Defining Dimensions for Assessing Sustainability in e-Governance Projects

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Abstract: Governments across the world have invested in e-governance projects as they help deliver citizen services efficiently and economically. Given that these projects are public-funded, they are regularly evaluated to measure the benefits accrued. Existing research on the subject has used impact assessment frameworks with defined dimensions and sub-dimensions for e-governance project evaluation. Current research literature in the area of assessment frameworks projects shows that the important dimension of sustainability is either ignored or not defined properly. This study addresses this gap by proposing a set of dimensions and sub-dimensions that can be used in an e-governance project to measure its impact on sustainability. The applicability of our proposed framework was validated using a case study approach. The framework was applied on the Common Service Center project in India. The findings reveal that the telecenter project is lacking in different aspects of sustainability as sustainability aspects were not considered at project conceptualization stage. Technological sustainability is the only aspect where the CSC project has performed well. This study would help both policymakers and practitioners in measuring the impact of e-governance projects on sustainability.

Keywords: Sustainability Metrics, Impact Assessment Studies e-Governance

1. Introduction

We are living in a technology-driven world. The information society is built on a diverse and constantly evolving combination of software and hardware commonly known as Information Communication Technology (ICT). ICT facilitates information creation, storage, processing, analysis and transmission (Nord, Riggio and Paliszkiewicz, 2017) and has impacted the society by transforming major industries like health, transportation, communication, consumer goods, security etc.

The transformation of public administration through e-governance projects is one such successful application of ICT. Electronic governance systems help to deliver government services efficiently and economically (Dwivedi et al., 2016; Naik, Joshi and Basavaraj, 2012) and also minimize bureaucracy and increase transparency (Krishnan, Teo and Lim, 2013), thus increasing citizens trust. E-governance also helps governments fulfil their agenda of inclusive services, i.e., services beyond all divides of economic or social status. As society becomes increasingly technology-driven, ICT is continuously being studied through the lens of sustainability to understand its positive and negative impacts. A sustainable information society (SIS)(Fuchs, 2006, 1970; Ziemba, 2017) is one such concept in which ICT is seen as a key enabler of sustainability. However, all is not always positive with ICT deployment and it has its share of negative impacts (Fuchs, 2006; Grunwald, 2017). Therefore, it is imperative that major ICT applications be examined for both positive and negative impacts on sustainability. While e-governance projects undoubtedly provide multiple benefits to citizens through better delivery of government services, there is a need to explore how they impact different parameters of sustainability.

To understand the benefits accrued through e-governance projects and their impact on the society, these projects are regularly evaluated using impact assessment frameworks with defined dimensions and sub-dimensions. It is observed that existing impact assessment frameworks in the field of e-governance are primarily focussed on economic and efficiency aspects while the sustainability aspects are either ignored or not adequately addressed.

A few studies have evaluated the impact of ICT adoption on sustainability at enterprises (Ziemba, 2017), household units (Ziemba, 2018a) and government units (Ziemba, 2018b). However, all these studies are based in Poland. Therefore, there is a need for further research on the new constructs of ICT adoption and sustainability (Ziemba, 2018b). Besides, there is lack of research on sustainability measurement in the context of e-governance projects. In a research article on the sustainability concept in e-governance (Larsson and

Grönlund, 2014), the authors observe that the majority of e-governance research on the concept of sustainability is to a large extent, arbitrary and shallow. Another observation is that most of the extant research focusses only on the social dimension of sustainability. A few recent studies have explored social, economic, and environmental dimensions of sustainability but from an overall country-level perspective. Financial sustainability of tele-centres has also received research attention (Naik, Joshi and Basavaraj, 2012). Krishnan, Teo and Lim (2013) have analysed country-level sustainability. However, there is hardly any study that has taken a holistic view of the concept by looking at all dimensions of sustainability in e-governance projects. This study addresses this gap by proposing a set of dimensions for sustainability that can be used to evaluate an e-governance project.

In this paper, we study sustainability from the perspective of e-governance projects. This paper attempts to answer the following two questions:

1. What are the dimensions of sustainability that need to be measured in an e-governance project?
2. What are the attributes of the dimensions identified and how will they be measured?

We study the literature on sustainability measures, e-governance assessment, green IT and IT for green to identify key dimensions and their attributes. Attributes are sub-dimensions that combine to form a higher level dimension. Furthermore, we give guidance on how the attributes should be measured so they can be practically used in the field for assessing the impact of e-governance projects.

2. Sustainable Development in e-Governance Projects

Sustainable development is defined as a "process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs" (World Commission on Environment and Development (WCED), 1987). Sustainable development is of critical importance to most countries across the world, as evident in the approval of the Sustainable Development Goals (SDGs) as a part of the United Nations General Assembly (UNGA) 2015 resolution (UNGA, 2015). Particularly, the role of technology is emphasized in sustainable development as its impact on society, economy and environment has been realised. One of the SDG goals, i.e., SDG16 covers the importance of technology-enabled public governance. Janowski (2016) provides a persuasive argument that to achieve sustainable goals, it is necessary that governments develop strong digital government capabilities.

