

Building Accountability in e-government Services: Inputs for Policy

Swapnil Sharma

International Management Institute, Delhi
New Delhi, India
Email: swapnil.sharma@imi.edu

Arpan K. Kar

Indian Institute of Technology, Delhi
New Delhi, India

M. P. Gupta

Indian Institute of Technology, Delhi
New Delhi, India

Abstract

Governments worldwide are investing many resources in developing digital government infrastructure and networks. Government webpages and supersites are substituting for their brick-and-mortar offices and physical state-citizen communication. This shift is transforming the administration and the process of digital government. We also see a growing push for expanding the role of citizens as participants and co-creators of policy and programs for establishing a collaborative digital government. This study examines the Indian e-government setup to explain how governments can ensure 'accountability by policy design,' or Digital Accountability (DA), on e-government service (eGS) websites. A mixed-method research design is used to uncover the critical design factors that can help build and maintain accountability on any government service (eGS hereafter) website. Our results show that Transparency remains the most important dimension, but concerns about security and privacy have also become foundational to the conceptualisation of accountability. Another important finding shows that building accountability is meaningful only if there is responsiveness and a sense of user control over the services. The findings also establish an explicit requirement to establish liability for service quality and effectively enforce a sense of accountability in modern eGS. We believe our findings can help improve the theoretical understanding of accountability in eGS while providing actionable insights to practitioners and policymakers to ensure accountable services in the digital age.

Keywords: E-Government, Digital Accountability, TISM, MICMAC, Best-Worst Method

1 Introduction

Governments across the globe are experimenting with newer forms of governance that leverage the rapidly evolving digital infrastructure and technologies. Digital Era Governance (DEG) is one such model of governance, and it was seen as a successor to the new public management (NPM) paradigm (Dunleavy et al., 2006; Margetts & Dunleavy, 2013). DEG is about transforming the way governments function, and governance is delivered. As per the proponents of the thought, we are in the second wave of DEG. This entails overhauling the public sector based on reintegration: streamline and integrate different government agencies through digital platforms; need-based holism: structuring government services and operations around the specific needs of citizens; and digitisation of the governance approach.

It may be observed in the way government departments' websites are replacing their physical offices at the lowest levels of state-citizen interaction for eGS delivery (Lindquist & Huse, 2017; Sharma, Kar, et al., 2022). This movement is leading to an evolution of governments and society by acknowledging and accepting how transformative digital technologies enhance eGS delivery (Bindu et al., 2019; Lindgren et al., 2019). Research shows that by encouraging digital access to information, governments want to promote efficiency in eGS to benefit individuals and society (Hasan & Linger, 2020; Verma et al., 2022). Online marketplaces, platforms, social media, machine learning, the Internet of Things, artificial intelligence and big data analytics are examples of technologies that encourage social and institutional innovation, facilitating the transition to DEG (Stamati et al., 2015). There are other conceptualisations of public organisations, such as public value management, collaborative governance, and new public governance, among others (Greve, 2015). However, we have chosen to work with the DEG paradigm for our study, as its sub-categories covering Transparency, Social Media, and shared service centres make it the closest representation of the governance practices in India and countries with similar technology diffusion and socio-cultural context (Margetts & Dunleavy, 2013). It coincides best with how India is trying to push the envelope of governance with the Digital India program and establish an improved eGS infrastructure in the country (MeITy, 2022). India is the world's largest democracy and one of the most diverse countries. Working in the Indian context also allows us to emphasise the generalisability of our results to developing nations and societies that might be suffering from issues like the digital divide and unequal diffusion of technology.

The fact that this is an ongoing transition doesn't help much, given the external and internal resistance towards change in existing government infrastructure and institutions (Clarke, 2020). We are not yet close to realising a complete transformation of our governments, and technology is not the silver bullet that will solve all of our administrative issues. Technology has also been accused of aggravating existing inequalities in our communities and society (Van Deursen et al., 2017). Scholars have often proposed enhancing the accountability of government agencies and processes as a solution, which is the basis for our research (Sharma et al., 2024; Twizeyimana & Andersson, 2019). The goal is to create an e-government architecture that can underpin future information societies where individuals are digitally connected and use the Internet for service access, fostering a sense of accountable government focused on social welfare.

Accountability has been defined in multiple cultural, institutional, and organisational contexts. However, for the sake of this study, we define Digital Accountability (DA) as a social relationship enacted by embedded design factors in eGS-delivering websites that ensure it presents a sense of accountability towards the citizen users.

The study is motivated by the idea that imposing accountability will address problems like middlemen, price manipulation, corruption, bureaucracy, and red-tapism (Harrison & Sayogo, 2014; Matheus & Janssen, 2020). Goal 16 of the Sustainable Development Agenda of the United Nations also calls for establishing transparent institutions that could support local digital ecosystems and contribute to the growth of inclusive and sustainable societies (United Nations, 2022). The Organisation for Economic Co-operation and Development (OECD) supports retaining accountability while presenting the concept of digital-by-design e-government platforms to promote transparent, inclusive, and responsive governance (OECD, 2020). Ensuring DA can improve eGS quality and make the government machinery more

accessible and transparent to the citizens. Furthermore, a lack of accountability breeds distrust in the state-citizen relationship, undermining the roots of democratic e-government. The principles of open data, citizen social networking, collaborative democracy, and interactive Web 2.0 apps would all be embodied in this type of governance model (Bindu et al., 2019). According to recent studies, DA is crucial to these e-governance approaches and is underappreciated even in developed countries (Clarke, 2020). This study attempts to establish that by ensuring accountability in the structure and policy of eGS websites, we can more efficiently assist policy execution and promote social good in developing countries. The problem of in-efficient government services persists even after all the technological innovations in eGS delivery, and just like the digital divide, this isn't the fault of the technology but of the people and policies that govern the technology (Mervyn et al., 2014). This issue is of special importance for developing democracies across the globe as they hold the biggest potential for public welfare. This manuscript is woven around two questions that could help us in exploring the conceptual build-up of DA in eGS websites serving citizen users:

1. How can we conceptualise accountability for eGS delivery (DA) regarding the contributing design factors?
2. What causal interrelationships exist among these design factors in ensuring DA?

We have used a mixed-method approach using a qualitative structural technique and a quantitative multi-criteria decision-making technique to tackle the two research questions. Both of these techniques are epistemologically complementary as they build upon the opinions of subject matter experts to present a picture of reality through their experiences. We were able to conceptualise DA in terms of 6 design factors or dimensions collated from a list of 29 features identified by experts on an eGS website as Transparency, Controllability, Responsibility, Responsiveness, Liability, and Security & Privacy. By combining these results with the structural modelling technique, we also explored the interrelationships these design factors or dimensions of DA have with each other.

We have discussed the details in the following sections of the paper, structured as follows: The background literature crossing the domains of information systems and public administration is reviewed in Section 2; Section 3 delves into the study's methodology, covering the design of this study and the analysis conducted to explore the research questions; Section 4 presents the findings from the analysis. In section 5, we highlight the theoretical contribution of this work as well as its practical utility for practitioners. Section 6 wraps up the document by summarising the study and acknowledging its limitations.

2 Background

Accountability is a very old concept and has always had its place in conversations around governance and administration in different forms and enactments. Researchers see the concept of accountability as a way of making governments more efficient, transparent, responsive and restricting the abuse of power by the state and its officials (Dubnick & Justice, 2004). It is proposed as a remedy for administrative challenges in a lot of contemporary literature in the digital governance and public administration fields (Petrakaki, 2018). The Public Administration Dictionary defined it as "a condition in which individuals who exercise power are constrained by external means and internal norms" (Koppell, 2005). In the following subsections, we have attempted to cover the different conceptualisations of accountability discussed in the past literature and how they could help us realise a guiding framework or design for enforcing DA.

