batticaloa district and select the in four different e-services (birth certificate, marriage certificate, death certificate and motor vehicle license) in 14 divisional secretariats offices in Batticaloa. The study considers customers of 112 for collecting the primary data.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Overview of E-Government

Continuous development in IT and computer usage plays a vital role on the functions of government organizations. Fang [15] defines e-government as a way for government to use the most innovative ICT, particularly web-based applications, to provide citizens and businesses with more convenient access to government information and services which provides greater opportunities to participate in democratic instructions and processes.

Karunasena [12] stated that currently most of the governments are using internet or web-based applications to disburse services toward citizens, business organizations, employees, government

agencies and other organizations. Government organizations are starting their e-government journey by providing statistical information on websites over internet and through that they are experiencing efficiency, effectiveness, and organizational performance. Successful government organizations need to concentrate on enhances transparency, communicate, and interact with citizens and other organizations via the web and development of appropriate online services. Delivering effective, appropriate, and quality services to the users should be measured time to time to ensure the level of performance.

To expedite the higher standard of service quality it is very important to understand the requirements of users and define relevant quality standard accordingly for a better evaluation. According to Saha [16], the e-government revolution raised as a result of the quick and dramatic developments in e-commerce and e-trading. The importance of IT and computer usage in government tasks is constantly evolving. Successful government organizations must focus on improving openness, communicating, and interacting with citizens and other organizations over the internet, as well as developing relevant online services.

Understanding the expectations of users and defining appropriate quality standard accordingly for a better evaluation is critical to expedite the higher standard of service quality [12]. According to the e-government survey rankings in 2022 by the United Nations, the Denmark is the world leader followed by Finland, the Republic of Korea, New Zealand, Sweden, Iceland, and Australia [17]. That reflects those countries in general have improved their online service delivery to cater their citizens' need. On a regional level, Europe remains with an average index value of 0.8305, followed by Asia (0.6493), the Americas (0.6438), Oceania (0.5081) and Africa (0.4054) [17]. Table 1 lists out the e-government survey rankings of the South Asian countries.

Table 1. Positions of the South Asian countries

Country	Position	Index
Maldives	104	0.5885
Sri Lanka	95	0.6285
India	105	0.5883
Pakistan	150	0.4238
Bhutan	115	0.5521
Bangladesh	111	0.5630
Nepal	125	0.5117
Afghanistan	184	0.2710

Source: United Nation's e-government survey, 2022

2.2 Types of E-Government

There are different types of e-government which depend on the nature of interactions and the group involved. According to Fang [15] there are eight types identified and which are also referred by Alzaki [68]. These different interactions are recognized among citizen, government institutions, business organizations, employees, and non-profit organizations.

1. Citizen to Government: In this type, citizens forward their requirements or send information to a specific government institution through their websites.
2. Government to Citizen: It includes offering information and communication services to the public through online.
3. Business to government: This includes e-transactions such as e-procurement and development of market websites for government purchasing.
4. Government to business: This is also e-transactions where accepting procurements, offering tenders, exchange of information, good secretariat and services.
5. Government to employee: It facilitates the employees of the Government organizations to access their career applications and processing paperless systems. It furthers assists them to interact with one another through internal communication.
6. Government to Government: It describes the internal exchange of information and databases. Government agencies, departments and cooperation will have a communication channel to simplify many processes among them
7. Nonprofit to Government: It includes exchange of information and communications with nonprofit organizations such as political parties and legislatures.
8. Government to Nonprofit: Government provides information, regulations, and instructions to the non-profit organizations through online and applies online mechanisms to control those bodies.

Present study focused on the government to citizen type of e-government to explore the research phenomena.

2.3 E-Government Service Quality

According to Crosby [19], service quality is defined as how well the service meets or exceed the customers' expectations on a consistent

basis. Gefan [20] defines service quality as the subjective comparison that consumers make between the quality of the service they expect to receive and the quality of the service they receive.

According to Lewis [21], service quality is a measure of how well the service level given fits customer expectations and producing excellent service entails consistently complying or fulfilling customers' expectations. The degree to which an e-government website supports the competent delivery of efficient e-services to assist individuals, companies, and agencies in fulfilling their governmental transactions and activities is referred to as e-government service quality [1]. In recent years, there has been a lot of focus on evaluating the quality of e-services. As a result, several studies have attempted to identify essential elements of e-service quality related with the online environment.

Ghobadian et al. [22] put forward that most of the service quality definitions fall within the customer led category. Juran [23] elaborates the definition of customer led quality as features of products which meet customers' need secretariat and thereby provide customer satisfaction. Grönroos [24] and Parasuraman [25] look at perceived quality of service as the difference between customers' expectation and their perceptions of the actual service received.

Lewis and Booms stated that service quality is a measure of how well the service level delivered matches customer expectations and delivering quality service means conforming or meeting customers' expectations on a regular basis. Supporting the view of Lewis and Booms, Parasuraman, Zeithaml and Berry [25] believe that the only criteria that can be considered in evaluating service quality are those defined or presented by the customers. In their view Booms, Parasuraman, Zeithaml and Berry [25] identified, ten criteria that customers use to judge the quality of the service that they receive. The first five relate to the quality of the final outcome while the reminder refers mainly to the quality of the process of service delivery [26].

