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E-Government Information Systems (IS) Project Failure in Developing Countries: Lessons from the Literature

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Abstract
E-government information systems (IS) projects experience numerous challenges that can lead to total or partial failure. The project failure factors have been identified and studied by numerous researchers, but the root causes of such failures are not well-articulated. In this study, literature on e-government IS project failures in developing-world contexts is reviewed through the application of qualitative meta-synthesis, design–reality gap analysis, and root cause analysis. In the process, 18 causal factors and 181 root causes are identified as responsible for e-government IS project failures. The most prevalent of the 18 causal factors are found to be *inadequate system requirements engineering* (with 22 root causes), *inadequate project management* (19 root causes), and *missing or incomplete features* (16 root causes). These findings can be of use to future researchers, policymakers, and practitioners seeking to identify methods of avoiding e-government IS failures, particularly in developing-world contexts.

Keywords
e-government, information systems (IS), project failure, literature review, qualitative meta-synthesis, design–reality gap analysis, ITPOSMO, root cause analysis

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1. Introduction

E-government information systems (IS) are increasingly becoming essential tools for the delivery of government services and the improvement of government administration in developing-world countries. Such systems enable citizens to access government services at a relatively low cost compared to traditional face-to-face services, making government services more convenient and accessible (Gilbert et al., 2004). These systems also transform the relationships between governments and their citizens by reducing citizens' personal interactions with government staff, thus increasing transparency and reducing corruption (Sun et al., 2015).

In Tanzania, notable e-government systems include the electronic payment gateway (GePG), which facilitates the collection of government revenues electronically from various sources, while simplifying the way citizens pay government bills (i.e., making payments through mobile phones and banks). Similarly, the traffic management system (TMS) facilitates the payment of drivers' fines by electronic means. The Ministry of Lands Information System (MOLIS) enables citizens to perform self-assessments of land rent and accrued penalties due to delayed payment, to generate bills, and to pay through the GePG. The system has helped to avoid multiple allocations of plots and minimise citizens' complaints about plot allocations. Other notable information systems include the national payment system (NPS), the electronic clearing house (ECH), the integrated financial management system (IFMS), the integrated human resource and payroll system, and the retail payment system (RPS) (Ministry of Works, Transport and Communication, 2016; Sæbø, 2012).

However, many e-government projects in Tanzania, as in other developing countries, have experienced challenges leading to total or partial failure (Gunawong & Gao, 2017). For example, Tanzania's Mwananchi portal—launched in 2009, revamped in 2014, and designed to act as the main information gateway between citizens and the government—was abandoned. And an e-claims system, acquired by the National Health Insurance Fund (NHIF) of Tanzania to facilitate the processing of insurance claims by health service providers, was delivered and accepted with critical features missing. As a result, some of the essential claim processing steps, including data

exchange between subsystems, were performed manually. The system was prone to errors, labour-intensive, and took a long time to process claims (National Audit Office of Tanzania, 2019). Another project had to be initiated to fix the identified problems.

In Lesotho, an evaluation of four e-government websites revealed that they were missing critical features and functionalities in terms of accessibility, usability, transparency, and interactivity (Thakur & Singh, 2012). In South Africa, the eThekwini Municipality's Revenue Management System (RMS) project, initiated in 2003, was only completed in 2016 and had a budget overrun of 666% (Comins, 2020; Thakur & Singh, 2012).

In an effort to better understand the main causes of e-government IS project failures in developing-world contexts, we conducted a literature review that applied qualitative meta-synthesis, design–reality gap analysis, and root cause analysis.

2. Research design

Analytical frameworks

Qualitative meta-synthesis

Qualitative meta-synthesis is a research method that involves the collection, interpretation, translation, and synthesis of findings across multiple qualitative studies (Sandelowski et al., 1997). The authors selected this method because most studies on e-government project failure are qualitative. This method is suitable for studies that require the integration of results from multiple qualitative studies as it combines both literature review and critical interpretation.

Design–reality gap analysis

In influential working papers on e-government for development, Heeks (2003; 2001) posits that most e-government project failures are the result of "design–reality gaps". Heeks (2003; 2001) proposes seven dimensions that must be analysed in order to understand these gaps, using the acronym "ITPOSMO" to represent the seven dimensions, as follows:

- information;
- technology;
- processes;
- objectives and values;
- staffing and skills;
- management systems and structures; and
- other resources: time and money (Heeks, 2003, p. 3).

Root cause analysis

Root cause analysis seeks to understand what happened and why it happened (Livingston et al., 2001). Al-Ahmad et al. (2009) use root cause analysis to review the literature on information technology (IT) project failures, finding that root causes fall under six factors: project management, top management, technology, organisational, complexity, and processes. Dalal and Chhillar (2013) conducted an empirical study to determine the root causes of software failures. According to Dalal and Chhillar (2013), the primary cause of software failure was inadequate testing due to insufficient testing tools, insufficient test cases, and lack of negative testing. Other root causes were inadequate project planning, requirement engineering, and design.

Methodology

Data collection

We performed multiple rounds of searches through different libraries, including Google Scholar, ACM Digital Library, Research Gate, IEEE Xplore, Springer, and Science Direct. The following keywords were used: e-government project failure; a case study of e-government project failure; causes of e-government project failure; factors leading to e-government project failure; the success of e-government projects; barriers of e-government systems; challenges of e-government projects; and issues of e-government projects. A total of 86 studies were found, and 64 articles were selected to be used in this study. The chosen studies were academic research articles and industrials research reports with a primary focus on the failure or success of e-government IS projects.

Causal factor charting

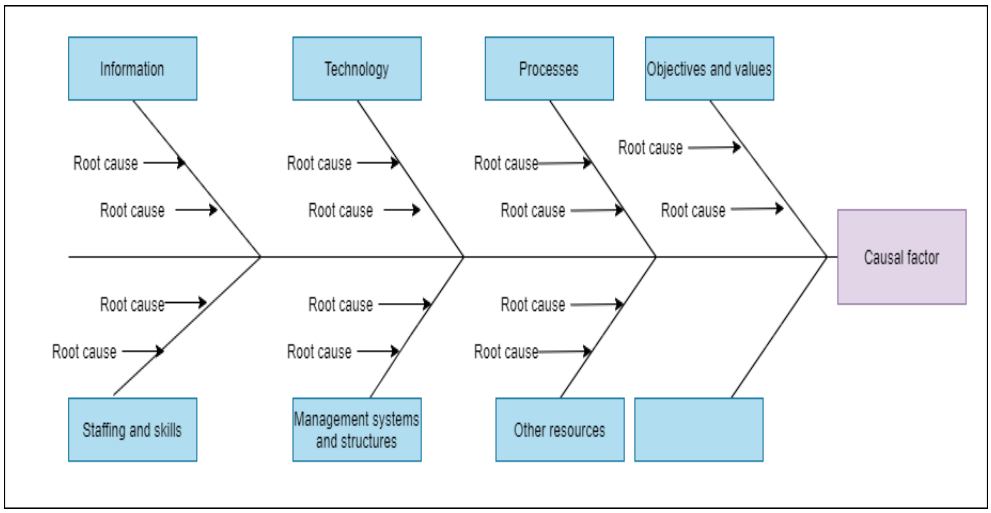
We used qualitative meta-synthesis to identify, across the 64 pieces of literature, the main causal factors that have been found to be responsible for IS project failure. Eighteen causal factors were identified. Additional literature searching was conducted to locate articles focusing on the identified causal factors and their root cause. A number of additional articles were identified, covering the following themes: user involvement (2 articles), e-government project management (6), e-government architecture (2), technology complexity (4), software testing (2), e-government infrastructure (3), information (2), requirement engineering (5), business processes management in governments (5), change management (2), management structure (2), e-government skills (2), top management involvement (1), and e-government systems integration (1).