2.1 Conceptualising Accountability

Meijer (2003) outlines how political and legal processes impose external accountability while the organisation's bureaucracy enforces internal accountability. External responsibility occurs outside the organisation's bureaucracy, whereas internal accountability exists within it. For example, the service head in a local government reports to the council's Executive. Moreover, government employees are bound by the rules set by the institutions in which they serve. External accountability is enabled via political and legislative structures and civil society activism. Bovens (2005) illustrated accountability as a social relationship where an actor must explain and justify their conduct to the public affected by their decisions. Bovens (2007) provides a broad overview of the phenomenon and a comprehensive outlook on the concept of accountability, outlining 15 different types of accountability relationships based on their contexts. Depending on the firm's nature, it can be legal, political, social, administrative or professional. Based on the actor's nature, it can be individual, hierarchical, corporate or collective (Bovens, 2007). It can be product-related, procedural or financial, depending on the conduct. It could also be seen as horizontal, vertical or diagonal, based on the nature of duties. Accountability was discussed as a means of resolving key governance issues of performance, control, and legitimacy in any public management context by using organisational and managerial control, performance assessment, and democratic governance (Dubnick & Frederickson, 2011).

Researchers have also conceptualised accountability in terms of citizen voice and the state's response to the supply and demand channels of eGS. Performance or compliance monitoring institutions that restrict abuses by government agencies and officials establish state-centred or horizontal accountability, making up the supply side of accountability. Social accountability or vertical accountability is established by actions and measures taken by individuals and civil society to make public officials answerable for their decisions; this is the demand side of accountability (Brinkerhoff & Wetterberg, 2016; J. Fox, 2014). Social accountability is gaining appeal as a counterbalance for inadequate state-centred accountability, and an increasing body of knowledge and research examines its usefulness and implications for governance and policy goals. Past literature also caveats the need for citizen engagement, data journalism and institutional support for e-government, as open data alone cannot ensure accountability (Matheus & Janssen, 2020).

2.2 Digital Accountability and e-government

E-government or electronic government is the phenomenon of using digital technologies in the agencies and institutions of the government to conduct administration and business to provide improved governance, better and easier delivery of services, and promote democratic participation (A. Meijer, 2007; Roy, 2006). It aids in restraining officials' discretionary powers, reduces the risk of corruption, and strengthens the weak social, legal, and political institutions (Mistry, 2012). Thanks to the Internet, citizens now readily search and acquire information on government programmes and undertake service transactions. Information repositories and libraries have become critical for record-keeping in the highly dynamic and volatile environment of information societies and the institutions that govern them using digital means (Paul, 2007). As noted by Bannister & Connolly (2011), the use of ICT in government is e-government. Nevertheless, until this usage leads to a material change in present structures, data, or processes, we should not term it e-governance. It is critical for the success of any e-government initiative to have : (a) a centralised, secure database to keep track of and enable

inter-departmental data exchange; (b) design and delivery of electronic services; (c) provision to conduct business with the government digitally; (d) ensuring government institutions and officials' accountability to facilitate digital democracy (Bolívar et al., 2007). Pina, Torres, & Royo (2007) studied more than 300 government websites across the European union (EU) analysing the transformational impact of digitally enhanced accountability (DA). They defined the degree of openness for an eGS website as a combination of the interactivity and transparency factors and a technique to objectively assess them. The existing literature also covers the ongoing debate about the openness of government systems vs citizen data protection and privacy, as well as national security issues and how they impact accountability (As-Saber et al., 2007; Sullivan & Clarke, 2010). Assessing and ensuring accountability can help promote citizen participation, which is critical for developing healthy digital democracies (Sharma, Kar, et al., 2022). According to academics, e-government procedures result in collective learning for both the people and the government in terms of identifying service gaps and co-designing new solutions (Barrett, 2019; A. Meijer, 2007). There may also be indirect benefits, such as enhanced government legitimacy and citizen confidence (Keymolen et al., 2012). DA mechanisms can also act as a catharsis for the populace by allowing them to push for punitive actions in the event of failures in e-service delivery by responsible government officials.

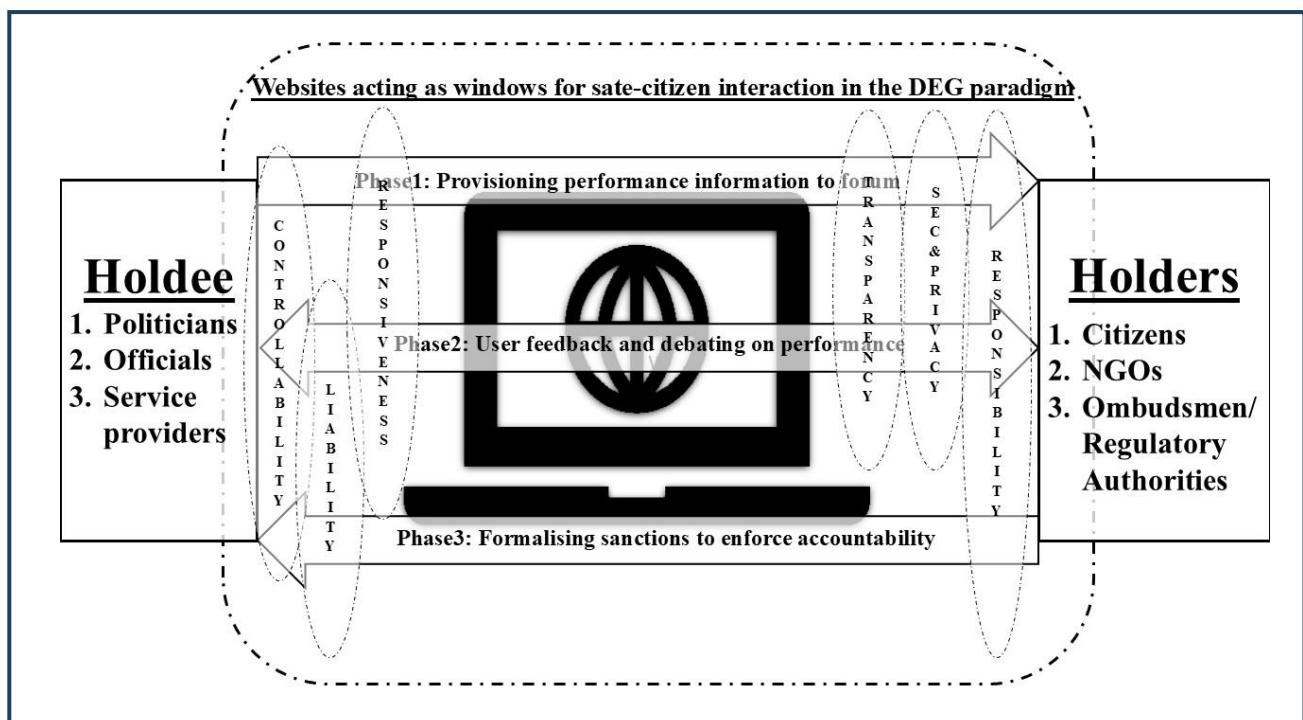


Figure 1: Process of DA in eGS delivery

Taking from past literature, we can outline the accountability relationship comprising three different phases (see Figure 1), and the design factors of the website will enable and support different phases of this relationship. First, the citizen forum collects data from different sources to reconstruct the events of rendering governance services. Then, the forum members discuss these events and evaluate actions and decisions based on defined service standards. Finally, sanctions are enforced depending on the forum's judgement in the third step. Performance statistics, program information, institutional accountability metrics, user feedback and

satisfaction data will be shared. The forum engages with this knowledge and makes the holdee accountable regarding their conduct, with institutionalised sanctions such as negative evaluation, wage/budget reductions, and the possibility of expulsion from power based on the forum's consensus. As a result, sanctions become the most crucial and final component of the relationship, as organisational accountability compliance would be impossible without them. Based on these phases and the different dimensions of DA that enable them, we have designed our study to come up with a conceptual framework for embedding and enabling DA mechanisms in government e-service-delivering websites and platforms. The following subsection details the mixed-method research approach adapted to build the theoretical foundations of digital accountability. Based on the background literature discussed earlier, we can conceptualise the DA relationship as shown in Figure 1. Governments, politicians, public service providers, and professionals may all be held accountable. Citizens, civil society experts, or consumers of these public services would all be the holders of accountability. The forum will be the web-sphere enabled by the website in the form of online blogs, forums or social media platforms that could sustain the interactions between the government and its citizen users. Citizens already use such media, but their voices often go unheard without a standard procedure to collect, analyse and act on these voices to improve eGS (Rathore et al., 2021).