2.4 Determinants of E-government Service Quality

To analyze e-government service quality, the e-government SERVQUAL model developed by Alanezi & Basri [1] taken into consideration. The SERVQUAL model, which was established and

presented by Parasuraman et al. [25] for the evaluation of service quality, has been investigated and changed by Alanezi & Basri [1] based on the features of e-government services. It includes the dimensions such as tangibility, reliability, responsiveness, personalization, information, and easiness.

2.4.1 Tangibility

Web site quality is the important tangible factor of e-government services as it is an interface to connect the users and the government. Web site design is comprised of the technical functioning of e-government web site and web site appearance. Thus, it is taken into account as crucial dimensions to attract the citizens. According to Lee and Lin [10], many studies, that have investigated the influence of web site design on e-service performance, found that web site design plays a major role in customers' satisfactions [27].

2.4.2 Reliability

Reliability refers to the degree to which a promised service provided by an e-government web site. This measured through factors such as the promised time, providing the confidence of delivering the right products, and correct charges [28]. According to Parasurnaman et al. [25] they found that reliability is one of the most important dimensions in SERVQUAL instrument. Other works on e-service quality also found that reliability is the most important dimensions on e-service quality dimensions.

2.4.3 Responsiveness

Parasuraman et al. [29] define responsiveness in the e-commerce domain as effective handling of problems and returns through the site. Responsiveness refers to the degree to which the services provided by an e-government web site is helpful and there is no delay in responding to citizens. Online user expects the organization to respond to their inquiries without delay. Immediate response will assist e-government users to make decisions faster, answers their questions and resolves their problems. Several studies have revealed that there is an important correlation between responsiveness dimension and customers' satisfactions.

2.4.4 Personalization

Personalization dimension in SEVQUAL scale concerns with providing caring and paying individual attention to customers. In online

environment, we have replaced the empathy dimension with personalization since there is no direct human interaction between the customers and employees in virtual environment. Thus, personalization refers to the degree to which an e-government web site provides a variety of services to convince specific individual citizen's need secretariat. Personalized service can play an enormous role in improving customer's satisfaction by personalizing some services such as, payment method, delivery method secretariat and service process [29].

2.4.5 Information

Information dimension concerns with the information provided by an e-government website, where desirably the information should be accurate, current and easy to understand. According to Levkov [30], in online environment, information is a very important factor for users in making their decisions. Users need accurate, current and easy to understand information to examine what they want to do. Also, if there is old information or old news this gives a negative impression of the organization. This is consistent with Obi [31] who recommended that e-government websites should provide information content that is up-to-date and reliable.

2.4.6 Easiness

Easiness refers to the degree of ease of using the web site and the facility to search for information. According to Yoo and Douth [32], easiness dimension is one of the most significant dimensions that have influenced customers' satisfactions and behaviors. An e-government web site should be user friendly such that it is easy for users to use the web site to search for information. This dimension describes the extent to which the e-government website is easy to access and easy to navigate. Furthermore, this dimension relates to the ease of completing a transaction.

2.5 Conceptualization

Conceptualization is the process of providing a clear notion, specific meaning, and agreed definition to numerous ideas and variables utilized in the field of study. As illustrated in Fig. 1, to examine the research objective a conceptual framework has been developed with e-government service quality as the independent variable, and the effectiveness of the e-government service as the dependent variable.

As discussed above, to analyze e-government service quality, the e-government SERVQUAL model developed by Alanezi & Basri [1] taken into consideration with the six dimensions such as tangibility, reliability, responsiveness, personalization, information, and easiness.

2.6 Hypothesis Development

A hypothesis is a tentative statement about the relationship between two or more variables. A hypothesis may be proven correct or wrong and must be capable of denial. A research hypothesis, which stand the test of time, eventually becomes a theory. Checking the significant or extent of impact of service quality factors on performance of e-government service is playing key role in this research. To achieve this, the following hypothesis are proposed in this study.

- H₁: There is a significant relationship between overall e-government service quality and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.
- H₂: There is a significant relationship between tangibility and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.
- H₃: There is a significant relationship between reliability and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

- H₄: There is a significant relationship between responsiveness and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.
- H₅: There is a significant relationship between personalization and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.
- H₆: There is a significant relationship between information and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.
- H₇: There is a significant relationship between easiness and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

3. RESEARCH METHODOLOGY

3.1 Research Philosophy

Philosophy of research depends on how researchers feel about knowledge growth. The research philosophy discusses the origins, existence, and creation of knowledge [33]. It's a belief in how to gather, interpret, and use information on a phenomenon. There are three interpretations of the research process. They are positivism, interpretivism, and realism [34]. Positivism relies on findings that can be quantified leading to statistical analysis.