Root cause identification

Fishbone diagrams were used to visualise the identified root causes linked to each of the 18 causal factors. The seven ITPOSMO design–reality gap dimensions served as root cause categories for each causal factor, drawn as branches connected to the

backbone (the causal factor). The root causes identified in the literature were then mapped onto each of the seven root cause categories, as illustrated in Figure 1.

Figure 1: Fishbone diagram with seven root cause categories (ITPOSMO dimensions)



3. Findings

A total of 18 causal factors were identified in the literature via qualitative meta-synthesis, as shown in Table 1.

Table 1: Causal factors identified in existing literature

	Causal factor	Literature
1	Inadequate system requirements engineering	Baguma & Lubega (2013), Goedeke et al. (2017), Hussain, Mkpojiogu, & Abdullah, (2016), Sweis (2015), Hofmann & Lehner (2001), Bubenko (1995), Michael & Boniface (2014), Zakaria et al. (2011)
2	Inadequate project management	Afyonluoğlu et al. (2014), Aikins (2012), Baguma & Lubega (2013), Goedeke et al. (2017), Gunawong & Gao (2017), Hossan et al. (2006), Imran et al. (2017), Rajapakse et al. (2012), Rajala & Aaltonen (2020), Sweis (2015), S. R. A. Shah et al. (2011), Twizeyimana et al. (2018)
3	Missing or incomplete features	Baguma & Lubega (2013), Damoah & Akwei (2017), Goedeke et al. (2017), Gunawong & Gao (2017)
4	Inadequate project planning	Aikins (2012), Baguma & Lubega (2013), Bakunzibake et al. (2018), Ghapanchi & Albadvi (2008), Goedeke et al. (2017), Hossan et al. (2006), Rajala & Aaltonen (2020), Rajapakse et al. (2012), Twizeyimana et al. (2018)
5	Inappropriate choice of technology	Goedeke et al. (2017), Ghapanchi & Albadvi (2008), Lau (2003)
6	Insufficient top management support	Aikins (2012), Baguma & Lubega (2013), Bakunzibake et al. (2018), Goedeke et al. (2017), Ojha & Pandey (2017), Sweis (2015)

	Causal factor	Literature
7	Integration failure	Al-Khanjari et al. (2014), Ghapanchi & Albadvi (2008), Goedeke et al. (2017), Lam (2005)
8	Procurement and contract shortcomings	Goedeke et al. (2017), Ojha & Pandey (2017), Rajapakse et al. (2012)
9	Inadequate business process management (BPM)	Afyonluoğlu et al. (2014), Baguma & Lubega (2013), Bakunzibake et al. (2018), Dada (2006), Goedeke et al. (2017), Gartlan & Shanks (2007), Martin & Montagna (2006), Reffat (2003), Swartz (2018), Trkman (2010)
10	Insufficient IS testing	Goedeke et al. (2017), Mansor & Ndudi (2015), Rajala & Aaltonen (2020), Rajapakse et al. (2012)
11	Insufficient change management	Afyonluoğlu et al. (2014), Aikins (2012), Bakunzibake et al. (2018), Ghapanchi & Albadvi (2008), Dada (2006), Hossan et al. (2006), Nograsek (2011)
12	Staffing and skills shortfalls	Abbas et al. (2017), Baguma & Lubega (2013), Dada (2006), Goedeke et al. (2017), Hossan et al. (2006), Rajala & Aaltonen (2020), Rajapakse et al. (2012), Ojha & Pandey (2017), Twizeyimana et al. (2018), Zakaria et al. (2011)
13	Technical over-complexity	Goedeke et al. (2017), Abbas et al. (2017), Botchkarev & Finnigan (2015), Sweis (2015), Lau (2003), Mukherjee (2008)
14	Obsolete technology	Baguma & Lubega (2013), Goedeke et al. (2017)
15	Information gaps	Heeks (2001), Rajapakse et al. (2012), Vyas et al. (2014)
16	Inadequate infrastructure	Baguma & Lubega (2013), Dahiya & Mathew (2018), Bakunzibake et al. (2018), Goedeke et al. (2017), Hossan et al. (2006), Rahman et al. (2014), Twizeyimana et al. (2018)
17	Political interference	Abbas et al. (2017), Baguma & Lubega (2013), Hossan et al. (2006), Rajala & Aaltonen (2020), Toots (2019)
18	Inappropriate organisational management structure	Abbas et al. (2017), Goedeke et al. (2017), Rajala & Aaltonen (2020), S. R. A. Shah et al. (2011)

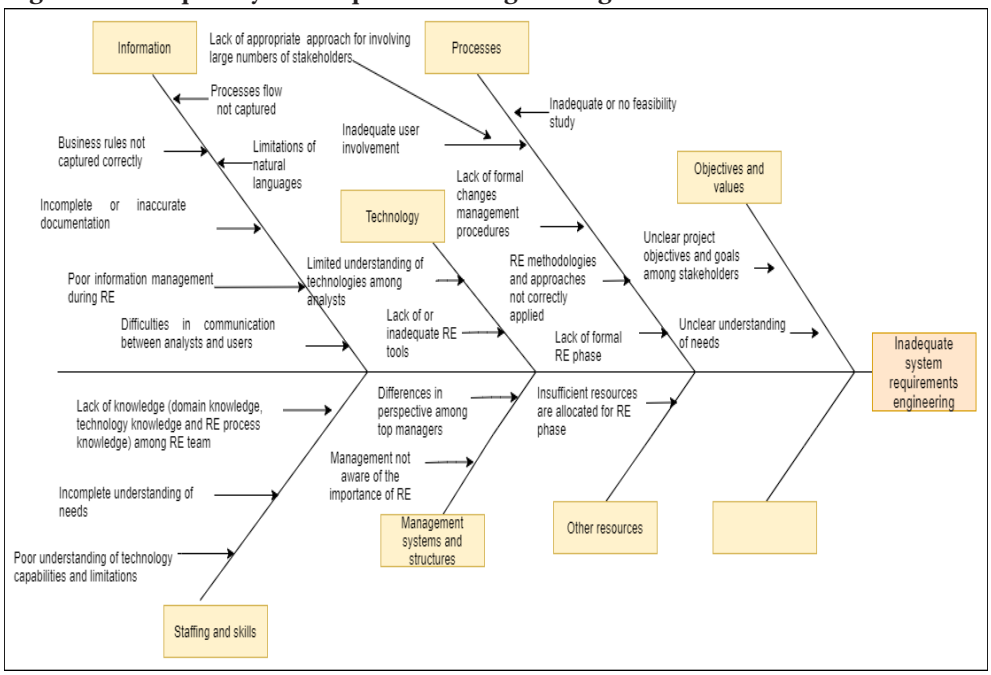
For each of the 18 causal factors tabulated above, root causes were identified in the literature, and mapped onto fishbone diagrams. The 18 sub-sections that follow explain each of the causal factors and provide a fishbone diagram for each causal factor's root causes.