2.3 Building a guiding framework to enforce digital accountability

The guiding research questions for this study define the scope for us. The study is an attempt to conceptualise DA to improve the quality of eGS delivery and support the development of digital democracies. The objectives that give this study its binding scope are focused on exploring the different design factors that create the perception of being accountable to users. Also, to explore how these design factors affect each other in building up an accountable eGS infrastructure in the country. The reason for choosing this is the constant lack in adopting eGS and participation from citizens in developing countries (Lindgren et al., 2019). Research claims that the black-box nature of administration and the feeling of being unheard in the citizens is the major cause of this. By building accountable e-government machinery, we can overcome these issues. Recent research also points to the possibility of employing participatory design in the public sector to successfully develop and implement administrative solutions (Kautz et al., 2020).

RQ1 builds up on past literature to come up with design factors that cover different dimensions of accountability in the state-citizen interaction online. We leverage the knowledge and experience of experts to refine these factors further and develop a list of factors that cover the major functional issues of eGS-delivering websites or web applications. This will allow us to understand the different features and functionalities we must build in the service to maintain a sense of accountability to the citizen users.

RQ2 delves a bit further and explores the causal relationship between these uncovered design factors to understand their influence on each other and in building up accountability in the state-citizen interaction on digital platforms. It allows us to handle the design in a better way by providing an insight into the nature of these design factors. We hope to understand what factors might be foundational to accountability and what might be critical in operationalising the concept in the real world.

3 Research Design and Methodology

The article adopts a mixed-method approach to tackle the questions guiding this study. We can combine methods with comparable ontological and epistemological assumptions in information systems research to obtain unique insights while investigating complex phenomena (Bjoern, 2005). Both methods used to analyse results from the review of literature and expert discussion allow us to rank different factors based on causal relationships.

3.1 Research Design

Figure 2 depicts the research design we followed for this study. We organised two focus groups with experts. A total of 45 experts were invited across different fields of expertise dealing with e-service delivering websites, and we were able to secure the attendance of 21 for the two panel discussions. These experts were recruited from the professional network of the authors, exploring experts in different ministries, government bodies, industry, and academia who had substantial experience in the e-government domain. We formally approached them by mail or by contacting their offices for possible participation. Panel 1 comprised 14 practitioners with 7-17 years of experience, and panel 2 had seven senior area experts with more than 20 years of experience (See Table A.1 in the appendix). Expert panel 1 was organised at the author's institute, while expert panel 2 was engaged online through a video conferencing platform.

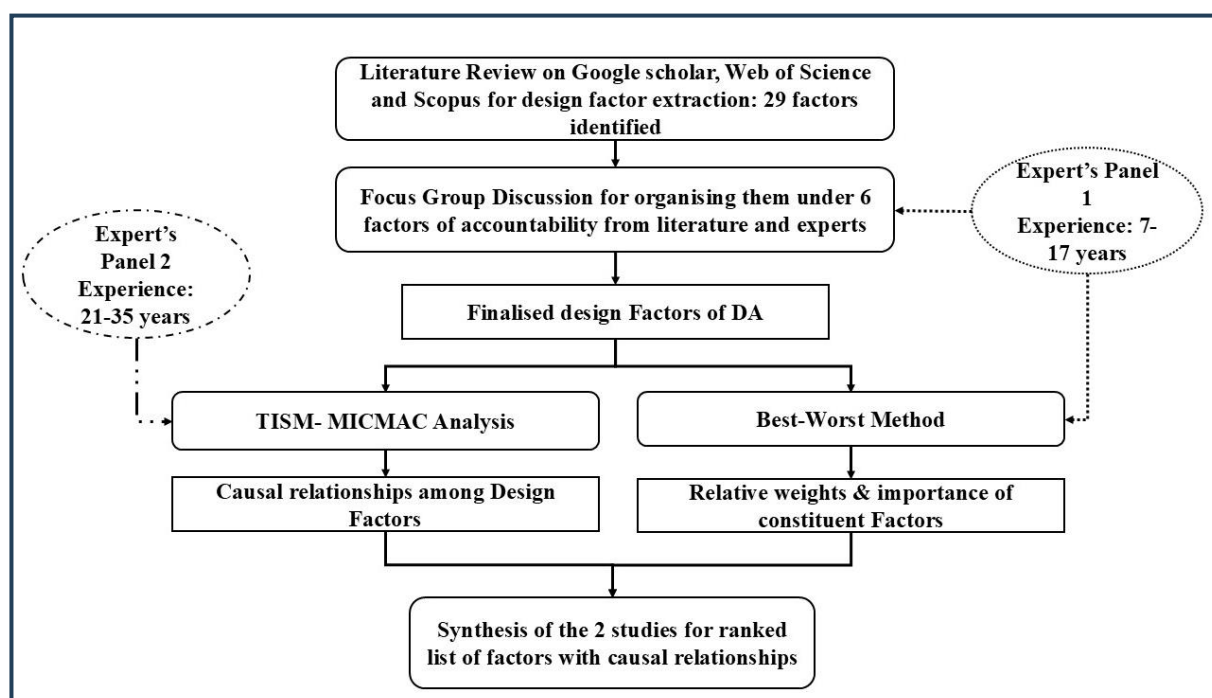


Figure 2: Synthesis of studies

A literature review was conducted in the first stage of the investigation to extract academic publications from Web of Science and Scopus. Although we did not explicitly use a systematic literature review framework like PRISMA, our search was still structured. We used a keyword sieve combining keywords like 'Accountability', 'government accountability', and 'political accountability' with the OR operator in the title-abstract-keyword field. This turned up many search results as accountability is a very widely used term, and we had to narrow our search down by filtering through specific keywords used by past researchers. De-duping was done

to reduce the list of articles and include unique studies. Metadata for relevant studies for this manuscript was downloaded, and we read through the abstracts to choose if the paper dealt with different dimensions related to the concept of accountability. Any study that dealt with the concept of accountability in service delivery was included, whatever the context in which the study was conducted. This was done to maintain a comprehensive list of factors to start with. This allowed us to understand what researchers mean when discussing accountability in real-world applications. We also included studies that discussed accountability as a possible solution to problems with eGS in any capacity. This also allowed us to build a corpus of background research.

Panel 1 was asked to present their ideas and discuss the findings from past literature to shortlist the contributing factors of accountability for eGS. This was done by initiating a discussion on the topic 'What makes up accountability on a website?' and the ideas expressed by the experts were collected in the form of notes which talked about different features, functions, and information the experts expected to see on an accountable website.