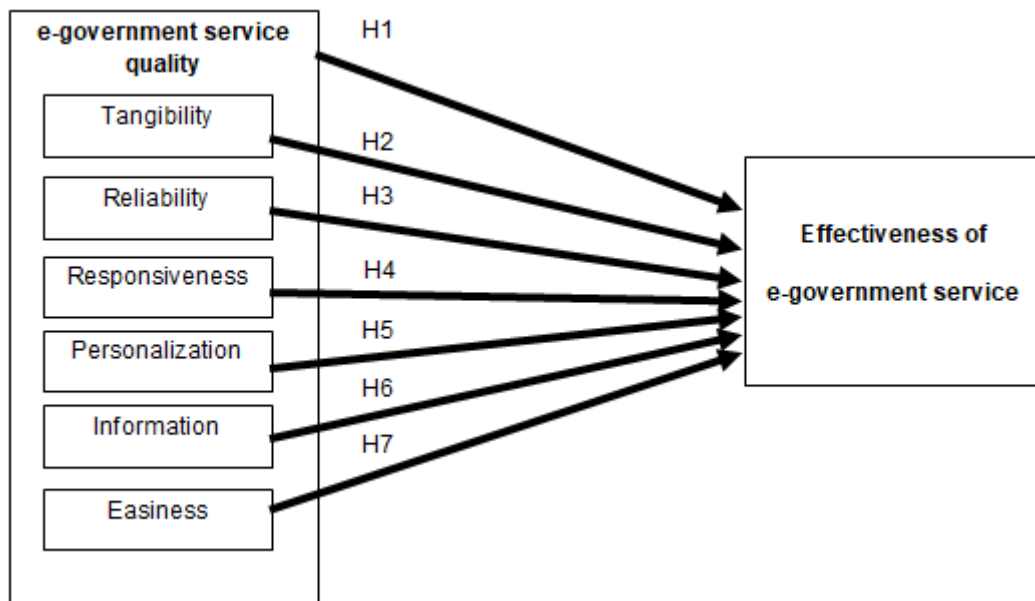


Fig. 1. Proposed conceptual framework for the study

Source: Developed by researcher

This research is done with social reality, and the information is obviously gathered in an almost value-free way, and the use of existing theories to hypothesize. Positivism relates to the philosophical stance of the natural scientist and entails working with an observable social reality to produce law-like generalisations [35]. Positivism seeks objective enquiry based on measurable variables and provable propositions and is concerned primarily with the explanation of observable events [36]. Hence, the research philosophy of this study is positivism.

3.2 Research Approach

Research approaches are used for making conclusions and establishing what is true or false. The most distinctive point between deductive, and inductive methods is the importance of theories to the analysis. Deductive approach measures the validity of hypotheses or theories while inductive approach leads to new theories, and generalizations emerging [37].

Based on the current study, variables such as e-government service quality (tangibility, reliability, responsiveness, personalization, information, and ease of usage), and effectiveness of e-government service are well defined, and explained the influence, developed hypotheses as well as test the hypotheses. Further collections of quantitative data are measured. Therefore, this study has used deductive approach.

3.3 Research Strategy

The research strategy considers how the researcher will respond to research questions as a general plan [38]. Research strategy is a general approach to the conduct of research. This includes the overall direction of the study, including the process of performing the research. Common research strategies used in business and management are experiment, survey, case study, action research, grounded theory, ethnography, archival research, cross sectional studies, longitudinal studies, and participative enquiry [39].

Survey is a popular method and common strategy in business research. Survey research is described as gathering information from a sample of individuals by responding to questions [40]. As this study is quantitative study using questionnaires to collect the data from the sampling population and using deductive approach the survey strategy has been selected

and used as appropriate research strategy for this study.

3.4 Methodological Choice

Quantitative analysis is the systematic empirical study of observable phenomena by means of numerical, mathematical, or computational techniques. The aim of quantitative research is to establish, and employ phenomena-related mathematical models, theories, and hypotheses. The measurement process is central to quantitative research because, it provides the fundamental connection of quantitative relationships between empirical observation, and mathematical expression. The quantification in empirical research is achieved by three steps, such as measurements of variables, estimation of population parameters, and statistical of hypotheses [41]. Therefore, the researcher applied quantitative methodology for this study.

3.5 Time Horizon

The time horizon is the time frame for completion of the project [42]. Cross sectional, and longitudinal may be the time horizon. Cross-sectional is when the data is collected at a single point. On the other hand, the collection of data takes place in more time points is called as longitudinal studies [43]. The research data are obtained from the respondents at a single point during the same time-period to answer a research question. Therefore, it is a cross-sectional study.

3.6 Research Site/Area Selection

This study considered 14 divisional secretariats in Batticaloa district as a research area. The researcher already mentioned that lack of empirical studies has conducted in this site/area regarding e-government service quality and effectiveness of e- government services.

3.7 Unit of Data Analysis

When conducting research, one of the most basic considerations is assess the primary unit of statistical analysis. This is called the unit of analysis [44]. Regarding objectives of this study, unit of analysis is the citizens who accessed the e-government services.

3.8 Population of the Study

Population is the whole set of entities that one tries to grasp or, more formally, to make a conclusion about [44]. Study population for this

research identified as citizens who accessed the e-government services in 14 divisional secretariats in Batticaloa district. As per the mid-year population calculated by the Sri Lankan government, the total population of Batticaloa district is identified as 590,000 on 2022 [45].

3.9 Sampling Technique/Method

Sampling is described as the process of selecting certain members or a subset of the population to make statistical inferences and estimate the characteristics of the population. There are two main sampling methods that are nonprobability, and probability sampling. The bulk of experimental research requires samples of 30 or larger [46]. Current study utilized the convenience sampling method which is a non-probability sampling technique due to non-traceable of population who are using e-government services in the selected divisional secretariats.

3.10 Method of Data Collection

Data collection is information collection to address a research issue. Data collection can be done through two main sources, including primary, and secondary data [47]. The primary data is the first compilation of original information. The primary sources of the data collected through the structured questionnaires. The self-administered questionnaires are distributed via direct conversations. Secondary data is information that has been gathered previously, and that has been put through the statistical process. Literature surveys based on various published, and unpublished research, journals, and books have been utilized for the conceptualization of this study.