Inadequate system requirements engineering

Requirements engineering is the process of discovering, documenting, and analysing services to be offered by a given system and the constraints under which those services should be provided (Feldgen & Clua, 2014). It involves systematic investigation and studying existing systems, processes, materials, operating environments, users' needs, and other artefacts to establish the new system's needs (Ullah et al., 2011). Bail (2010) estimated that inadequate system requirements specifications caused 50% of

IS project failures. For instance, the student information system implemented by the Uganda Management Institute (UMI) failed because it missed vital features in the finance module. The analyst failed to include these features' requirements in the initial requirements specification document (Baguma & Lubega, 2013). Requirements engineering problems include missing requirements, incomplete requirements, ambiguous requirements, poor requirement traceability, elicitation of irrelevant requirements, and poor requirements management (Shah & Patel, 2014). The root causes of inadequate information system requirements engineering are presented in Figure 2.

Figure 2: Inadequate system requirements engineering

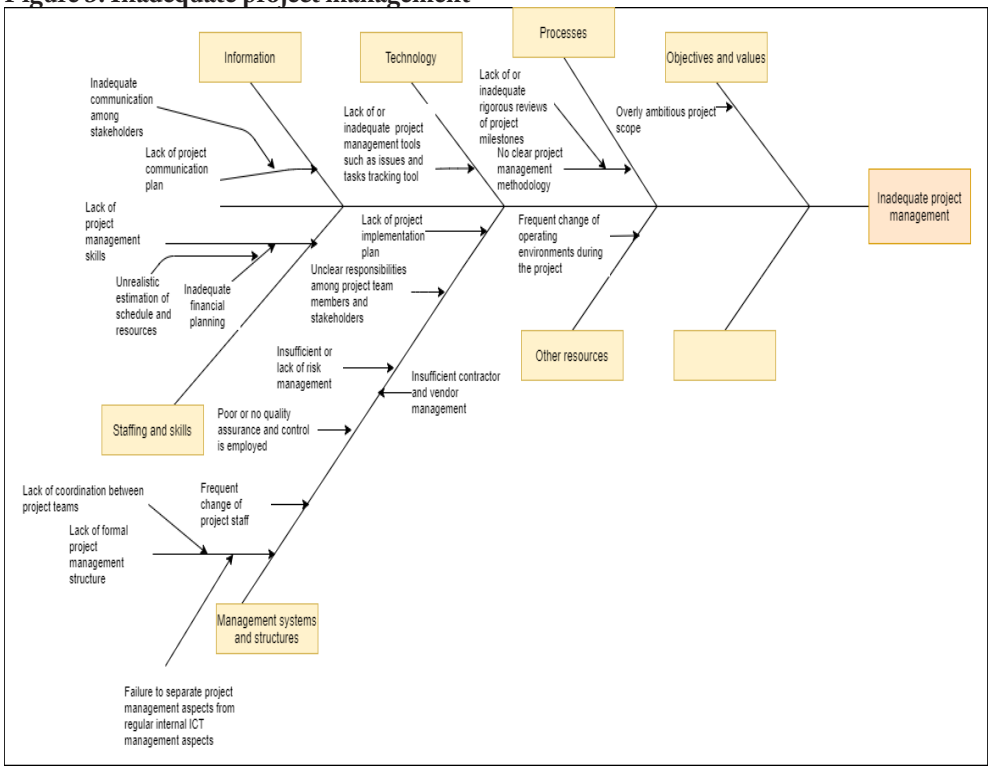


Inadequate project management

Project management is the application of knowledge, skills, tools, and techniques to guide the project activities in accordance with project objectives and goals (Imran et al., 2017). Many e-government IS projects fail due to inadequate project management. The electronic National Traffic Information System (e-NaTIS) in

South Africa failed mainly due to poor project management (Rajapakse et al., 2012). E-government projects should adopt proven project management methodologies, align their goals with organisational strategic goals, and hire competent people to manage them (Aikins, 2012). The root causes of inadequate project management are shown in Figure 3.

Figure 3: Inadequate project management

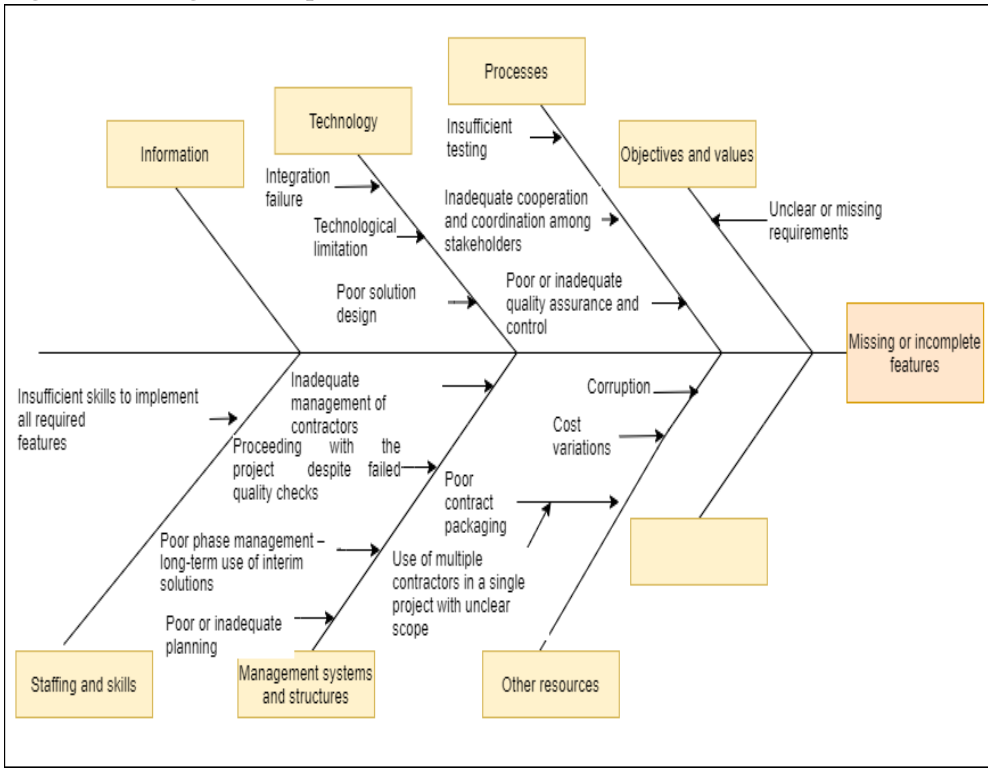


Missing or incomplete features

An IS project is said to be successful if it is delivered within time, budget, and with desired quality, features, and usability that reflects the real needs of the customers or users (Hussain, Mkpojiogu, & Abdullah, 2016). In some cases, e-government IS

projects are delivered and accepted with missing or incomplete vital features, thus failing to function and provide the anticipated results (Baguma & Lubega, 2013; Damoah & Akwei, 2017). This practice leads to a total or partial failure of the e-government IS project. For example, the Friend a Gorilla project in Uganda, implemented to raise awareness and funds for promoting Gorilla conservation, was delivered without crucial features for the online selling of promotional materials and SMS-based Gorilla friending (Baguma & Lubega, 2013). Several root causes can lead to the delivery of incomplete projects, including government officials' compromises due to corruption, and the failure to follow the correct procedures (Damoah & Akwei, 2017). Other root causes are as indicated in Figure 4.