These features comprise the list of sub-factors like citizen charter, organisational structure, roles and responsibilities document, among others. Once we collected these features and the group agreed that these features were sufficient to ensure accountability for eGS, we moved towards further grouping these sub-factors for parsimony in the analysis. The first five factors were from past literature, and the panel felt that there should be an additional dimension of security & privacy covering features like user data storage and sharing policies, owing to the recent developments in the Indian privacy law and a supreme court judgement on the same in 2018. The definitions of these dimensions are context-specific and developed with the help of experts' opinions. They describe the meaning of a particular factor concerning eGS delivery. Twenty-nine sub-factors on and off the website were chosen based on a consensus-building exercise, later organised under six overarching design factors of DA selected from the literature and experts' discussion (see Table 1). Panel 1 experts were also asked to create comparison vectors for applying the BWM method, thereby generating the weights for each factor.

3.2 Best-Worst Analysis

We used a multi-criteria decision-making (MCDM) approach known as the Best-Worst Method (BWM) to analyse the shortlisted factors. BWM aids in determining the relative importance of dimensions, as well as their inferred rankings, in terms of ensuring DA. BWM is similar to the analytical hierarchy process (AHP) but does not require the full pairwise comparison matrix. It generates consistent results with fewer data points (Rezaei, 2015, 2016). BWM is comparable to how decision-makers evaluate choices and make judgments in real situations. It has been applied to a variety of issues in different disciplines of study, including innovation management (Gupta & Barua, 2016), Business-to-government data exchange factors (van de Kaa et al., 2018), measuring research and development performance (Salimi & Rezaei, 2018), supplier classification and risk assessment (Torabi et al., 2016), examining implementation success factors for identity systems (Mir, Kar, et al., 2020) and for developing artificially intelligent robotic systems (Mir, Sharma, et al., 2020).

Once the design factors, sub-factors and relative weights were finalised, we invited Panel 2 to take the study forward. The senior practitioners in panel 2 contributed to the TISM-MICMAC analysis by reviewing the results from the BWM analysis and coming up with causal explanations for the design factor interrelationships. We can create a comparative analysis of

the results generated from the two methods as one gives us relative rankings of the factors. In contrast, the other generates a hierarchical diagram of the same factors. The levels of the TISM diagram also refer to the factor's role and ranking in enforcing DA in service delivery.

3.3 TISM & MICMAC Analysis

Following the mixed-method approach, we employed a structuring methodology, Total Interpretive Structural Modelling (TISM), to examine the interrelationships between these dimensions and corroborate their perceived relevance in the selected context. It is an improvement over Interpretive Structural Modelling (ISM), a method for transforming ambiguous and abstract mental models into accurate hierarchical structures of elements by understanding and presenting their contextual links on the diagrams's connectors for clarity (Sushil, 2012). It allows us to create a conceptual model of DA and explain the causal relationship between the design factors in building it up as a concept and operationalising it in the real world. TISM has been used extensively by scholars for diverse enquiries like: choosing a city for smart city project (Kumar et al., 2019), identifying barriers to using big data analytics for a sustainable auditing system (Shukla & Mattar, 2019), for sustainable supply chain performance (Shibin et al., 2017), and for developing an ecosystem view of collaborative m-governance (Sharma, Mir, et al., 2022), for identifying and analysing change forces in e-government (Nasim, 2011), for creating a benchmarking model for education (Yeravdekar & Behl, 2017) and for analysing barriers to adoption of blockchain technology (Mathivathanan et al., 2021). TISM allows us to create a hierarchical digraph for the chosen factors with their interrelationships based on the experts' opinions in panel 2. It allows us to understand how different dimensions are connected to each other, and the why of these relationships is explained on the connector (Jena et al., 2017). The levels in this diagram can also be used to rank the dimensions in order to validate the BWM results. The TISM technique's step-by-step method with the generated tables and knowledgebase are outlined in subsequent sections of the paper.

The Matrix of Cross Impact Multiplications Applied to Classification (MICMAC) was used to investigate these factors further based on the reachability matrix developed earlier. The driving power of these dimensions is ascertained by taking the row sum of the reachability matrix and dependence by taking the column sum (see Table 5). These sums indicate the influence of any dimensions over other dimensions by virtue of their reachability (driving power) or the influence of other dimensions in ensuring them (dependence). We create a 2 by 2 matrix based on these numbers with driving power and dependence as the two axes. We do this by plotting the dimension on a graph based on these two values and dividing the two axes into halves, giving us the four classifications: drivers, dependents, linkage and autonomous factors. Drivers are the factors that have the maximum impact on the objective to be achieved by contributing most to the relationships in the structural model. They could be seen as the main components contributing to building up a concept or idea. Dependents are factors that could be seen as constituents or features of the outcome or objective. Linkage factors lie between the drivers and dependents and hold up the whole conceptual structure being explored. They led the path from the drivers to the dependent variables. Autonomous variables contribute little to explaining the relationships being investigated in the structural model of the concept.

4 Results

This section covers the different findings generated during the course of this research under three sub-sections.

4.1 Design factors of DA from the review of literature and expert's validation

We undertook an exercise to uncover and shortlist design factors for a website, which could help ensure DA. We ended up with a list of 6 factors, covering 29 sub-factors as per the literature review and expert's opinion.

F#	Factor Name	Definition	Sub-factors	Source
F1	Transparency	The government website offers all service and performance information	• Citizen charter • Service data dashboards • Provisioning performance data in clear understandable metrics • Organisational structure • Role and responsibility of office bearers	(Ackerman, 2005; Bovens, 2005, 2007; Brandsma & Schillemans, 2013; Fox, 2015; Koppell, 2005; Pina et al., 2007, A. J. Meijer, 2003; Misuraca & Viscusi, 2015; Pina et al., 2007; Roy, 2006)
F2	Controllability	A government website performs what's necessary and incorporates civilian feedback	• Allowing participatory policy and service design • Facilitating citizen intervention at different process levels • Allowing for practices such as participatory budgeting of resources and negotiated policy making	(Aman et al., 2013; Bertot et al., 2012; Bovens, 2005, 2007; Brinkerhoff & Wetterberg, 2016; Dubnick & Frederickson, 2011; Eshiet, 2019; Koppell, 2005; Sørensen, 2012; Dahiya, 2016; T. (David) Lee et al., 2019; Mahmood, 2016; Petrakaki, 2018; Harrison & Sayogo, 2014)
F3	Responsibility	The website and its administrators are cognizant of the terms and conditions of the services rendered	• Developing and publishing KPIs • Publishing audit information • Providing service statistics • Service continuity planning • Service level agreements • Process tracking facility	(Bovens, 2005, 2007; Brandsma & Schillemans, 2013; Drach-Zahavy et al., 2018; Fox, 2015; Halachmi & Greiling, 2013; Heinrich & Brown, 2017; Hladchenko, 2016; Keymolen et al., 2012; Lee & Joseph, 2013; A. J. Meijer, 2003; Pina et al., 2007; Roy, 2006)
F4	Responsiveness	Must have an efficiently interactive design which can facilitate citizen interactions	• Facility of feedback • Active two-way communication over service issues • Timely resolution of citizen demands • Flexibility in operations to accommodate citizen requirements • Reporting back to citizens regarding their queries and complaints • Maintain a digital space for interaction between users and with the government institution	(Aman et al., 2013; Bertot et al., 2012; Bovens, 2005, 2007; Brinkerhoff & Wetterberg, 2016; Dubnick & Frederickson, 2011; Eshiet, 2019; Koppell, 2005; Sørensen, 2012; Dahiya, 2016; T. (David) Lee et al., 2019; Mahmood, 2016; Misuraca & Viscusi, 2015; Petrakaki, 2018)