Sustainability is a well-researched subject in the sustainable information society (SIS) community. In the SIS literature (Fuchs, 2006; Ziemba, 2017), sustainability is conceptualized based on four components: ecological , economic, socio-cultural and political. Studies in SIS literature primarily examine the impact of ICT adoption on sustainability. These studies have taken three key stakeholders in the information society as the unit of analysis: enterprises (Ziemba, 2017), household units (Ziemba, 2018a) and government units (Ziemba, 2018b). The extant literature has however, not examined e-governance projects as a unit of analysis only from the sustainability perspective.

Research on the importance of sustainability in e-governance is a new phenomenon (Larsson and Grönlund, 2016). Two prominent literature reviews on the aspects of electronic government in sustainable development can be found in Estevez and Janowski (2013) and Larsson and Grönlund (2014). Both studies find the use of the sustainability concept in e-governance quite limited and arbitrary. Estevez and Janowski (2013) coin the term eGov for sustainable development (EGOV4SD). In the conceptual framework proposed for EGOV4SD, their perspective of e-governance is defined by the following four dimensions: government, technology, interactions, customers and society. The EGOV4SD framework perspective is based on the prism of the sustainability model (Spangenberg, 2002).

Larsson and Grönlund (2014) present a dynamic socio-technical perspective of sustainability. Their model extends the triple bottom-line model of sustainability by complementing it with the dimension of technology. The triple bottom-line (TBL) method (Elkington, 1994) is defined as an accounting concept that considers three aspects of sustainability: Social, Economic and Environmental sustainability. Their extension of the TBL model is based on the argument that technology is a key enabler in capturing and sharing information about

sustainability among countries and that technology is embedded and closely interlinked with organisations and people.

Table 1: Sustainability dimensions and themes in eGov research, adapted from Larsson and Grönlund (2014)

Social	Economic	Environmental	Technical
Needs and participation	Cooperation	Decision making and information	Standards and interoperability
Politics and governance	Security & control	Infrastructure & energy	Information preservation over generations
Evaluation, analysis and measurement	Feasible plan and model	Environmental strategy	Holistic view
Values, goals and policies	Stakeholders & citizens	Environment as an important value for eGov	Technical infrastructure
Future uncertainty	Alignment of social & technical		
Regulations, trust and security	Decision making and information		
Holistic view of organisation and technology			

As technology is embedded among processes and people, it is difficult to separate the impact of technology from the user deploying or using the technology. There is a need to define a dimension that includes both, therefore Larsson and Grönlund (2014) include the dimension of technology in their model of sustainability. The framework is presented in Table 1. In this work, we use this analytic framework to define the indicators for assessment of sustainability in e-governance projects. This framework has also been used by Larsson and Grönlund (2016) as an analytic lens for interpreting and soliciting views of practitioners regarding sustainability in e-governance initiative.

3. Methodology

In this research, we use semi-exploratory approach to define dimensions and sub-dimensions for sustainability measurement in e-governance projects. New insights and dimensions are then added based on the case study (Prosser, 1999). The methodology used is similar to the approaches used in earlier research studies (Juwana, Perera and Muttil, 2010a; b; Wątróbski et al., 2018), i.e. a deductive approach is used to guide the selection of variables and constructs measured. Juwana, Perera and Muttil,(2010a; b) develop a conceptual framework for water sustainability Index while Wątróbski et al. (2018) use an MCDA-based quantitative approach. In our approach, we do not generate a composite score; therefore, we use a semi-exploratory approach using the Delphi technique (Landeta, 2006).

The methodology used in this paper comprises first identifying various sustainability dimensions. The relevant extant literature on sustainable development for e-governance, sustainability in e-governance, Green Information Technology (Green IT) and Green Information System (Green IS) literature relevant to e-governance and sustainability reporting was first reviewed. As the focus of our research is on defining and measuring sustainability in e-governance projects, we then reviewed and analysed relevant papers on e-governance and linked them to the literature on sustainability identified in the first step. Next, the Delphi method was used to triangulate the final identified dimensions with the results of in-depth interviews, which we conducted with experts in the area of e-governance. Details of the application of the Delphi method is provided in section 6. As we are exploring a contemporary phenomenon within its real context, boundaries between phenomenon and context are not clearly evident, therefore, we use the case-study method (Yin, 2013). Using Common Service Centre (CSC) as a case study, our proposed framework was validated. CSC is selected for the study because of its complexity, diversity and spread. Details of the CSC project are provided in section 7.