3.11 Validity and Reliability of Instruments

Reliability, and validity are concepts used to evaluate the quality of collected data. The

researcher indicates how well a method, technique, or test measure something. Reliability is about the consistency of a measure, and validity is about the accuracy of a measure [48]. Reliability is seen as the degree to which the test is free of measurement errors, since the more measurement errors occur the less accurate the analysis becomes [49].

The internal consistency measure (Cronbach's Alpha (α)) has been used to assess the reliability, and validity of the instrument. The suggested value of 0.7 has been used as a cut-off of reliability. Koonce, & Kelly [50] indicate attributes for data reliability as follows (Table 2):

3.12 Method of Data Analysis and Evaluation

Data analysis is the order and process the structure of the mass of data collected. It is characterized as messy, ambiguous, and time-consuming, but also as a fascinating, and creative process [51]. It was analyzed according to the characteristics of the collected data; the statistical kit for social science allowed the quantitative data analysis method. As mentioned in Table 3, to address the stated objectives of this study, bivariate, and multivariate analysis method was used to analyze data.

3.12.1 Pearson's correlation analysis

Bless, Higson, and Kagee [52] describe a correlation as the relationship between two variables where one variable's change is followed by expected change in another variable. Correlation Analysis is a statistical method used to determine whether or not there is a relationship between two variable/datasets and the strength of that relationship. A correlation coefficient is a method of putting a value to the relationship.

Table 2. Decision attributes for reliability analysis range decision attributes

Range	Decision Attributes
$\alpha \geq 0.9$	Excellent Reliability
$0.8 \leq \alpha < 0.9$	Good Reliability
$0.7 \leq \alpha < 0.8$	Acceptable Reliability
$0.6 \leq \alpha < 0.7$	Questionable Reliability
$0.5 \leq \alpha < 0.6$	Poor Reliability
$\alpha < 0.5$	Unacceptable Reliability

Source: Koonce, & Kelly, [50]

Table 3. Objective based method of analyses

No.	Objective	Method of Analysis
1.	To identify the relationship between e-government service quality and effectiveness of e- government services in selected divisional secretariats of Batticaloa district.	Bivariate Analysis (Pearson Correlation)
2.	To identify the influence of e-government service quality on effectiveness of e- government services in selected divisional secretariats of Batticaloa district.	Multivariate Analysis (Simple Regression)

Source: Developed for the study purpose

Table 4. Decision criteria for bivariate analysis

Range	Decision Attributes
r = 0.5 to 1.0	Strong positive relationship
r = 0.3 to 0.49	Moderate positive relationship
r = 0.1 to 0.29	Weak positive relationship
r = -0.1 to -0.29	Weak negative relationship
r = -0.3 to -0.49	Moderate negative relationship
r = -0.5 to -1.0	Strong negative relationship

Source: Develop for the study purpose

Correlation coefficients range between -1 and 1. A “0” indicates that there is no relationship between the variables, whereas a “-1” or “1” indicates that there is a perfect negative or positive correlation. The correlation coefficient denoted by “r” measures the degree of association between two dimensions and variables (see Table 4). This study evaluates the significant study variables relationship if the corresponding p-value is less than 0.05.

Testing Hypothesis of Correlation:

H₀: There is no relationship between study variables (p ≥ 0.05)

H₁: There is a relationship between study variables (p < 0.05)

3.12.2 Regression analysis

Analysis of regression is a statistical technique used to identify a relationship between a dependent variable, and a set of explanatory factors. The dependent variable, referred to as the (Y) variable, is the value to be identified by the researcher based on the explanatory factors. Regression analysis is a statistical method for analyzing and comprehending the relationship between two or more variables of interest [53]. The process used to perform regression analysis an understanding which factors are important, which can be ignored, and how they interact with one another.

This study uses two main types of regression analysis, simple regression analysis and multiple regression analysis. Simple regression analysis uses one independent variable to explain or predict the outcome of the dependent variable Y,

while multiple regression analysis uses two or more independent variables to predict the outcome.

Simple Linear Equation:

$$Y = a + \beta X$$

Y = Dependent variable

X = Independent variable

a = Y-intercept

β = Slope of the equation

Multiple Regression Equation:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n$$

Y = Dependent variable

X (X₁, X₂, X_n) = Independent variables

a = Y-intercept

β (β₁, β₂, β_n) = Slopes of the equation

4. DATA ANALYSIS AND FINDINGS

4.1 Data Collection and Response Rates

Table 5 shows the details of collected questionnaires from the citizens of 14 divisional secretariats in Batticaloa district. 100 questionnaires were responded by the citizens out of 112 distributed questionnaires. Hence the response rate was 89.28%.

4.2 Reliability Analysis

According to this study the overall variable Cronbach's Alpha Coefficient for tangibility is 0.882, reliability is 0.878, responsiveness is 0.824, personalization is 0.843, information is 0.897, easiness 0.853 and effectiveness of e-

government service is 0.819. Considered, and approved as a reliable instrument when the alpha coefficient value of the Cronbach is above 0.70.

Also in this study, Cronbach's overall variable Alpha Coefficient values are above 0.70, so it is shown that all items are considered reliable, suggesting that each instrument's internal reliability was satisfactory.