F5	Liability	The website should have a clear mechanism for holding accountable those responsible for service failures	• Appointing SPOCs • Publicly recognising process owners • Provisioning sanctions in the SLAs in case of service failures	(Bovens, 2005, 2007; Brandsma & Schillemans, 2013; Brinkerhoff & Wetterberg, 2016; Drach-Zahavy et al., 2018; Fox, 2015; Halachmi & Greiling, 2013; Heinrich & Brown, 2017; Koppell, 2005; Pina et al., 2007; Hladchenko, 2016; Keymolen et al., 2012; Lee & Joseph, 2013)
F6	Security and Privacy	The website should have a well-defined security and privacy policy that includes access restriction and data sharing rules	• User data requirements • Data storage policy • Data sharing policy • Possible usage of data for profiling and targeting • Undertaking compliance measures	(Aman et al., 2013; Brandsma & Schillemans, 2013; Koorn et al., 2010; As-Saber et al., 2007; Keymolen et al., 2012; Maréchal, 2015; Sullivan & Clarke, 2010)

Table 1: Design factors of digital accountability

The first factor was Transparency, which is often used interchangeably with accountability. It is related to the openness of the eGS website and how well it communicates and presents relevant information to citizen users. Some of the important sub-factors clubbed by the experts under the definition of transparency include a Citizen Charter, data dashboards, performance data on different services and officials in clear and understandable form, along with a description of the organisational structure with clearly defined roles and responsibilities of the officials. The second factor was Controllability, which is the dimension to which a website allows to capture citizen feedback. The third factor was Responsibility, which is related to the explicitly expressed awareness of the service providers to their promised service standards via the website. The third factor was Responsiveness, which covers the level of interactivity offered on the website and ensures that the exchange of information is two-way. The fourth factor was Liability, which covers subfactors like identifying process owners and single points of contact (SPOCs) in times of service failure and a description of punitive action that needs to be taken in such a case to maintain answerability in the DA relationship. The last factor identified was that of Security & Privacy, which covers the website's data protection and sharing policy along with a clear description of access levels, data management and user-generated or submitted data usage.

4.2 Ranking of the factors based on Study 1

BWM was then employed using two independent comparison vectors created by defining which criteria are the best (for this study, F1- Transparency) and the worst (F3- Responsibility) based on the consensus in panel 1. Readers should note that the terminology of worst is just a need of the method and in no way says that the chosen dimension is detrimental or in any way insignificant to the analysis. It is a relative term that creates a reference for comparison and makes the job of the experts smoother. Numbers are assigned from 1 and 9 to each criterion, with 1 denoting 'equally significant' and 9 denoting 'most significant' to generate the best-to-others and worst-to-others matrices.

Best to Others	Transparency	Controllability	Responsibility	Responsiveness	Liability	Security & Privacy
Transparency	1	3	5	4	2	3

Table 2: Comparison vector 1- Best to Others

Others to the Worst	Responsibility
Transparency	5
Controllability	3
Responsibility	1
Responsiveness	2
Liability	4
Security & Privacy	3

Table 3: Comparison vector 2- Others to Worst

Min-Max inequalities are developed based on these vectors as per the weight estimation procedure of BWM (See appendix A.1) to generate each dimension's relative weight, as shown in Table 4.

Factors	Transparency	Controllability	Responsibility	Responsiveness	Liability	Security & Privacy
Weights	0.36	0.14	0.06	0.10	0.20	0.14

Table 4: Weights for the selected dimensions

The consistency ratio for our comparisons was 0.0235 and this being below 0.25 signifies a highly consistent comparison (Rezaei, 2015).

4.3 The hierarchical model of DA and factor classification from study 2

To validate the BWM results, we used the qualitative TISM and MICMAC techniques in consultation with experts on panel 2. Experts' opinions were used to derive the reachability matrix, which gives all possible interrelationships between the factors in the context of ensuring DA.

RM	F1	F2	F3	F4	F5	F6	Driving Power
F1	1	1	1	1*	1	1	6
F2	0	1	1	1	0	0	3
F3	0	0	1	1	0	0	2
F4	0	0	1	1	0	0	2
F5	0	1	1	1	1	0	4
F6	1	1*	1*	0	1	1	5
Dependence	2	4	6	5	3	2	

Table 5: Fully transitive Reachability Matrix with Dependence and Driving Power

The ones with an asterisk (1*) denote significant transitive relationships between factors. This matrix's row and column sums also ascertain each factor's driving power and dependence. This data is used in the MICMAC classification. Level partitioning gives us the levels (in Table

6) for the hierarchical diagram (figure 3) for every factor as per the process outlined in Appendix A.3.

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	{1,2,3,4,5,6}	{1,6}	{1,6}	4
F2	{2,3,4}	{1,2,5,6}	{2}	2
F3	{3,4}	{1,2,3,4,5,6}	{3,4}	1
F4	{3,4}	{1,2,3,4,5,6}	{3,4}	1
F5	{2,3,4,5}	{1,5,6}	{5}	3
F6	{1,2,3,4,5,6}	{1,6}	{1,6}	4

Table 6: Levels in the canonical matrix

These levels allow us to present the design factors of DA in hierarchical structures with their contextual interrelationships on the connectors, as explained by the panel 2 experts.

In the TISM diagram, the levels increase from bottom to top, and the ranking decrease in the same direction. Therefore, we can flip the level numbers and get the rankings of these dimensions based on the TISM analysis.

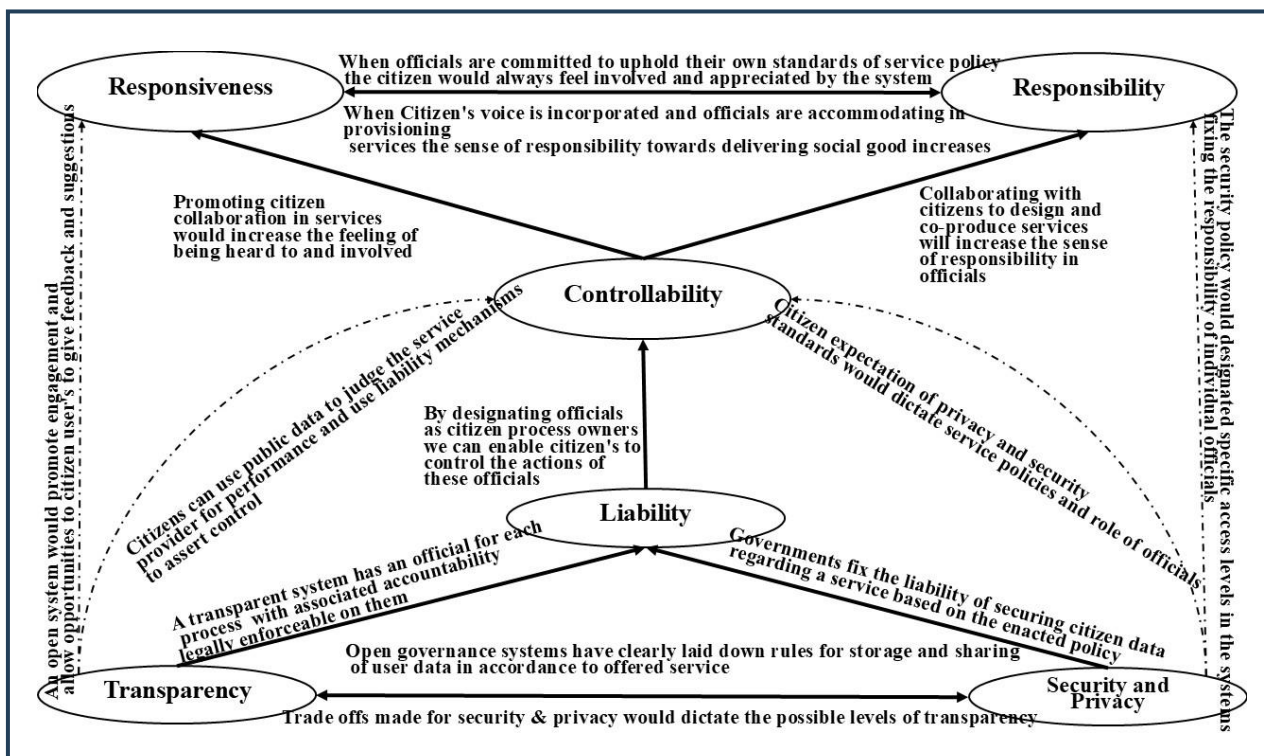


Figure 3: Conceptual diagram of Digital Accountability

We performed the MICMAC classification based on the TISM reachability matrix developed previously (table 5). A plot of the dimensions was created based on their dependence and driving powers to develop the 2*2 matrix of MICMAC. For this analysis, we took driving power as the x-axis and dependence as the y-axis, creating the classification of dimensions below.