4. Existing Assessment Frameworks in Electronic Governance

Impact assessment is defined as "the systematic analysis of the lasting or significant changes—positive or negative, intended or not—in people's lives brought about by a given action or series of actions"(Roche, 1999). The purpose of impact assessment studies is to justify investments made in e-government projects and establish a performance benchmark for future projects (Bhatnagar and Singh, 2010). Impact assessment

studies are challenging to design as a judicious mix of qualitative and quantitative metrics are required to measure the multiple objectives of an e-governance project (Grimsley and Meehan, 2007; Bhatnagar and Singh, 2010). Because of the importance of both economic and non-economic metrics in assessment studies, traditional approaches that only focussed on measuring economic measures of outcomes are being extended or revised, for example, the WiBe (Economic Efficiency Assessment) methodology (Rothig, 2004).

In this literature survey, we first present the overview of the assessment frameworks that are widely accepted as the benchmark for impact assessment studies or those that form the foundation on which the current approaches are derived. The approaches are: WiBe, MAREVA (ADAE, 2005), eGEP (European Commission, 2006), EAF (Rama Rao, Venkata Rao and Satyanarayana, 2004) and the approach by Bhatnagar & Singh (Bhatnagar and Singh, 2010).

The WiBe methodology contains four categories of dimensions. Economic efficiency is the only quantifiable dimension that measures all IT parameters whose cost and benefit can be quantified in monetary terms. MAREVA assessment is based on five categories of dimensions: State financial value, Direct customer value, Public services social & operational value, and Project necessity and Risk. State financial value and Direct customer value are the two quantitative dimensions that measure improvement through monetary terms.

The eGEP Measurement Framework is a comprehensive multidimensional framework that is based on the three value drivers of efficiency (financial and organisational value), effectiveness (user value) and democracy (political value). The eGEP framework strives to arrive at an optimal balance between quantitative and qualitative metrics for the three value drivers.

The EAF framework is focussed on five key dimensions: service orientation, technology, sustainability, cost-effectiveness and replicability. Each dimension further consists of sub-indicators. Each dimension is assigned weight based on its importance. Service orientation is given the highest weightage. Based on the weightage, a final assessment score is calculated for the project. The EAF framework is very detailed with well-defined metrics for each of the dimensions. It is the official assessment framework of the government of India and is used for most assessment studies in the country. The Bhatnagar and Singh (2010) framework is derived from all the four frameworks presented earlier and can be viewed as a shortened version of the EAF Framework.

From the perspective of sustainability assessment, only EAF has considered sustainability as a key dimension. The sustainability attribute is further defined into three sub-categories, i.e., organisational sustainability, commercial sustainability, and legal sustainability. The concept of sustainability as defined in the EAF framework is very vaguely defined and does not cover most of the dimensions of sustainability as defined by researchers in the domain of sustainable development in e-governance. The framework also completely ignores the social and environmental dimensions. The framework has been conceptualized with the assumptions that assessment studies will be done only after the project has been implemented for a few years. Metrics like employee buy-in, continuity of top leaders cannot be measured at the initial stages of the project. In this study, we attempt to address these gaps.

5. Development of a Framework for Assessing Sustainability in e-Governance Projects

E-governance projects involve investment of public funds. Impact assessment frameworks justify these investments by measuring improvements in quantifiable metrics of efficiency and return on investment. Metrics like overall improvement in quality of life, empowerment of citizens, and inclusivity are largely ignored as their impact can only be measured over the long term and even if the impact is visible, it is difficult to isolate their contribution. Similarly, consequences of sustainability are only visible over long term, so defining metrics that can predict whether the project will be sustainable in future is challenging. The negative impact of ignoring sustainability-related actions in a project is also visible in future. Therefore, sustainability is largely ignored as a dimension in most of the impact assessment frameworks.

Among the assessment frameworks discussed in section 4, Rama Rao, Venkata Rao and Satyanarayana, (2004) proposed the E-government Assessment Frameworks [EAF]. EAF is the only framework that has sustainability as a dimension and is the official framework for conducting e-governance assessments in India. It has five primary dimensions. Sustainability is one of the dimensions but its exact definition is not clear. It only mentions that the objective of the dimension is "*Is the Project sustainable over long periods of time, with or*

without the motive force that initiated the Project" (Rama Rao, Venkata Rao and Satyanarayana, 2004). The sustainability dimension is divided into three sub-dimensions or attributes: organisational sustainability, commercial sustainability, and legal sustainability. The sustainability dimension, as defined in the EAF framework, does not capture the essence of the concept of sustainability as defined by the World Commission on Environment and Development.

This framework and its variation has been used for impact assessment study of multiple projects (Bhatnagar and Singh, 2010), but in none of the projects sustainability is measured. The EAF does not make it mandatory for all dimensions to be measured for a project, and as it is a framework, the project evaluation team can decide on the dimensions they think are critical. As a result, all assessment studies primarily study economic aspects, efficiency aspects and overall perception of the project among citizens. Moreover, most studies are done from the citizen perspective and not from the overall society perspective. The objective of our research is to address this gap by defining appropriate dimensions and its sub-dimensions to measure sustainability in e-governance projects.