4.3 Bivariate Analysis

The bivariate analysis was used to investigate the relationship between an independent variable, and a dependent variable. Correlation analysis is used to find out the relationship between independent, and dependent variables. Simple regression analysis is used to find out influence level between independent and dependent variables.

4.3.1 Pearson's correlation analysis

Correlation analysis is used to measure the relationship among the tangibility, reliability, responsiveness, personalization, information, easiness, and effectiveness of e-government services.

Pearson Correlation coefficient indicates the direction, strength, and significance of the bivariate relationships among all the variables that were measured on interval scale [54]. This analysis is related with the objective one.

Objective One: To identify the relationship between e-government service quality and effectiveness of e- government services in selected divisional secretariats of Batticaloa district.

Table 7 shows the results of Pearson correlation between effectiveness of e-government service and e-government service quality, tangibility, reliability, responsiveness, personalization, information, and easiness. The correlation coefficient (r) values are 0.862, 0.804, 0.867, 0.901, 0.861, 0.854 and 0.888 respectively at the 0.01 significance level (2-tailed) is 0.000. Moreover, the value is falls under the coefficient range of 0.5 to 1.0. Based on this; there is a strong positive, and significant relationship between effectiveness of e-government service and e-government service quality, tangibility, reliability, responsiveness, personalization, information, and easiness. Therefore, it can be

Table 5. Data collection and response rates

No.	Divisional Secretariats in Batticaloa	Received
1.	Manmunai North	08
2.	Kattankudy	08
3.	Mannmunai Pattu	07
4.	Manmunai South & Eruvilpattu	07
5.	Porathivu Pattu	08
6.	Manmunai Southwest	07
7.	Manmunai West	06
8.	Eravur Town	08
9.	Eravurpattu	07
10.	Koralipattu South	06
11.	Koralaipattu	08
12.	Koralaipattu West	07
13.	Koralaipattu Central	06
14.	Koralaipattu North	07
Total		100

Source: Survey data

Table 6. Reliability analysis for overall variables

Variable	Number of Question Items	Cronbach's Alpha Value
Tangibility	4	0.882
Reliability	3	0.878
Responsiveness	3	0.824
Personalization	3	0.843
Information	3	0.897
Easiness	2	0.853
Effectiveness of E-Government Service	6	0.819

Source: Survey data

Table 7. Coefficient correlations analysis

Variables	Effectiveness of e-government services	
E- government service quality	Pearson Correlation	0.862**
	Sig. (2-tailed)	.000
Tangibility	Pearson Correlation	0.804**
	Sig. (2-tailed)	.000
Reliability	Pearson Correlation	0.867**
	Sig. (2-tailed)	.000
Responsiveness	Pearson Correlation	0.901**
	Sig. (2-tailed)	.000
Personalization	Pearson Correlation	0.861**
	Sig. (2-tailed)	.000
Information	Pearson Correlation	0.854**
	Sig. (2-tailed)	.000
Easiness	Pearson Correlation	0.888**
	Sig. (2-tailed)	.000

** . Correlation is significant at the 0.01 level (2-tailed)

Source: Survey data

concluded that all hypothesis of study are accepted.

H₁: There is a significant relationship between overall e-government service quality and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

H₂: There is a significant relationship between tangibility and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

H₃: There is a significant relationship between reliability and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

H₄: There is a significant relationship between responsiveness and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

H₅: There is a significant relationship between personalization and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

H₆: There is a significant relationship between information and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

H₇: There is a significant relationship between easiness and effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

4.4 Simple Regression Analysis

Regression analysis is used to measure the influence among the e-government service quality and effectiveness of e-government services. This analysis is related with the objective two.

Objective Two: To identify the influence of e-government service quality on effectiveness of e-government services in selected divisional secretariats of Batticaloa district.

Simple regression test was performed to examine the influence of e-government service quality and effectiveness of e-government service. Based on Table 8 illustrates that 'R Square' statistic value is 0.859 which means 85.9% of the variation in e-government service quality is explained by effectiveness of e-government services.

Table 8. Model summary of e-government service quality

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509a	.859	.256	1.02109
a. Predictors: (Constant), e-government service quality				

Source: Survey data

Table 9. ANOVA of e-government service quality

ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	104.409	1	104.409	100.140	.000 ^b
	Residual	299.234	287	1.043		
	Total	403.643	288			

a. Dependent Variable: Effectiveness of E-Government Service
 b. Predictors: (Constant), E-Government Service Quality

Source: Survey data

Table 10. Coefficients of e-government service quality

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Sta. Error	Beta		
1	(Constant)	1.194	.309		20.045	.000
	e-government service quality	.816	.082	.509	-10.007	.000

a. Dependent Variable: Effectiveness of E-Government Service

Source: Survey data

As per the Table 9, the proposed model was adequate as the F statistic (F=100.140) were significant as the 5% level since the p-value is less than 0.05.

Based on Table 10, regression equation can be written as follows:

$$Y = \beta_0 + \beta_1 X_1 + e$$

Were, Y – Effectiveness of E-Government Service

X – E-Government Service Quality

$$\text{Effectiveness of E-Government Services} = 1.194 + .816X_1$$

The results indicates that e-government service quality ($\beta = .816$, $p < 0.05$) significantly influence the effectiveness of e-government service.

Coefficient for e-government service quality is 0.816, which means when e-government service quality increase by one unit, effectiveness of e-government service will increase by 0.816 units. Effectiveness of e-government service is equal to 1.194 when the e-government service quality is zero.