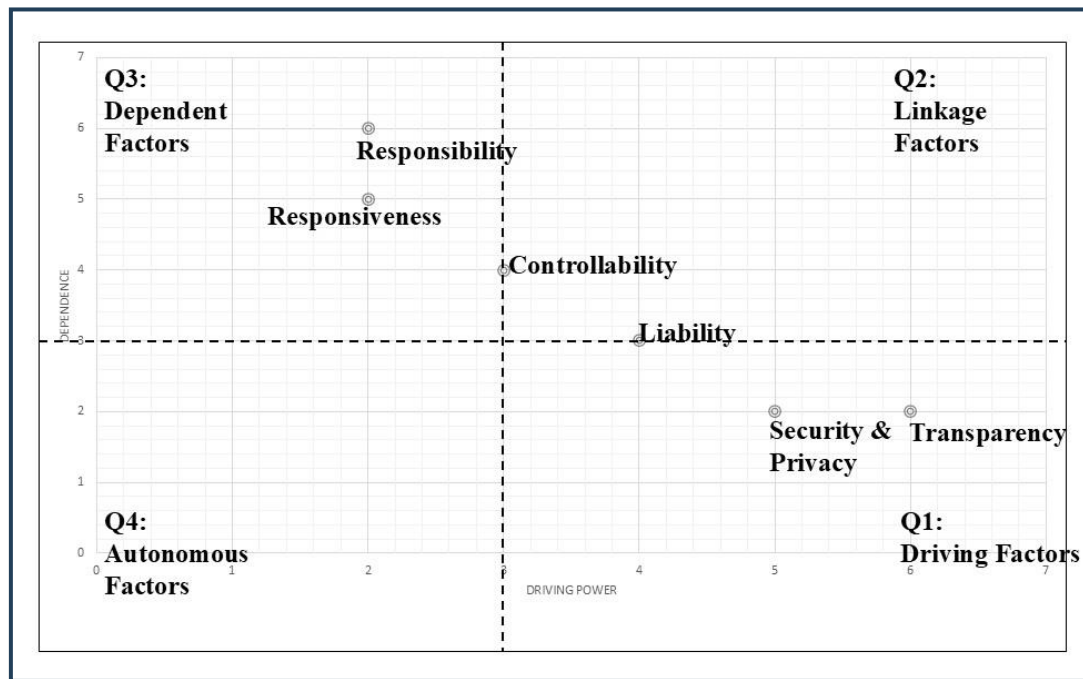


Figure 4: Classification of DA dimensions

In the context of DA, Transparency and security & privacy emerged as driving factors having the greatest effect over the context, whereas responsiveness and responsibility are dependent dimensions. The aspects of Liability and Controllability figured as connecting factors bridging the driving and dependent dimensions.

5 Discussion

This manuscript explores the conceptualisation of digital accountability for eGS. The two issues allow us to understand the different design factors that can be used to ensure accountability by design into eGS websites and its supporting policy. We sought to determine the relative importance and interrelationships of these factors. The table below demonstrates how we critically compared and validated the results leveraging the mixed-method approach adopted for this study.

Comparison Table	Factors	Method I		Method II		
		BWM weights	BWM Ranks	TISM weights	TISM Ranks	MICMAC Class
F1	Transparency	0.36	1	4	1	Driving Factor
F2	Controllability	0.14	3	2	3	Linkage Factor
F3	Responsibility	0.06	5	1	4	Dependent Factor
F4	Responsiveness	0.10	4	1	4	Dependent Factor
F5	Liability	0.20	2	3	2	Linkage Factor
F6	Security and Privacy	0.14	3	4	1	Driving Factor

Table 7: Comparative summary of findings

In the chosen scenario, Transparency and Security & Privacy were clustered as the two most significant driving components, contributing to almost half of all accountability measures.

Literature establishes that accountability cannot be imposed without system transparency. Transparency has the maximum weight as a component of DA since it has essentially been synonymous with Accountability for a long time, serving as the basis for accountable democratic processes (Hladchenko, 2016). The first facet of the DA relationship, that is, facilitating data for recreating scenarios of service failure and aiding citizen users in evaluating or judging the website's performance in light of the set goals for its corresponding department or office, is solely enacted and based on Transparency (Lindgren et al., 2019; Petrakaki, 2018). Open data facilitation does not end with adopting an open data policy. However, it is about iterative, incremental improvements through which the organisation responds to various stakeholders' requirements and uses open data with the changing times (Park & Gil-Garcia, 2022). It solves government service's lack of openness by quickly providing all vital information and allows engagement with and accommodating citizen feedback, with controllability and responsiveness dimensions. Although security and privacy appear less significant in the BWM results, the TISM-MICMAC results indicate that this is a driving factor in the DA context. It dictates the online service's balance for obtaining, storing, and using citizen data securely while developing and rendering services for them. It discusses the trade-offs governments and agencies must strike when balancing national security and user profiling issues for policy and service design (As-Saber et al., 2007; Mahmood, 2016). They dictate how the government office keeps its digital environment safe and secure while employing government data for social good and how the principals define guidelines for citizen services (Maréchal, 2015). They represent the trade-offs in delivering e-services utilising user data to target and build social programs while preserving citizen rights (Hardy & Maurushat, 2017; Saldanha et al., 2022).

According to experts, the controllability element entails developing web services that provide citizens control over procedures and norms based on the notion of interactivity (Pina et al., 2007). Together with Liability, it came out as a linking factor. These are contextually placed as the second and third most essential elements, accounting for 34 percent of total DA mechanisms. This is because they are inextricably linked with the systemic execution of accountability mechanisms and benchmarks stated in the policy, which covers the operationalisation question. These factors drive citizen users' overall trust in the system of e-governance (Antoni et al., 2018). These factors are significant because they determine how accountability is operationalised and enforced based on web service regulations. These elements are critical for developing a democratic setup's capacity to provide accountability mechanisms, and they become much more crucial in an e-governance setting.

The top levels of the DA diagram feature Responsibility and Responsiveness, which accounted for about 16 percent of the accountability components. They are visualised as dependent factors because, first and foremost, they depend on policies established by the system users. These policies fix the rules of citizen interaction and the responsibility for governance processes on officials in case of a service failure. Also, these variables determine how interactivity is implemented in the form of a reaction, report, or response on the website. These aspects, however, are in no way trivial because they comprise the user engagement side of the entire accountability process (Zimmermann, 2016). Responsibility relates to a government office's adherence to the rules established for its operation, derived from the transparency component, since its success will be judged only based on predefined standards. Responsiveness is an outcome of the controllability factor because it encompasses officials' and systems' sensitivity to citizen users' voices. It represents how successfully the citizen

feedback was employed in establishing and executing policy goals and handling complaints about instances of exclusion or service failures (Fox, 2015). It is also how governments reassure citizens that their voices are being heard, that the administration is sympathetic to their concerns, and that the responsible officials will be held accountable if policy goals are unmet. They help conceptualise DA as a social relationship between the government and its citizen users.