We define the dimensions for measuring sustainability in e-governance projects using the analytic framework presented in Table 1. In addition to Larsson and Grönlund (2014), we also refer to the Global Reporting Initiative (GRI) (GRI, 2013) to define the metrics. GRI is the global standard (KPMG, 2103) for reporting on sustainability and the framework is widely used for measuring sustainability aspects. Furthermore, the framework has also been used in research by academic scholars for various studies (Fernandez-Feijoo, Romero and Ruiz, 2014; Navarro-Galera, Alcaraz-Quiles and Ortiz-Rodríguez, 2016). Economic, environmental and social are the three aspects of sustainability for which extensive list of performance indicators are provided in the GRI guidelines. We studied the GRI guidelines to find indicators that are applicable for e-governance projects.

As mentioned earlier, based on the analytic framework (Larsson and Grönlund, 2014), in this study, we the use the following dimensions for measuring sustainability in e-governance projects: Social, Economic, Environmental and Technology. Each of these dimensions and the metrics used to measure the dimensions are explained below.

5.1 Social

Lack of adoption of services provided by e-governance projects is one of the core issue faced by the projects. In many cases, citizens lack the knowledge to use the services because of reasons like lack of digital literacy, illiteracy, economic reasons, age etc. Another key reason for low adoption is the perceived lack of usefulness of the services to the citizens. Creating awareness among the key stakeholders of the project is necessary to make the project sustainable. Awareness or promotion of the project services is not enough, training should also be provided to the users to enable them to use the services. Awareness and promotion will also help the stakeholders understand the need to adopt the services and also justify the costs involved in building and sustaining the project. In table 2, So1 and So2 are the assessment questions that capture the awareness aspect of social sustainability.

Online dissemination of information on the projects to the citizens plays an important role in bringing transparency and accountability. Information dissemination helps stakeholders know about project governance, project activities, future planned activities and costs. E-governance projects should have a mechanism in place so that all information regarding the project and its activities, as mandated by government reporting guidelines, are accessible to all stakeholders, primarily citizens. Openness in information sharing will enhance citizen participation in project activities. In addition, information regarding project evaluation or impact assessment studies of the project should also be publicly available. Readiness assessment, Impact assessment and monitoring reports are important from the sustainability aspect, as they provide information that justify the costs involved in the project and also provide basis for future action. In assessment studies, what is to be measured, how it is to be measured and who is going to measure it are aspects that should be reported. In table 2, So5 and So6 are the assessment questions that capture the information-sharing aspect of social sustainability.

Table 2: Key Indicators for Assessment of Social Sustainability in E-governance Projects

Social Dimensions	
So1	Are initiatives been taken to increase awareness of the services available through the project among stakeholders?
So2	Are awareness campaigns and camps being organized to make citizens understand how to avail the services and the usefulness of the services?
So3	Has the project created jobs for people in the local region?
So4	Has the project initiated/ funded community projects?
So5	Is regular assessment of the project done based on established evaluation frameworks and published regularly?
So6	Does the project provide on its official website details on the project, people involved, grievance redressal process and other information mandated by the government?
So7	Is importance of sustainability evident in the project purpose and strategic statements? Are there well-defined Sustainability goals?
So8	Does the project have mechanism for involving stakeholders in different aspects of the project?

Social sustainability cannot be achieved unless the key stakeholders are actively involved in the project. Among the key stakeholders, the local community is the most important. E-governance projects should involve local community by providing jobs to the members, initiating and funding community projects etc. A mechanism should be created to seek stakeholder inputs in each stage of the project, especially in the development stage. In Table 2, So3, So4 and So8 are the assessment questions that capture the stakeholder involvement aspect of social sustainability.

The sustainability aspects should be explicitly stated in the vision, goals, and policy statements of the project. Project planning and execution is directed by the strategic direction provided by the top-level vision and policy statements. Explicit statement of sustainability aspects in the vision and project objective statement will provide legitimacy to sustainability-related activities. Policy statements should also examine the sustainability aspects in future as project continuity issues can arise with change in leadership and political climate. In Table 2, So7 assessment questions capture the policy aspects of social sustainability.

Table 3: Key Indicators for Assessment of Economic Sustainability in E-governance Projects

Economic Dimensions	
Ec1	Is revenue forecast done and communicated to all stakeholders?
Ec2	Revenue forecast is based on assumptions. Is the impact of change in these assumptions on project sustainability regularly evaluated?
Ec3	Is data on expenditure and subsides published and communicated to all stakeholders?
Ec4	For PPP projects, are the revenue-sharing and minimum revenue support agreements adhered to?
Ec5	Is training conducted regularly?
Ec6	Is there availability of future training plans for staff involved in the project?