5. CONCLUSIONS AND RECOMMENDATIONS

According to the objectives of this study regarding the e-government service quality and effectiveness of e-government services, specifically four services were analyzed. The proposed scale is based on revising the literature

and modifying the SERVQUAL scale. There are six dimensions and 24 items in this proposed scale for measuring the e-government service quality. The six dimensions in this scale are: tangibility, reliability, responsiveness, personalization, information, and easiness.

The correlations analysis indicates that, there is a strong positive relationship between e-government service quality and effectiveness of e-government services as well as the six dimensions of the e-government service quality and effectiveness of e-government services. Accordingly, the findings of the study consistent with the previous findings of Lee & Lin [10]. In addition to that, regression analysis shows that, the e-government service quality positively contributes to the effectiveness of the e-government services. This results also consistent with the previous findings of Karunasena & Deng [12]. As a result, the two objectives of this study is confirmed by the current data and with the previous literature.

The proposed scale will allow the governments to understand which area in e-government services that should be emphasized. This proposed scale will be able to identify and set up quality characteristics of e-government services that will contribute toward increasing users' satisfactions. A high-quality e-government service is the determinant factor toward the success of divisional secretariat office. By understanding the characteristics of quality e-government services that enhance users' satisfactions, government service managers and governmental

organizations can avoid investing valuable resources in offering e-service quality characteristics that may not work effectively. This paper too will create awareness among e-service managers to pay more attention to e-service quality, as well as assisting them to improve e-service performance and competitiveness [55-57].

To measure the service quality of e-government services appropriate quality dimensions were used by the researcher. When the quality of tangibility was measured it was found that divisional secretariat offices have adequate computer machineries are visually appearing in the divisional secretariat office. Further, the user interface of the e-government service has a well-organized appearance in divisional secretariat office. In addition to this, quick and easy to get the birth certificate, death certificate, marriage certificate, motor vehicles license. The overall e-government services have high quality service to the citizens. In addition to that reliability is referred as how far beneficiaries can receive the e-government services are performed within the promised time. Divisional secretariat office employees will deliver the right services whatever order. It was measured and found to be in high level quality, as well as providing the confidence of delivering the right products, and correct charges.

Other works on e-service quality also found that reliability is the most important dimensions on e-service quality dimensions. The reliability is most important factors that should be emphasized in ensuring good quality e-services. In addition, responsiveness refers to the degree to which the services provided by an e-government are helpful and there is no delay in responding to citizens. It was measured and found in high level quality. Citizens expect the divisional secretariat office to respond to their inquiries without delay. Immediate response will assist e-government users to make decisions faster, answers their questions and resolves their problems in the office do not spend much time or waiting in line to get the service [58-60].

In addition, Information dimension concerns with the information provided by an e-government services, where desirably the information should be accurate, current and easy to understand. Information is a very important factor for users in making their decisions. Users need accurate, current and easy to understand information to examine what they want to do. Divisional

secretariat office information that enables users to identify considers my current wishes and need in and employees understanding of my specific need information [61,62].

In addition, easiness refers to the degree of ease of using the e-government services and the facility to search for information. Easiness dimension is one of the most significant dimensions that have influenced customers' satisfactions and behaviors. An e-government service should be user friendly such that it is easy for users to search for information. To conclude the results, indicate that, strong positive, and significant relationship between tangibility, reliability, responsiveness, personalization, information, easiness, and effectiveness of e-government services [63-65].

This research is exploratory research which focused on identifying the effectiveness of e-government services. The findings have proven the importance of certain service quality and trust factors on effectiveness of e-government services. The work presented here has been limited to four e-government services of divisional secretariat service only. Future work investigating the significant factors on a large scale to include more selected e-government services would further add to the understanding of e-government projects in Batticaloa district as well as other parts of Sri Lanka. Furthermore, similar research covering local e-government projects at local council level would also be valuable in extending the scope of citizens' use in all other districts in Sri Lanka. Furthermore, as the improvement of service quality of e-government services helps to increase usage of e-government services.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Alanezi MA, Basri S. A proposed instrument dimensions for measuring e-government service quality. *Int J of u-and e-Service, Science and Technology*. 2010; 3(4):1-18.
2. Kraemer KL, King JL. Information technology and administrative reform: Will the time after e-government be different?.
3. Kassen M. Blockchain and e-government innovation: automation of public