5.1 Contribution to Theory

Scholars have explored the role of effective institutions and accountability in delivering corruption-free services to the citizens (Heinrich & Brown, 2017). Recent geopolitical situations concerning the COVID-19 crisis have also reestablished the role of accountable government and citizen collaboration in dealing with public welfare issues through digital innovation (Criado & Guevara-Gómez, 2021). In the same spirit, this study investigated the design factors of accountability to conceptualise DA for eGS delivery. It contributes to information systems and public administration research, allowing us to understand better how people perceive DA. Using mixed-method research allowed us to cover the three important dimensions of theory building: *what*, *how*, and *why*. The design factors of DA cover the *what* part of its conceptualisation. They are the building blocks for ensuring accountability in eGS delivery. The study also unveils the interrelationship between these design factors at various stages of DA's conceptualisation as a social relationship between governments and their subjects, covering the *how* and *why* parts. The BWM weights and hierarchical interrelationships between the factors describe how they relate to each other in ensuring accountability for eGS delivery.

The causation of these relationships can also be explained by the explanations drawn from the knowledge base and expert's opinion. For developing nations like India, these design elements could be considered the building blocks leading up to the higher-level concept of DA. By combining research literature from IS and public administration, we have tried to map the different technical features to the conceptual dimensions of the DA relationship enabled by the eGS website. It becomes a very important theoretical contribution as it presents a framework for bringing back the possibility of building up trust online transparently and without human intervention prone to corruption.

5.2 Practical implications

The study also offers insights for practitioners who manage and run e-government websites to facilitate eGS. These practitioners deal with daily issues relating to digital service platforms or websites.

Findings suggest that the factors of Transparency, security & privacy, responsiveness, and responsibility are where they can develop and drive the feeling of openness and trust for the citizen users. For instance, the availability of a lucid and structured citizen charter outlining the terms of eGS offered can enhance Transparency and lay down the security policy for the citizen user. Clear and publicly available documentation of the roles and responsibilities of different officials that established accountability would lead to better trust and Transparency instead of the usual black-box view of administration (Hooda et al., 2023). Provisioning an open platform for people to interact with other service users and process owning official online can also create a space for catharsis, grievance sharing and establish openness in the eGS platforms.

Practitioners can use the pairwise comparison logic from the knowledge base to develop better policies by considering the causal relationships between the dimensions. Practitioners can also develop rating indexes for platforms based on these factors to improve the efficiency of eGS delivery. Auditors working on reviewing and enhancing e-service platforms could also utilise the findings of this study to build quantitative methods to assess governance websites for their accountability towards citizen users.

Another view of the driving, linkage and dependent factors would be to look at them as strategic, tactical and operational level dimensions of policy making. By focusing on the strategic policy dimensions, we can define the long-term goals of the e-service. Using the operational and tactical level policy objectives, policymakers can design and dictate the day-to-day operation of the platforms and websites so that the quality of eGS delivery is maintained and accountability is ensured across all processes. The driving factors of security & privacy, along with Transparency, deal with policy-level issues of service delivery and will show effects in the long run. The linkage or tactical dimension of controllability and liability helps operationalise these policy issues in the infrastructure of the web services and enforce them daily. The operational or dependent dimensions of responsiveness and responsibility will become the performance dimensions. They will be reflected in the citizen user's experience while interacting with the web services platform or website. This type of evidence-based policymaking can ensure the implementation of policy objectives for delivering social welfare and development for all using eGS initiatives.

5.3 Future scope and limitations

This section acknowledges certain limitations of this study. Our findings may not be highly generalisable, particularly for developed countries, because all experts were from India. Furthermore, expert opinion is vulnerable to vary in context and geographies studied. Even though we conducted the literature review on multiple platforms, there will always be the possibility of missing out on some important piece of literature. We only covered the literature in English; some important factors or issues might be left out, which may be covered in any other publication language. The findings of this study would be applicable mostly to a democratic setup as the insights are drawn from the Indian context and are contingent on the openness of the democratic setup in a country.

Future researchers can use our findings to expand the DA constituents list to include other important factors that impact DA for eGS. Scholars may also consider the possibility of including elements connected to the individuals who develop and operate such systems or web services, such as fairness, exclusion owing to designer prejudice, etc. Scholars can also look at concerns like systemic discrimination, man-in-the-middle bias, and other factors impacting the design and implementation of eGS platforms and websites.

6 Conclusion

We summarise our findings and observations to address the questions about conceptualising digitally enhanced accountability (DA) by exploring design factors of e-government websites and their interrelationships. We conducted a literature study in the field of e-government, which resides at the confluence of public administration and information systems literature, to explore the essential factors to conceptualise accountability for eGS. Transparency, Controllability, Responsibility, Responsiveness, Liability and Security & Privacy were established as the constituent dimensions, and we validated this based on the expert's opinion.

Employing a mixed-method approach by combining the quantitative BWM technique with the qualitative TISM-MICMAC technique. We were able to ascertain the relative contextual importance of these factors and explore their interrelationships in ensuring DA. We classified these dimensions as dependents, drivers, and linkage factors when designing and implementing accountability measures on eGS-delivering websites. The findings from this study highlight that the cornerstone of accountable government processes is Transparency and establishing the liability of government officials at the policy level. Developing confidence among citizens and encouraging the usage of e-services requires enforcing responsibility and responsiveness in website operations. Controllability and liability act as linkages that facilitate the operationalisation of accountability mechanisms by incorporating citizen's voices.

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Appendix

A.1 Expert Panel Details

S.no	Expert	Sector	Experience (years)	Gender	Domain Expertise
Panel 1: Experts with 5-20 years of experience					
1	Government advisor	Public	17	Male	IT Policy
2	Senior Scientist, Web Technologies	Public	17	Male	E-governance
3	Senior Scientist, Web Technologies	Public	16	Male	E-governance
4	Professor	Public	15	Male	Public Administration
5	Professor	Public	14	Female	IT Policy
6	Senior IT Consultant	Private	12	Male	E-governance
7	Senior IT Consultant	Public	10	Male	E-governance
8	Associate Professor	Public	10	Male	Information Systems Area
9	Assistant Vice President, Product based IT company	Private	9	Female	Web Services
10	Associate Director, Research think tank	Private	9	Male	Information Systems Area
11	Associate Professor	Public	8	Female	Information Systems Area
12	Website and New Media Manager	Private	7	Male	Web Services
13	Product manager, Product based IT company	Private	7	Male	Web Applications
14	Research Fellow at think tank	Public	7	Female	E-governance
Panel 2: Senior experts with more than 20 years experience					
1	Director Genereal of government IT organisation	Public	35	Female	E-governance and ICT Policy
2	Professor	Public	30	Female	Public Administration and IT Policy
3	Civil Servant and CEO of government IT organisation	Public	27	Male	E-governance and public administration
4	President of think tank and government advisor	Private	27	Male	ICT and Economic Policy
5	Senior Consultant with World Bank	Private	25	Male	E-governance and ICT Policy
6	Professor	Public	25	Male	Information Systems Area
7	Supreme Court lawyer and Technology Counsultant	Private	21	Male	IT Law and Policy

Table A.1: Expert Panel Details

A.2: Best-Worst Method inequalities

We use the 2 vectors developed in table 2 and 3 to develop min-max equations for all criteria which could be written as solvable inequalities.

$$W1-2W2 \leq \xi,$$

$$W1-3W3 \leq \xi,$$

$$W1-4W4 \leq \xi,$$

$$W1-5W5 \leq \xi,$$

$$W1-4W6 \leq \xi,$$

$$W1-5W5 \leq \xi,$$

$$W2-3W5 \leq \xi,$$

$$W3-W5 \leq \xi,$$

$$W4-2W5 \leq \xi,$$

$$W6-3W5 \leq \xi,$$

for all W_j such that: $W1+W2+W3+W4+W5+W6=1$

And, $W1, W2, W3, W4, W5, W6 \geq 0$

A.3: Step-wise TISM analysis

This sub-section outlines the analysis done using the TISM-MICMAC method

Step I: Using literature review and experts' opinion, create a list of factors constituting DA (see Table 1).