5.2 Economic

In economic dimensions of sustainability, two core themes are identified. Revenue and expenditure aspects cover the financial sustainability of the project. E-governance projects are completely funded by the government or developed through the public-private partnerships (PPP) models. As private players invest in the projects to make financial gains, in PPP e-governance projects, a viable business model is a necessity for the project to survive in future. Therefore, it is very critical to evaluate economic sustainability of an e-governance project at the time it is initiated. The process of revenue forecasting for every project should be communicated to all stakeholders. However, this is a challenging task since multiple variables need to be considered. Communicating and consulting different stakeholders in the forecasting process can help improve the process. Another aspect that needs to be considered from the financial sustainability point of view is the evaluation of the impact of changes in technology or policy on the future financial sustainability of the project. For government-funded projects, data on expenditure and subsidies should also be communicated to the stakeholders. Private players involved in the PPP arrangement with the government have an agreement on revenue sharing and subsidies, and they need to adhere to the terms specified in the arrangement. In table 3,

Ec1, Ec2, Ec3 and Ec4, are the assessment questions that capture the financial aspect of economic sustainability.

Training is the second theme of economic sustainability. Training to citizens on how to use the services provided by the projects was discussed in social dimensions in an earlier section. From the economic sustainability aspect, training is related to the facilities provided to the employee or resources that work in the e-governance projects so that they have the ability and skills to deliver the services to citizens. Proper planning and execution of training sessions with adequate infrastructure and support facilities can lead to efficient delivery of services. In Table 3, Ec5 and Ec6 are the assessment questions that capture the training aspect of economic sustainability.

5.3 Environmental

To define the metrics on environmental aspects in e-governance projects, we refer to the literature on Green IT and Green IS (Loeser, 2013). Green IT refers to the measures and initiatives that address the adverse environmental impact associated with use of IT systems, i.e., both the hardware and software aspects. Initiatives like proper disposal of IT hardware, improving energy efficiency of hardware systems and data centers etc., are categorized as Green IT (Boudreau, Chen and Huber, 2008; Loeser, 2013). E-governance projects primarily involve complex IT systems. To efficiently run these systems, huge investments are made on IT infrastructure projects. Because of the prevalence of large IT infrastructure projects in the e-governance sector, the scope of adopting Green IT initiatives in e-governance is high. Metrics En1, En2, En4, En8, En9, En10, En12 presented in Table 4 are proposed to capture Green IT aspects of environment sustainability in an e-governance project.

While Green IT has direct positive impact on environment, Green IS has an indirect impact. Green IS initiatives refer to the development, use and management of information systems that help support environment sustainable activities. Use of video conferencing software, systems that track and monitor carbon emissions, optimised supply chain systems are examples of Green IS systems (Boudreau, Chen and Huber, 2008). Assessment questions En6, En13, En14 and En16 capture the Green IS aspects of environmental sustainability. Green IT and Green IS, along with appropriate strategies at policy-making, can help achieve the objective of environmental sustainability in e-governance projects. Affirmative pro-environmental policy-level actions are indicated by the presence of a Green IT /IS plan, centralized IT sourcing decisions, presence of e-waste policies, and regular communication on the importance of Green IT/IS among employees. Automation of a process can also result in the reduction of negative environmental impact. Assessment questions En5, En7, En11, En12 and En13 capture the policy-level aspects of environmental sustainability.

Table 4: Key Indicators for Assessment of Environmental Sustainability in E-governance Projects

Environmental Dimensions	
En1	Are eco-labels considered when purchasing hardware?
En2	Are eco-friendly paper and cartridges used?
En3	Is the sourcing of IT equipment centralized?
En4	Are energy-efficient cloud services used?
En5	Is there a Green IT/IS action plan?
En6	Is detailed energy monitoring of all devices done?
En7	Are the users of the system informed and educated regarding sustainability practices?
En8	Do the users take double-sided black & white printing as default?
En9	Do users use laptops or desktop computers?
En10	Are LED displays and LED lights deployed?
En11	Are there any e-waste policies and rules and are the users educated about them?
En12	Is power management software installed on PCs\laptop?
En13	Does the project track and measure resource consumption, emissions and report the firm's environmental footprint?
En14	Is firm-wide environmental management systems implemented?
En15	What % of the process is completely automated?
En16	Do the users use video conferencing or tele-conferencing systems instead of travelling?

5.4 Technology

Technical sustainability can be categorised into two categories: Technology infrastructure and standards for data sharing and preservation. Technology sustainability is not possible without putting in place robust infrastructure, i.e., servers, electricity, network availability, data centres etc., for the e-governance projects. But investment in technology infrastructure alone cannot help achieve the goal of technical sustainability. Independent e-governance projects should be able to share information among themselves so that citizens can avail services through a single interface without accessing multiple systems for each of their requirements. The goal of true seamless delivery of citizen services can only be achieved by making the systems interoperable (Guijarro, 2007; (Jochen) Scholl and Klischewski, 2007). This ability of independent systems to exchange information and then be able to the process and use the information correctly is known as interoperability. Interoperability is the core technology theme that is essential for sustainability of e-government systems. It is achieved by following standardised technical, data and process standards across projects. In addition to interoperability, privacy of the data and preservation of citizen data are critical for technology sustainability. Trust on the e-government systems among citizens can only be achieved by ensuring steps are taken to safeguard privacy of the data. Assessment questions for capturing technical dimensions of sustainability in e-government systems are presented in Table 5.