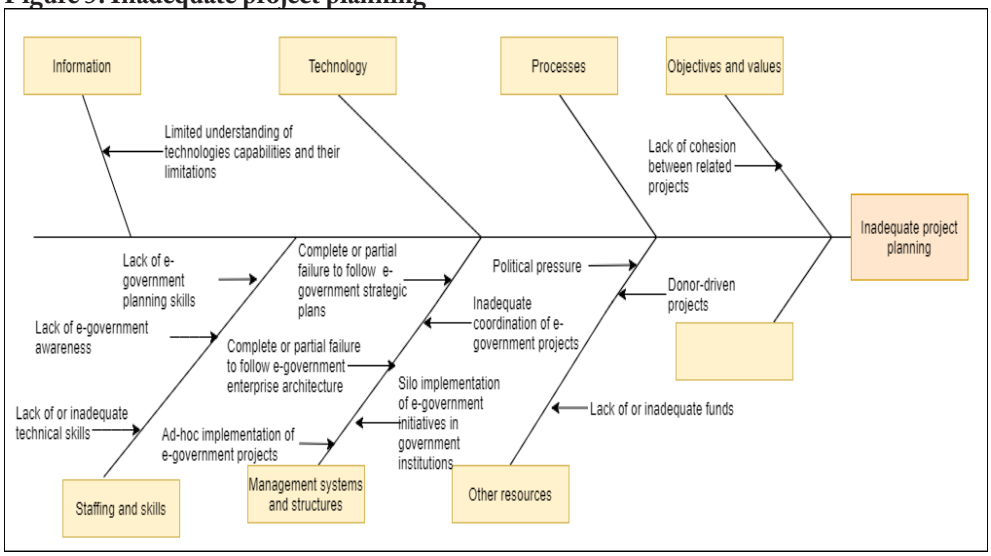
Figure 4: Missing or incomplete features



Inadequate project planning

The project plan outlines activities, timelines, resources, risks, constraints, expected output, and baseline information against which the project can be conducted, monitored, and evaluated (Imran et al., 2017). Many of the challenges facing e-government projects can be avoided or minimised if projects are thoroughly planned (Ghapanchi & Albadvi, 2008). The e-Revenue License project in Sri-Lanka is considered a successful e-government initiative because it was adequately planned (Rajapakse et al., 2012). The root causes of inadequate project planning are shown in Figure 5.

Figure 5: Inadequate project planning

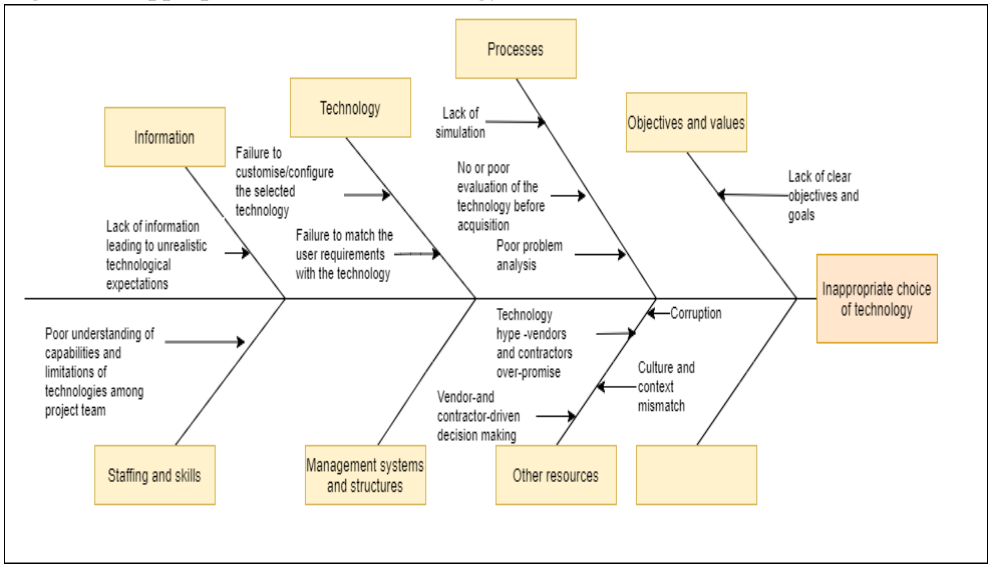


Inappropriate choice of technology

When selecting technology for a particular project, several factors must be considered, including easy to learn and use, fit for the purpose, easy to integrate with existing systems, availability of documentation and support, availability of skills, overall implementation costs, overall perceived quality, and usefulness (Hussein et al., 2007). Factors such as vendor hype and corruption may influence the choice of technology, leading to what is commonly known as vendor-driven projects (Damoah & Akwei, 2017). Thailand's smart card project, as described by Gunawong and Gao (2017), is an example of the use of inappropriate technology in an e-government initiative.

This project, which was launched in 2003 and abandoned in 2006, produced smart cards that could not be used electronically. Governments are advised to thoroughly evaluate the technologies before contracting suppliers (Lau, 2003). The root causes of inappropriate choice of technology are shown in Figure 6.