Step II: Develop the TISM reachability matrix (RM) in consultation with experts to establish different possible relationships between the factors

We develop the RM by taking expert's input in a pairwise comparison matrix, where each possible relationship is coded as a 1 or 0 if there is no relation. It is a mathematical representation of the interrelationships between the factors. This table is an $n \times n$ matrix describing the relationships between the different factors under analysis. Each cell with a 1 represents a possibility of a relationship. The ones with an asterisk (1*) denote significant transitive links for the context under examination. Transitivity is checked with a simple rule in the matrix that if dimension A will influence B and B will influence C, then by virtue of transitivity A should be influencing C. However, in TISM, we only retain those transitive links that are significant and explained by the experts in the chosen context.

Step III: Conduct pairwise analysis of the interactions between these elements to create a knowledgebase that includes causal explanations from experts and even transitive relationship that are contextually significant (Table A.4).

The knowledgebase is a representation of the panel's knowledge of and about the interrelationships between the factors being analysed. Each relationship in the context is analysed for two things: first, whether any relationship is possible between 2 factors or not, and second, if possible, what are the causal explanations for the same? Table 5 presents this collection of knowledge that will become the foundation for further analysis. TISM uses a logic behind the relationships to explain the causality. We have chosen to work with the rationale of 'dimension A will influence dimension B' with influence in ensuring DA as the logic of comparison.

	Factors	comparison statement	Possible relation	Causal interpretation for relationships
	F1-Transparency			
1	F1-F2	Transparency will influence Controllability	Yes	Transitive: Using public data and liability systems, citizens can assess and influence service provider performance.
2	F2-F1	Controllability will influence Transparency	No	
3	F1-F3	Transparency will influence Responsibility	Yes	Because of publicly available terms and conditions of the services, there will be demand to perform and meet the established KPIs.
4	F3-F1	Responsibility will influence Transparency	No	
5	F1-F4	Transparency will influence Responsiveness	Yes	Transitive: An open system will encourage participation and provide chances for citizens to provide recommendations and feedback.
6	F4-F1	Responsiveness will influence Transparency	No	
7	F1-F5	Transparency will influence Liability	Yes	Each procedure will have a legally and structurally accountable representative in a transparent system.
8	F5-F1	Liability will influence Transparency	No	
9	F1-F6	Transparency will influence Security and Privacy	Yes	Open Systems has well defined guidelines for storing and sharing user data in line with the services furnished.
10	F6-F1	Security and Privacy will influence Transparency	Yes	Security and privacy trade-offs would limit the amount of openness that could be achieved without jeopardising data protection and access restrictions.
	F2-Controllability			
11	F2-F3	Controllability will influence Responsibility	Yes	Collaborating with public to build and co-produce services will increase officials' sense of accountability.
12	F3-F2	Responsibility will influence Controllability	No	
13	F2-F4	Controllability will influence Responsiveness	Yes	People would feel more heard and involved when governments promote citizen collaboration.
14	F4-F2	Responsiveness will influence Controllability	No	
15	F2-F5	Controllability will influence Liability	No	
16	F5-F2	Liability will influence Controllability	Yes	We may empower citizens to regulate officials' conduct by identifying them as process owners over platforms and websites.
17	F2-F6	Controllability will influence Security and Privacy	No	
18	F6-F2	Security and Privacy will influence Controllability	Yes	Transitive: Citizens' expectations of privacy and security would shape service rules and authorities' roles.
	F3-Responsibility			

19	F3-F4	Responsibility will influence Responsiveness	Yes	Citizens will always feel connected and valued by the system if authorities are upholding the promised standards of service policy.
20	F4-F3	Responsiveness will influence Responsibility	Yes	When people' views are heard and administration is accommodating, the sense of responsibility for social good grows.
21	F3-F5	Responsibility will influence Liability	No	
22	F5-F3	Liability will influence Responsibility	Yes	Fixing officials' obligation for specified duties and processes would help users and the ombudsman to enforce responsibility.
23	F3-F6	Responsibility will influence Security and Privacy	No	
24	F6-F3	Security and Privacy will influence Responsibility	No	Transitive: Individual officials' responsibilities would be fixed by the security policy, which defines the levels of access in the systems.
F4-Responsiveness				
25	F4-F5	Responsiveness will influence Liability	No	
26	F5-F4	Liability will influence Responsiveness	Yes	designating authorities liable for service outcomes and making their performance information public helps ensure that they become receptive to people's feedback.
27	F4-F6	Responsiveness will influence Security and Privacy	No	
28	F6-F4	Security and Privacy will influence Responsiveness	No	
F5-Liability				
29	F5-F6	Liability will influence Security and Privacy	No	
30	F6-F5	Security and Privacy will influence Liability	Yes	Policymakers determine who is responsible for safeguarding citizen data in relation to a service depending on the policy that has been adopted.

Table A.2: TISM knowledge base

Step IV: use the TISM partitioning procedure to ascertain levels for each dimension in the diagraph.

This is an iterative process of assigning different levels to the factors we are trying to analyse. We start by putting down all the factors in table A.2 with their reachability and antecedent sets. Reachability set for a factor is defined by all the cells in their row which have a 1 (with or without the asterisk) in the fully transitive reachability matrix. Antecedent set is the collection of all the cells that have a 1 (with or without the asterisk) in their column of the fully transitive reachability matrix. The intersection set is simply the intersection of the reachability and antecedent sets.

In any iteration of the partitioning process, we assign a level to any factor if their reachability and intersections sets are same. And, in the next iteration that number is removed from the complete table. For instance, in the first iteration of the table A.2, we assign F3 and F4 level 1 and in the next iteration the numbers 3 & 4 are removed from the table completely. We then assign F2 the next level as per the first rule and continue the process until all factors are

assigned a level. The final matrix which assigned levels to all factors is called the canonical matrix.

Iteration-1				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	{1,2,3,4,5,6}	{1,6}	{1,6}	
F2	{2,3,4}	{1,2,5,6}	{2}	
F3	{3,4}	{1,2,3,4,5,6}	{3,4}	1
F4	{3,4}	{1,2,3,4,5,6}	{3,4}	1
F5	{2,3,4,5}	{1,5,6}	{5}	
F6	{1,2,3,4,5,6}	{1,6}	{1,6}	
Iteration-2				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	{1,2,5,6}	{1,6}	{1,6}	
F2	{2}	{1,2,5,6}	{2}	2
F5	{2,5}	{1,5,6}	{5}	
F6	{1,2,5,6}	{1,6}	{1,6}	
Iteration-3				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	{1,5,6}	{1,6}	{1,6}	
F5	{5}	{1,5,6}	{5}	3
F6	{1,5,6}	{1,5,6}	{1,6}	
Iteration-4				
Factors	Reachability Set	Antecedent Set	Intersection Set	Level
F1	{1,6}	{1,6}	{1,6}	4
F6	{1,6}	{1,6}	{1,6}	4

Table A.3: Level Partitioning for TISM.

Step V: Create a final TISM diagram based on the allocated levels, with interpretative explanations on the connecting arrows (figure 3). The factors are put in bubbles at different hierarchical levels, connected by arrows. Solid arrows are used for direct relations while dotted ones are used for transitive relationships. Explanations from the knowledge base are then put on this arrows to give a structured view of the interpreted concept under study.

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