Table 5: Key Indicators for Assessment of Technology Sustainability in E-governance Projects

	Technology Dimensions
Te1	Does proper infrastructure exist (hardware, software, network, power etc.)?
Te2	Are the applications used developed based on government standards and are they interoperable?
Te3	Is information preserved and stored in a secure manner?
Te4	Is privacy of citizen data maintained?

6. Finalizing Dimensions and Sub-Dimensions using the Delphi Method

Based on review of extant literature, a semi-structured questionnaire was designed to administer to experts as part of the Delphi process. A four-round Delphi study was conducted with five experts who were all e-governance project champions in their own right, including: An environment expert, two academic professors, a technology expert and a social scientist in the areas of sustainability development, Green IT-IS and Impact assessment. The questionnaire contained all the parameters extracted from past literature and these formed the conceptual framework. The group coordinator explained to the experts the scope of the work and informed them that they could change, drop, or add any new dimensions or sub-dimensions of the conceptual framework. The members of the expert group shared their knowledge on each question with each other and refined the answers several times. They also modified the parameters that form part of the proposed conceptual framework.

The response of each expert was kept confidential and was collected in a controlled manner. The group eliminated any irrelevant opinion. After collecting the responses, they were processed to arrive at a consensus. At this time, validity and reliability of the responses was maintained. Accordingly, a final set of dimensions and sub-dimensions were finalized. The conceptual model with finalized dimensions and sub-dimensions was then validated using Common Service Center as the case study.

7. Applying the Framework: Common Service Center Project

7.1 Common Service Center Project

Common Service Centres (CSCs) are ICT-enabled tele-centers at the village level in India for delivery of government, financial, social and private sector services, such as land records, banking, identity cards, online applications etc. (Dwivedi et al., 2016). CSCs have been envisaged in the National e-Governance policy (2006) of Government of India as one of the pillars of e-Government infrastructure in the country for delivery of government services to citizens in rural areas.

At the time of inception in 2007, the CSC project envisaged setting up 100,000 rural kiosks and 10,000 semi-urban kiosks catering to approximately 600,000 villages across the country. As the first phase was nearing completion, the targets were revised upwards to 250,000 CSCs in the month of June 2010 to cover all village panchayats. As on 31st March 2016, the government reported that 1,99,325 CSCs were in operation (CSC Status Map, 2017).

Table 6: Services at Common Service Centres

Types	Broad classification of services	Detail of services
A	Statutory and non-statutory services	• Certificates • Tax • Public distribution system
B	Utility bill payments	• Electricity bill • Water bill
C	Business to citizen transactions	• Banking transactions • Mobile recharge • DTH recharge • Addition deletion of telephone numbers • Do not call registry of mobile phones
D	Inquiry services	• Downloading the tender and other forms • PNR railway inquiry • Examination results
E	Social benefits transactions	• Pensions • MGNREGA • Direct benefits transfer (DBT) • Various scholarships payments
F	Mobile transactions	• End-to-end mobile transactions

Source: (CSC 2.0 Scheme, 2017)

The CSC scheme is designed by the government in the Public-Private Partnership (PPP) mode to create a conducive environment for the private sector to play an active role in the implementation of e-Government in India. The PPP model of the CSC scheme follows the 'Build-Own-Operate' model with the private sector responsible for setting up and running the centres. Until 2015, the CSC project structure was a 3-tier structure consisting of the CSC operator (called Village-Level Entrepreneur or VLE); the Service Centre Agency (SCA) responsible for the operation of 500-1000 CSCs; and a State Designated Agency (SDA) identified by the State Government, which was responsible for managing the implementation in the entire state (Common Service Centers : E-Governance Project of India, 2018). SCA and VLE were the private players who invested in setting up and operating the CSC. In 2015, the SCA was removed from the structure and replaced by a government created society (CSC_2_0_Guidelines.pdf, 2017) to enable the government to have a direct control over the CSCs.

CSCs are responsible for providing services which can broadly be divided among six categories as summarized in Table 6. The above discussion not only highlights the importance that the Indian government has placed on CSCs for delivery of e-Government services but also sets the context for study of their sustainability.

7.2 Method

A semi-structured interview was the main method used for collecting data about the sustainability practices followed at the CSCs. A case study based on semi-structured interviews was chosen as it has been judged as the most appropriate method for developing insights into e-government practices. Thirty two CSCs were selected and VLEs managing them were interviewed. The CSCs selected were from different states of India. Table 7 presents the distribution data. Interviews were conducted in-person or on telephone in the period of March – April 2017. Among the CSCs contacted, 23 were from rural and 7 from urban areas. All the VLEs interviewed were males. Figure 1 presents thee average income generated per month by the CSCs we surveyed. Each interview lasted from 30-60 minutes and was recorded and transcribed. The semi-structured interview questions were based on the dimensions defined in this paper, as explained in section 5. In addition to the interview data, policy documents, minutes of meetings, and government notices regarding the project were also analysed. Next we present the result of our study.