- information processes. *Inf Syst.* 2022;103: 101862.
DOI: 10.1016/j.is.2021.101862
4. Akman I, Yazici A, Mishra A, Arifoglu A. E-government: A global view and an empirical evaluation of some attributes of citizens. *Gov Inf Q.* 2005;22(2):239-57.
DOI: 10.1016/j.giq.2004.12.001
 5. Centeno C, van Bavel R, Burgelman JC. A Prospective View of e- Government in the European Union. *Electronic Journal of e-Government.* 2005 Oct 1;3(2):pp83-90.
 6. Tan CW, Benbasat I, Cenfetelli RT. Building citizen trust towards e-government services: do high quality websites matter?. In *Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008)* 2008 Jan 7 (pp. 217-217). IEEE.
 7. Santos J. E-service quality: A model of virtual service quality dimensions. *Managing service quality: An International Journal.* 2003 Jun 1;13(3):233-46.
 8. ICTA. Information Communication Technology Agency of Sri Lanka, Colombo, Sri Lanka; 2023.
Available: www.icta.lk
 9. Hanna J, Wernig M, Markoulaki S, Sun CW, Meissner A, Cassady JP et al. Treatment of sickle cell anemia mouse model with iPS cells generated from autologous skin. *Science.* 2007;318(5858): 1920-3.
DOI: 10.1126/science.1152092, PMID 18063756
 10. Lee GG, Lin HF. Customer perceptions of e-service quality in online shopping. *Int J Retail Distrib Manag.* 2005;33(2):161-76.
DOI: 10.1108/09590550510581485
 11. Collier JE, Bienstock CC. Measuring service quality in e-retailing. *J Serv Res.* 2006;8(3):260-75.
DOI: 10.1177/1094670505278867
 12. Karunasena G, Rameezdeen R. Post-disaster housing reconstruction: comparative study of donor vs owner-driven approaches. *Int J Disaster Resil Built Environ.* 2010;1(2):173-91.
DOI: 10.1108/17595901011056631
 13. Crishantha WG, Nanayakkara D, Weerawarana SM. e-government Programme Implementation in Sri Lanka, eAsia Conference (eAsia2009), Colombo, Sri Lanka; 2009.
ISBN: 978-955-9021-90-2
 14. Ministry of Defense and Urban Development. Development plan of batticaloa municipal council area; 2014.
Available:https://www.uda.gov.lk/attachments/devplan_detailed/Development%20Plans%202019-2030/Batticaloa/Batticaloav1.pdf.
 15. Fang Z. E-government in digital era: concept, practice and development. *Int J Comput Internet Manag.* 2002;10(2):1-22.
 16. Saha K, Keung AJ, Irwin EF, Li Y, Little L, Schaffer DV et al. Substrate modulus directs neural stem cell behavior. *Biophys J.* 2008;95(9):4426-38.
DOI: 10.1529/biophysj.108.132217, PMID 18658232
 17. United Nations's e-government survey; 2022.
Available:<https://www.google.com/search?client=safari&rls=en&q=United+Nation%E2%80%99s+e-government+survey%2C+2022&ie=UTF-8&oe=UTF-8>
 18. Alzaki.A.A.A, Ameen S. Evaluation Of E-Government Services In Bahrain. Project Paper for the Degree of Master of Information Technology. June 2009.
 19. Crosby F. Relative deprivation revisited: A response to Miller, Bolce, and Halligan. *Am Pol Sci Rev.* 1979;73(1):103-12.
DOI: 10.2307/1954733
 20. Gefen D. Reflections on the dimensions of trust and trustworthiness among online consumers. *SIGMIS Database.* 2002;33(3):38-53.
DOI: 10.1145/569905.569910
 21. Lewis BR. Service Quality measurement. *Mark Intell Plan.* 1993; 11(4):4-12.
DOI: 10.1108/02634509310044199
 22. Ghobadian A, Speller S, Jones M. Service Quality: concepts and models. *Int J Qual Reliab Manag.* 1994;11(9):43-66.
DOI: 10.1108/02656719410074297
 23. Juran JM. How to think about quality. JM Juran, AB Godfrey, RE Hoogstoel, and EG, Schilling (*Edivisional secretariat*): *Quality-Control Handbook.* New York: McGraw-Hill; 1999.
 24. Grönroos C. A service quality model and its marketing implications. *Eur J Mark.* 1984;18(4):36-44.
DOI: 10.1108/EUM000000004784
 25. Parasuraman A, Zeithaml VA, Berry LL. A conceptual model of service quality and its