Figure 6: Inappropriate choice of technology

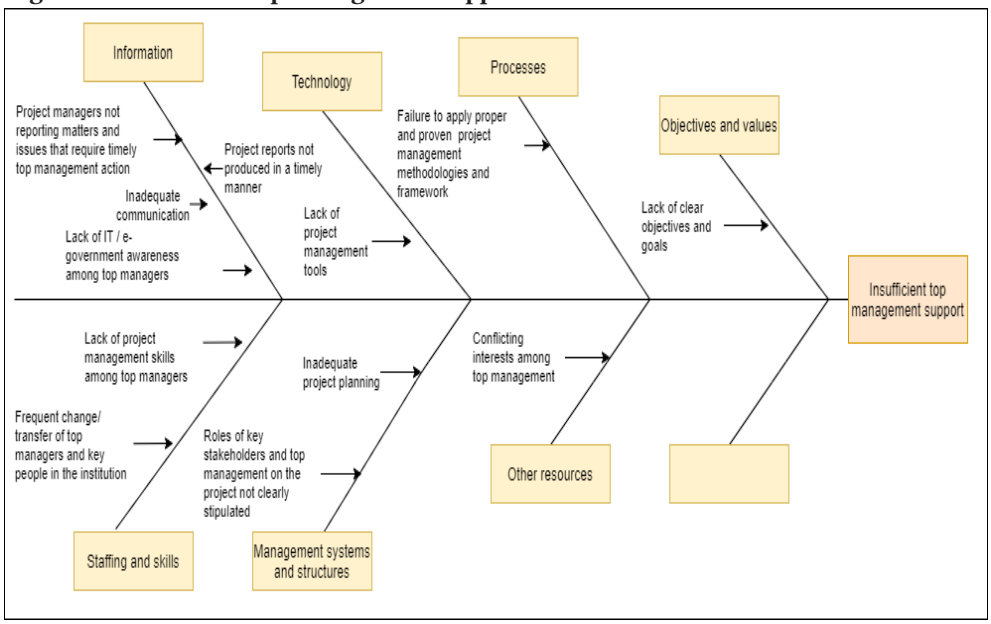


Insuffi cient top management support

As owners and sponsors of the e-government IS project, top managers are expected to closely follow up on critical aspects of the project, including ensuring that the project goals, objectives, vision, and values reflect those of the organisation. Top managers have to ensure that the project is managed according to the organisation's standards and that resources are made available in a timely fashion. They also have to ensure that project risks are identified and adequately mitigated. A systematic review of the project will ensure that milestones are accomplished in a timely fashion and

that project resources are appropriately used. Finally, top managers must promote the project to internal and external stakeholders (Ojha & Pandey, 2017; Zwikael, 2014). The root causes of insufficient top management support are shown in Figure 7.

Figure 7: Insufficient top management support

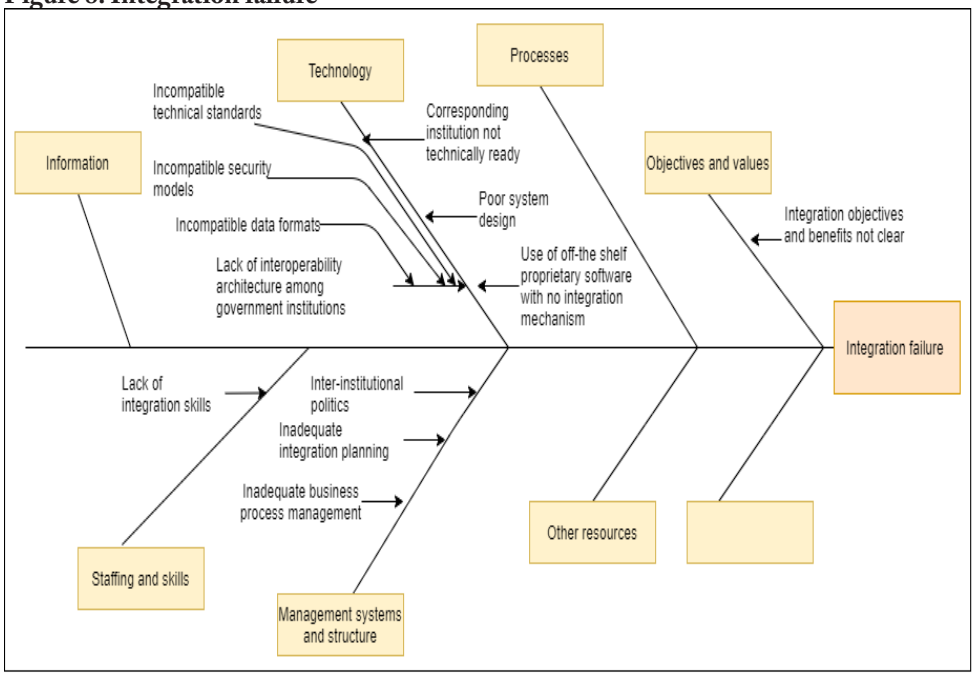


Integration failure

Delivering seamless services requires e-government systems to be integrated vertically and horizontally (Layne & Lee, 2001). However, this has been difficult to achieve (Sun et al., 2015). According to Lam, W. (2005), e-government systems integration challenges are categorised into four main categories: strategy, technology, policy, and organisation. Most government institutions and agencies develop their e-government systems independent from one another without paying much attention to how other government institutions and agencies might interact with them (Al-Khanjari et al., 2014). For example, integration between the citizen help requests (CHR) system designed by Bangladesh Police to facilitate online incident reporting and an identification system to authenticate the requesters failed due to technology and

organisational issues. Therefore, the police kept receiving requests with fake names, addresses, and contact information (Hasan, 2015). The root causes of integration failure are shown in Figure 8.

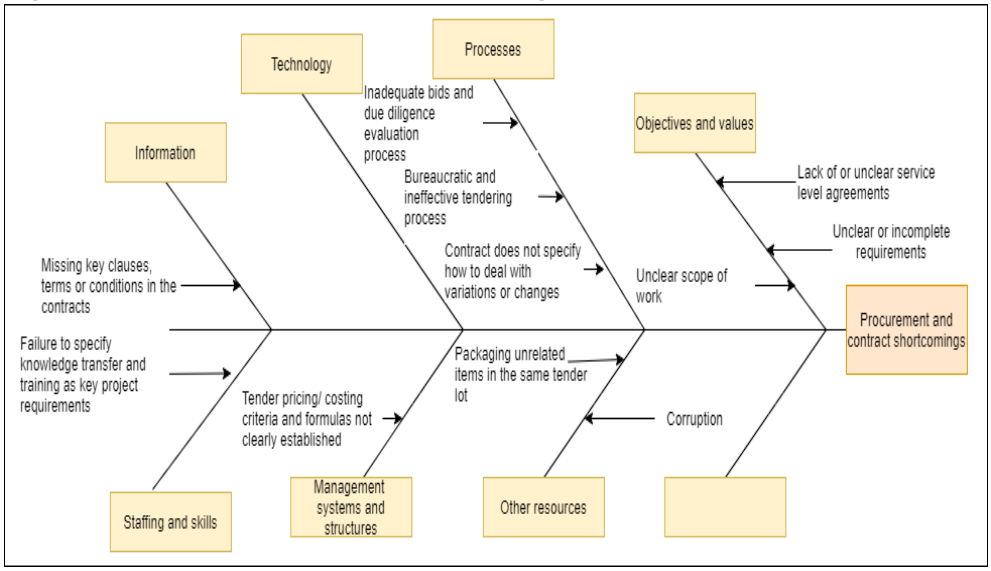
Figure 8: Integration failure



Procurement and contract shortcomings

Government institutions outsource most e-government IS projects to external vendors, contractors, and suppliers through legally binding contracts. Different forms of public-private partnerships are used in some cases (Ojha & Pandey, 2017). In either situation, it is essential to have a contract that specifies the parties involved, their obligations, the consequences for failure to meet the obligations, and settlement procedures for disagreement (Afyonluoğlu et al., 2014). Failure to have a fair contract may lead to legal issues, which may eventually lead to project failure. Figure 9 presents the root causes of procurement and contract shortcomings.