Table 7: State-wise distribution of CSC interviewed

STATE	NUMBER OF CSCs INTERVIEWED
Bihar	4
Chhattisgarh	3
Delhi	4
Gujarat	2
Haryana	2
Jharkhand	3
Maharashtra	3
Punjab	2
Rajasthan	3
Uttar Pradesh	3
Uttarakhand	1
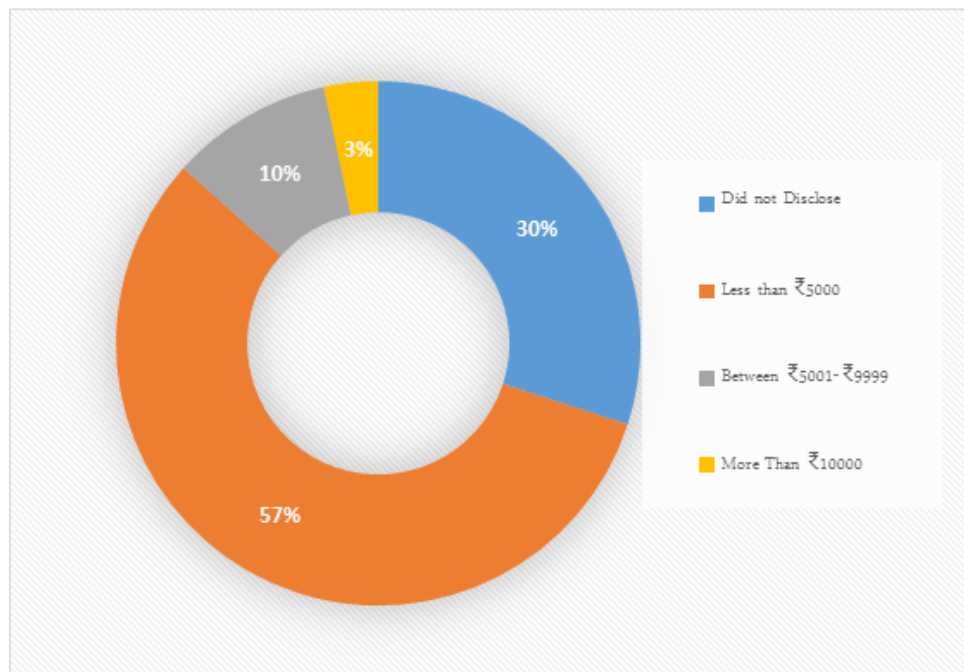
Figure 1: Income distribution of CSCs interviewed

7.3 Analysis : CSC project from the sustainability perspective

7.3.1   Social

The vision and project policy statement provides the basis on which a project is designed and implemented. Sustainability aspects should be explicitly stated in the project goals. In our framework, based on the social dimensions defined, the So7 assessment question captures this aspect of the project. From our review of the project documents, goals and objectives, it is evident that sustainability aspects were never considered during conceptualization of the Common Service Center project. With respect to the dimension of awareness (So1 , So2) and information sharing (So5 , So6), it was found that no initiatives were taken toward creating awareness of the services among the citizens, while from the perspective of information sharing dimension, it is seen that most of the CSC data and project documents are available to stakeholders. It was ascertained from a majority of the participants that although they had participated in official impact assessment studies, these studies had been conducted sporadically in an unstructured manner. In regard to the remaining social dimensions of stakeholders involvement (So8) and local community engagement (So3, So4) it was evident that

not many initiatives were taken towards involving the local community and other stakeholders in the project. While there was no directive to recruit staff for running the CSCs, it was observed that a few of the CSCs had hired one or two staff. There have been no initiatives or funds towards building local community projects. Overall, from the social sustainability aspect of the CSC project, it can be concluded that there is no conscious effort towards achieving social sustainability which had been taken and therefore, the first step towards achieving it should be to make it a priority at the policy level. Recruitment of people from local community to operate the tele-center, information sharing of project documents, and assessment of the CSCs are the only positive actions observed from the social sustainability perspective.

7.3.2   Economic

Two core aspects were defined as dimensions: Revenue & Expenditure (SoEc1, Ec2, Ec3, and Ec4) and Training (Ec5). The CSC project is a PPP project based on the Build Own Operate (BOO) model. In this model, there are contractual agreements between the private players and the government. In the CSC project, the CSC operator, i.e., VLE is the private player and has invested in the project expecting a good flow of income from the CSC operations. But from the interviews conducted it was found that hardly any revenue forecast had been done. Moreover, 23 of the 30 VLEs interviewed had no idea of the contractual terms for revenue sharing.