- implications for future research. *J Mark.* 1985;49(4):41-50.
DOI: 10.1177/002224298504900403
26. Arulanantham S. Effects of stressful life events on human brain structure: a longitudinal voxel-based morphometry study. *Stress.* 2007;14(2):227-32.
 27. Cox J, Dale BG. Service Quality and e-commerce: An exploratory analysis. *Managing Service Quality [An International Journal]*. 2001;11(2):121-31.
DOI: 10.1108/09604520110387257
 28. Zeithaml VA. Service Quality, profitability and the economic worth of customers: What we know and what we need to learn. *J Acad Mark Sci.* 2000;28(1):67-85.
DOI: 10.1177/0092070300281007.
 29. Parasuraman A, Zeithaml VA, Malhotra A. ES-QUAL: A multiple-item scale for assessing electronic service quality. *J Serv Res.* 2005;7(3):213-33.
DOI: 10.1177/1094670504271156
 30. Levkov N. Comparative study on E-government indicators between western Balkan countries and the EU countries. *Annual of faculty of economics-Skopje*; 2018.
 31. Obi C. Nigeria's Niger Delta: understanding the complex drivers of violent oil-related conflict. *Afr Dev.* 2009;34(2).
DOI: 10.4314/ad.v34i2.57373.
 32. Yoo B, Donthu N. Developing and validating a multidimensional consumer-based brand equity scale. *J Bus Res.* 2001;52(1):1-14.
DOI: 10.1016/S0148-2963(99)00098-3
 33. Bajpai N. *Business research methods. India: Pearson Education*; 2011.
 34. Saunders M, Lewis P, Thornhill A. *Research methods for business students (6. utg.)*. Harlow: Pearson; 2012.
 35. Saunders M, Lewis P, Thornhill A. *Research methods for business students. 8th ed.* Harlow, Essex: Pearson; 2019.
 36. Williams KM. *Doing research to improve teaching and learning: A guide for college and university faculty*. Routledge; 2014.
 37. Bell E, Bryman, & Harley. *Business research methods*; 2018.
 38. Saunders M, Lewis P, Thornhill A. *Research methods for business students*. Pearson education; 2009.
 39. Collis J, Hussey R. *Business research: A practical guide for undergraduate and postgraduate students*. Macmillan International Higher Education; 2013.
 40. Ponto J. Understanding and evaluating survey research. *J Adv Pract Oncol.* 2015;6(2):168-71. PMID: 26649250.
 41. Given L. *The SAGE encyclopedia of qualitative research methods*. New York: SAGE; 2008.
 42. Saunders SE, Bartz JC, Bartelt-Hunt SL. Soil-mediated prion transmission: is local soil-type a key determinant of prion disease incidence? *Chemosphere.* 2012;87(7):661-7.
DOI: 10.1016/j.chemosphere.2011.12.076, PMID 22265680
 43. Saunders M, Lewis, PHILIP, Thornhill, ADRIAN. *Research methods. Business students. 4th ed.* England: Pearson Education Limited; 2007.
 44. Salkind NJ, editor. *Encyclopedia of research design*. SAGE. 2010;1.
 45. Registrar general department. Sri Lanka, midyear population estimates by district & sex; 2014-2022.
Available:http://www.statistics.gov.lk/Resource/en/Population/Vital_Statistics/Mid-year_population_by_district.pdf.
 46. Balnaves M, Caputi P. *Introduction to quantitative research methods: An investigative approach*. SAGE; 2001.
 47. Vikineswary S, Abdullah N, Renuvathani M, Sekaran M, Pandey A, Jones EB. Productivity of laccase in solid substrate fermentation of selected agro residues by *Pycnoporus sanguineus*. *Bioresour Technol.* 2006;97(1):171-7.
DOI: 10.1016/j.biortech.2005.02.015, PMID 15967661
 48. Middleton WEK, Spilhaus AF. *Meteorological instruments. In: Meteorological instruments*. University of Toronto Press; 2019.
 49. Zohrabi M. Mixed method research: instruments, validity, reliability and reporting findings. *Theor Pract Lang Stud.* 2013;3(2).
DOI: 10.4304/tpls.3.2.254-262
 50. Koonce GL, Kelly MD. Analysis of the reliability and validity of a mentor's assessment for principal internships. *Educ Leadersh Rev.* 2014;15(2):33-48.
 51. Marshall TW, Rossman T. *Using qualitative methods in organizational research*. SAGE; 1999.
 52. Bless C, Higson-Smith C, Kagee A. *Fundamentals of social research methods*:

- an African perspective. Juta and Company Ltd; 2000.
53. Sperandei S. Understanding logistic regression analysis. *Biochem Med.* 2014; 24(1):12-8.
DOI: 10.11613/BM.2014.003, PMID 24627710
54. Samouel AHP, Page M. Jnr HJ. [UK edition]. *Money*; 2007. Research methods for business.
55. Johnson CD, Abu-Hilal M. Persistent organ failure during the first week as a marker of fatal outcome in acute pancreatitis. *Gut.* 2004;53(9):1340-4.
DOI: 10.1136/gut.2004.039883, PMID 15306596
56. Arnauld T, Barrett AGM, Hopkins BT. ROMPgel-supported biphenyl and naphthalene: Reagents for lithiation reactions with minimal purification. *Tetrahedron Lett.* 2002;43(6):1081-3.
DOI: 10.1016/S0040-4039(01)02317-6
57. Burgelman RA, Välikangas L. Managing internal corporate venturing cycles. *MIT Sloan Manag Rev.* 2005;46(4): 26.
58. Ridings CM, Gefen D, Arinze B. Some antecedents and effects of trust in virtual communities. *J Strateg Inf Syst.* 2002; 11(3-4):271-95.
DOI: 10.1016/S0963-8687(02)00021-5
59. Karunasena K, Deng H. Exploring the public value of e-government: an empirical study from Sri Lanka; 2010.
60. Karunasena K, Deng H. Critical factors for evaluating the public value of e-government in Sri Lanka. *Gov Inf Q.* 2012; 29(1):76-84.
DOI: 10.1016/j.giq.2011.04.005
61. Elsas R, Krahn JP. Universal banks and relationships with firms. *SSRNJournal*; 2003. 2003/20 [CFS working paper].
DOI: 10.2139/ssrn.447521
62. Silva CA, Oliveira AC, Vilas-Boas L, Fink MC, Pannuti CS, Vidal JE. Neurologic cytomegalovirus complications in patients with AIDS: Retrospective review of 13 cases and review of the literature. *Rev Inst Med Trop Sao Paulo.* 2010;52(6):305-10.
DOI: 10.1590/s0036-46652010000600004, PMID 21225213
63. Rajasekar S, Philominathan P, Chinnathambi V. Research methodology. E-print. arXiv preprint physics/0601009. 2013;1-53.
64. Rowe F. What literature review is not: Diversity, boundaries and recommendations. *Eur J Inf Syst.* 2014; 23(3):241-55.
DOI: 10.1057/ejis.2014.7
65. Sahadev S, Purani K. Modelling the consequences of e-service quality. *Mark Intell Plan.* 2008;26(6):605-20.
DOI:10.1108/02634500810902857

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