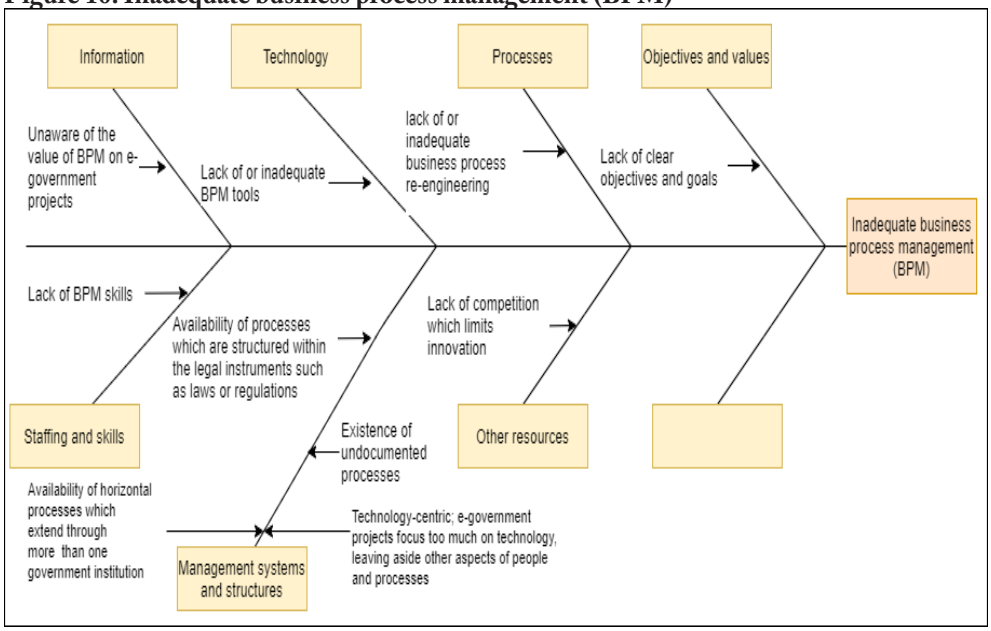
Figure 9: Procurement and contract shortcomings



Inadequate business process management (BPM)

Business process management (BPM) is an organisational strategy to identify, model, analyse, measure, automate, optimise, and continually improve fundamental activities in an organisation (Trkman, 2010). The overall objective of e-government initiatives is to improve public service delivery and enhance administration processes through e-services. In this case, BPM and e-government are two initiatives that have to go together as they complement each other. Unfortunately, most e-government IS projects are designed without BPM as a significant component (Martin & Montagna, 2006). Implementing an e-government information system without undertaking process re-engineering may lead to undesirable results and eventually project failure. The root causes of inadequate BPM are shown in Figure 10.

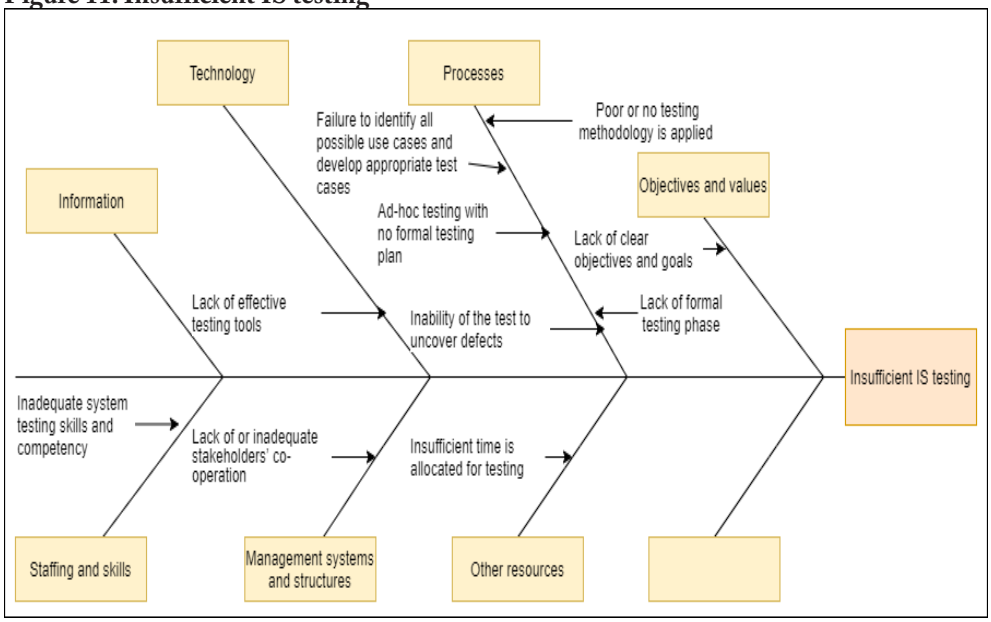
Figure 10: Inadequate business process management (BPM)



Insufficient IS testing

IS testing is one of the critical phases in the system development life cycle, aiming to verify, validate, detect, and fix errors in the system (Chaudhary, 2017). During the verification process, the developed system is checked to assess its conformity against the specified requirements. Insufficient system testing leads to the system's inability to meet stakeholders' expectations and needs, leading to abandonment (Mansor & Ndudi, 2015). The root causes of insufficient IS testing are shown in Figure 11.

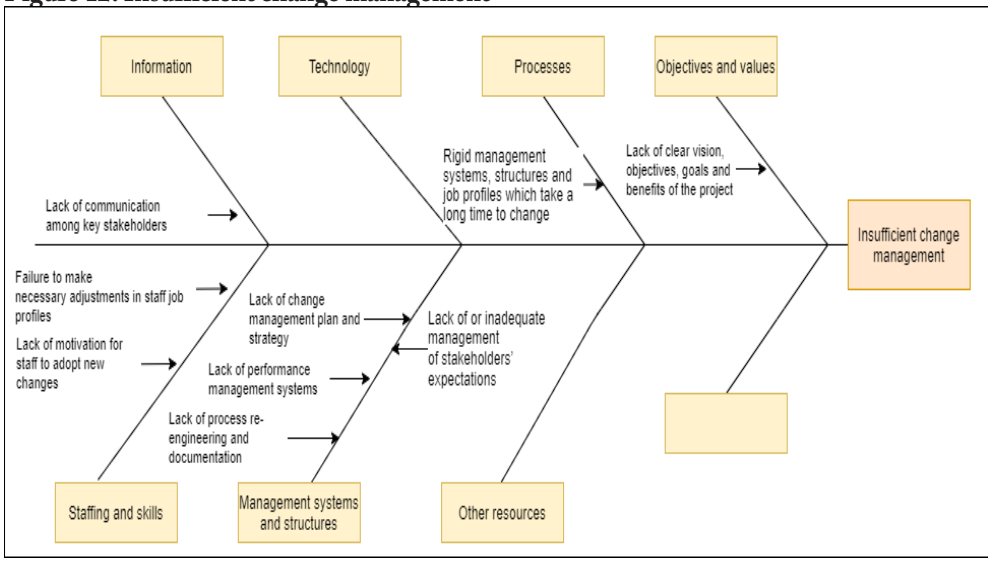
Figure 11: Insufficient IS testing



Insuffi cient change management

E-government projects are transformational as they tend to change the business process, service delivery mechanisms, and organisational structure (Afyonluoğlu et al., 2014). Successful transformation requires an appropriate change management process. Some e-government systems projects fail due to the institution's inability to make the necessary institutional rearrangements to shift from the old processes to the new processes offered by the developed e-government IS. A practical change management framework to support the successful implementation of the e-government system project must consider all the organisation's aspects, including technology, administration, operation, legislation, people, and organisation (Afyonluoğlu et al., 2014; Nograsek, 2011). The root causes of insufficient management are shown in Figure 12.