At the planning stage, revenue forecasting was not done properly and revenue expectations were not communicated to the main stakeholder, i.e., VLE. This may explain the closure of many CSCs because of the low revenue generated by them, thus making them unviable for the VLE. In case of training of the VLE, a majority of the personnel had attended at least one training session but overall, the training had not been conducted regularly. Overall, financial sustainability was found to be a major concern for the project.

7.3.3   Environmental

As sustainability was not one of the objectives of the project, pro-environment practices were not expected to be practised. From the dimensions specified in Table 3, it was found that light-emitting diode (LED) lights had been adopted and this was the only positive aspect of the dimension. However, the adoption was attributable to another government policy that offers subsidized LED lights. There is a need to create a Green IT/IS plan and educate the VLEs about the sustainability practices such as the use of eco-labels while buying hardware products, power management software etc. Presently, the VLEs individually bought their own hardware and software, having a centralized sourcing agreement can lead to better management. Creating awareness and explaining the benefits that can result from Green IT/IS activities may result in better adoption of sustainable environmental practices.

7.3.4   Technological

Proper infrastructure (Te1), interoperability (Te2) and Privacy of data (Te3 and Te4) are three aspects of technological sustainability. From the CSC project perspective, interoperability and security aspects are not relevant as the services are only delivered through the project. The CSC project is only an interface or one stop shop where the citizens can get all the services under one 'roof'. It is dependent on other e-government projects to deliver services listed in Table 6. At the CSC level, all the CSCs we visited had the necessary hardware and software required for the project. Overall, from the technological sustainability perspective, it can be concluded that the CSC project is in good shape.

8.   Discussion

The analysis of the CSC project reveals that when building e-governance projects that are sustainable on the four dimensions of social, economic, environmental and technological, policy-makers have to first understand the importance of building sustainable systems. Sustainability needs to be included as one of the project goals at the project conceptualization stage. Unless deliberate processes and practices are defined and followed, sustainability goals cannot be achieved. The CSC project only does well from a technical sustainability perspective. Overall, financial sustainability is a major concern for the project. Steps need to be taken towards accurate revenue forecasting and these forecasts should be communicated clearly to the major stakeholders. At the project conceptualization stage, the project sustainable goals should be clearly defined by the top management and that should from the basis of a Green IT/IS plan.

While there has been no similar research to compare our results with, recent work done on sustainable information systems in government units (Ziemba, 2018b) has some similarity to our work in both approach and results. These studies report that government units do not gain any significant ecological, economic, socio-

cultural, and political benefits from adopting ICT. Besides, they also conclude that ICT quality significantly and positively impacts sustainability. These findings resonate with our findings in the case study where technological sustainability is the only aspect where the CSC project has performed well. Our work complements the work done by Ziemba (2018b; a, 2017) as the SIS model can be used as input for designing sustainability measurement metrics for specific ICT projects.

9. Conclusion

In this paper, we have proposed a set of sustainability dimensions and sub-attributes for measuring sustainability impact in an e-governance project. The four dimensions used for assessing sustainability in our framework are: Social, Economic, Environmental and Technology. We then provide sub-dimensions or attributes for each of the four dimensions so that the framework can be practically used in the field for assessment of e-governance projects. We provide thirty four sub-dimensions. Eight sub-dimensions have been defined for assessment of awareness, information-sharing, stakeholder involvement and policy aspects of social sustainability. For the assessment of financial and training aspects of economic sustainability six sub-dimensions are given. For the assessment of Green IT, Green IS, and policy aspects of environmental sustainability we have proposed sixteen sub-dimensions. For the assessment of the dimension of technology we have given four sub-dimensions that assess the aspects of technology infrastructure, data privacy, and standards for data sharing and preservation.

To show the usefulness of our framework, we have applied the framework to assess the sustainability of the Common Service Center project in India i.e. the largest tele-center project in the world. This work contributes to existing research in the area of assessment frameworks used for evaluating e-governance projects. Our work also has significance for practitioners involved in assessment studies as it provides detailed metrics that not only provide guidance but also can be quickly adopted as they are to measure sustainability. Our work also contributes to SIS literature by providing sustainability measures at a new unit of analysis, i.e., e-governance projects. Our work also holds significance for policymakers involved in e-governance project planning and conceptualization as it would help them determine which sustainable dimensions should be prioritized and measured in a project.

Our study has certain limitations. While our suggested dimensions and attributes can be used in any e-governance project irrespective of the region where it is implemented, more applications of the framework need to be conducted to check the robustness and coverage of the dimensions. As it is not possible to define all possible sustainability constructs for an e-governance project, there is scope for further research to identify new constructs so that practitioners can have more choices while selecting the appropriate set of sustainability dimensions they need to measure based on their project context. In addition to defining more constructs, research on the categorisation of sustainability constructs as mandatory or optional is required. Defining mandatory constructs in assessment studies need to be researched further given that sustainability metrics may get completely ignored by project managers.

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