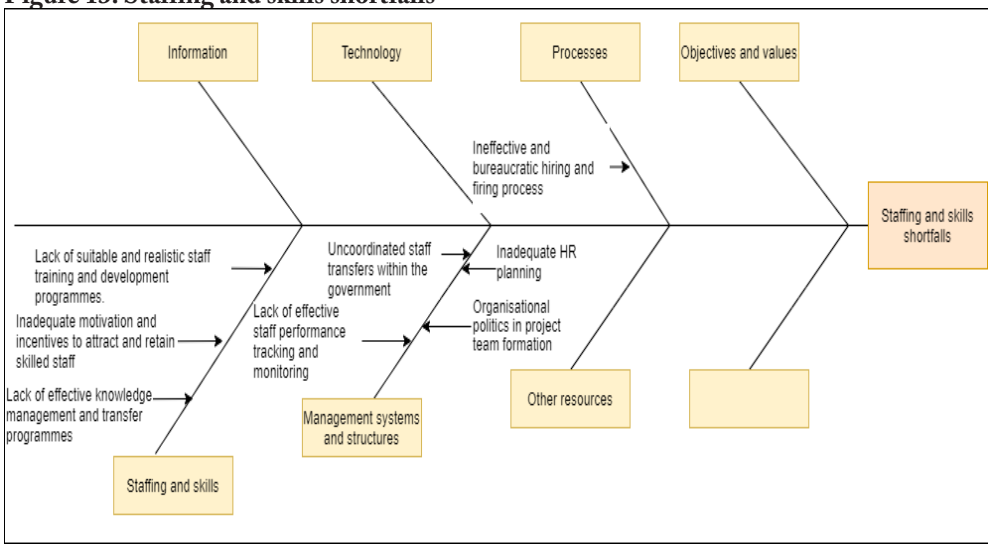
Figure 12: Insufficient change management



Staff ing and skills shortfalls

An effective e-government project implementation team must possess essential skills, including: strategic information technology skills, information society skills, information management skills, technical skills, project management skills, and communication and presentation skills (Lau, 2003; Al Salmi et al., 2017). Most governments in developing countries suffer from a severe shortage of skilled staff (Rahman et al., 2014). The lack of relevant technical skills within the e-government project team negatively impacts the information systems quality (Ghapanchi & Albadvi, 2008). Khan and Islamabad (2009) estimated that Pakistan's government is getting barely 40% of results from its investment in e-government initiatives due to the lack of a skilled workforce. The root causes of staffing and skills shortfalls are shown in Figure 13.

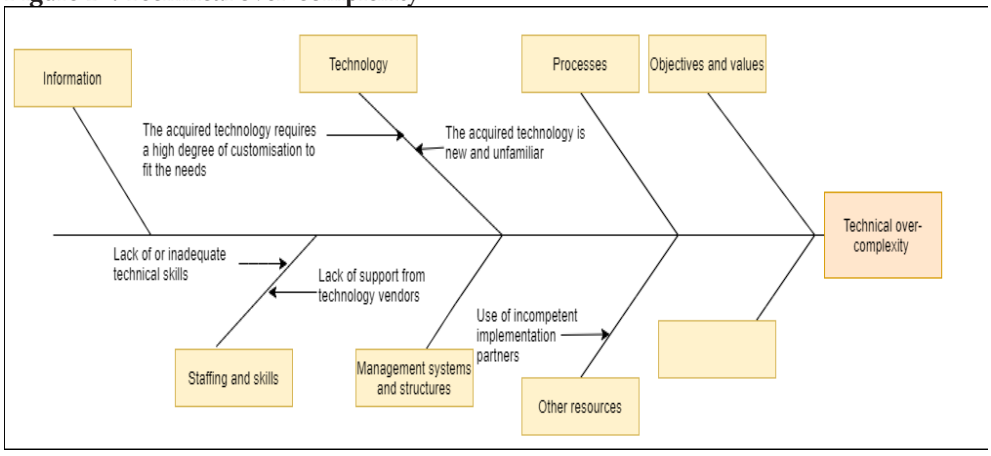
Figure 13: Staffing and skills shortfalls



Technical over-complexity

In this context, technical complexity refers to the difficulty of solving a given problem using the technology in question. It includes the inability to precisely determine information and processing requirements, data communication, and the overall system design, setup, and configurations (Xia & Lee, 2005). Lack of intensive technology evaluation is a leading cause of technical complexities and problems in e-government IS projects. Learning from previous project mistakes is crucial in mitigating risks and failures in new projects (Mukherjee, 2008). Figure 14 presents the root causes of technical over-complexity.

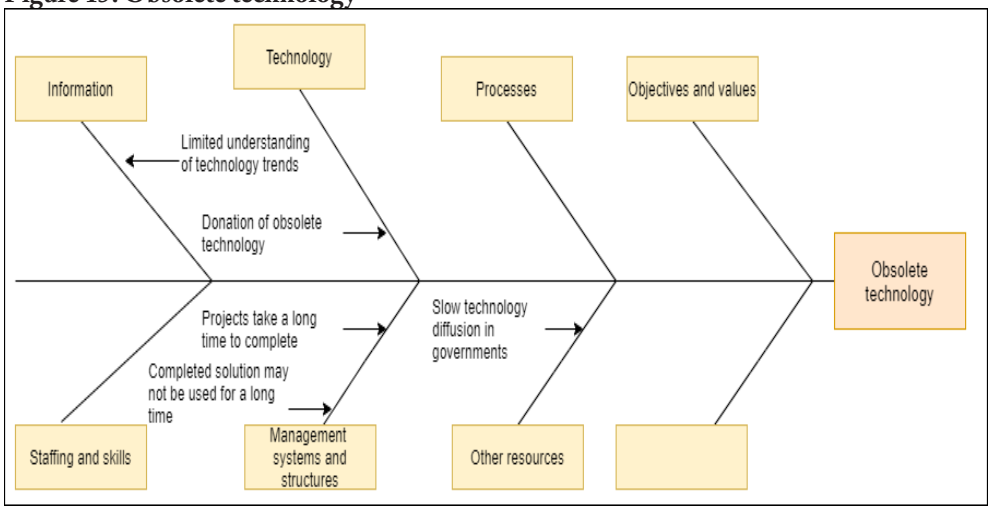
Figure 14: Technical over-complexity



Obsolete technology

The planning and implementation of e-government systems projects take a relatively long period of time. Consequently, some e-government projects are delivered while their associated technologies are or are about to become obsolete. Developing countries also suffer from adopting outdated technology when technological equipment and systems are donated by developed countries. The root causes of obsolete technology are shown in Figure 15.

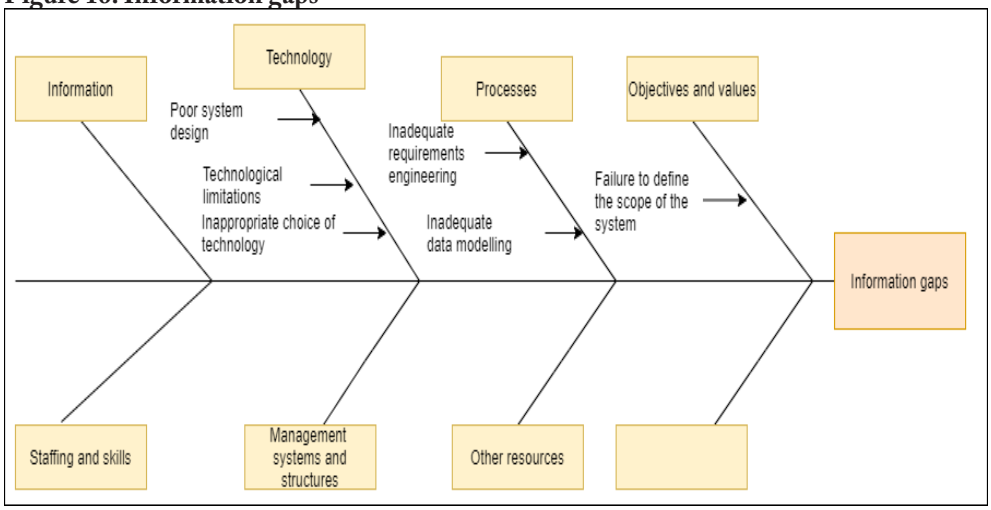
Figure 15: Obsolete technology



Information gaps

Mismatch of data between what is captured or produced by the system and what is required by users of the system can lead to e-government IS failure (Heeks, 2001). In e-government IS, the information gaps exist in three situations: capturing unnecessary information not required for processing or reporting; the failure to capture essential information necessary for processing or reporting; and asking for particular information that may not be available or relevant to some users or scenarios. For instance, the citizen help requests (CHR) system designed by Bangladesh Police required a request to have a valid signature of the requestor to start the investigation (Hasan, 2015). Citizens' inability to provide digital signatures online made the system unusable (Hasan, 2015). The root causes of information gaps are shown in Figure 16.

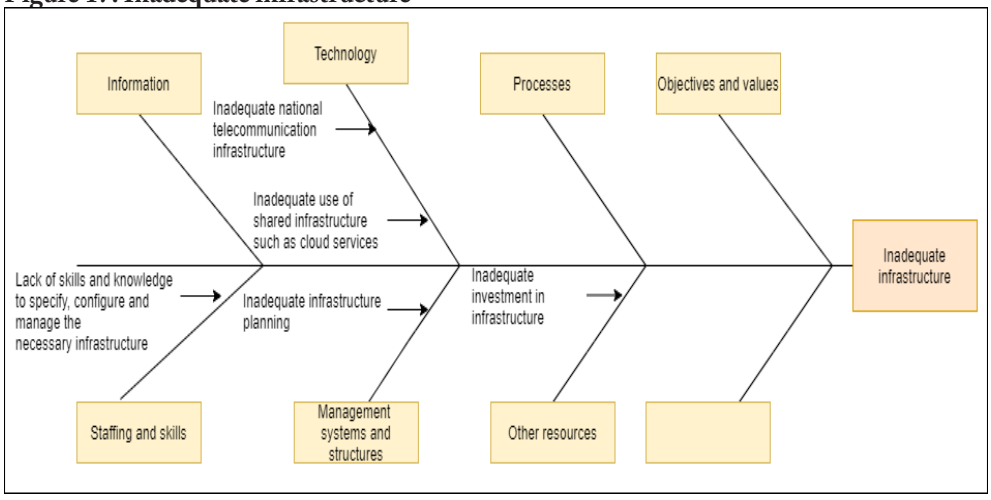
Figure 16: Information gaps



Inadequate infrastructure

E-government infrastructure encompasses hardware platforms, software platforms, middleware, data communications equipment, networks, backup hardware, disaster recovery hardware, and security technologies (Dahiya & Mathew, 2018). These devices and equipment make it possible to offer e-government services that are accessible to users. In IT, the performance and effectiveness of infrastructure are measured with reference to: reliability – its ability to ensure continuous uptime; scalability – its ability to accommodate increased load; and flexibility – its ability to accommodate changes that may be required (Dahiya & Mathew, 2018). The root causes of inadequate infrastructure are presented in Figure 17.

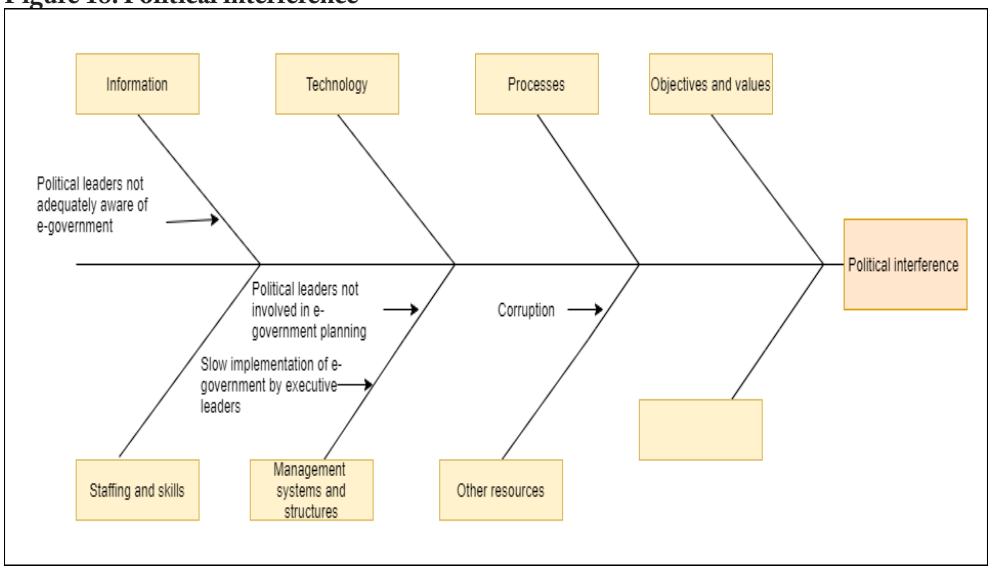
Figure 17: Inadequate infrastructure



Political interference

Governments are run by politicians who influence many aspects of decision making, leadership, and development initiatives. Politicians influence many government projects in positive or negative ways through several means, such as appointing personnel responsible for projects, manipulating project scopes and deliverables to suit their political interests, and making various decisions (Baguma & Lubega, 2013; Rajala & Aaltonen, 2020). E-government IS projects may also similarly suffer or benefit from political interference. The root causes of political interference are shown in Figure 18.

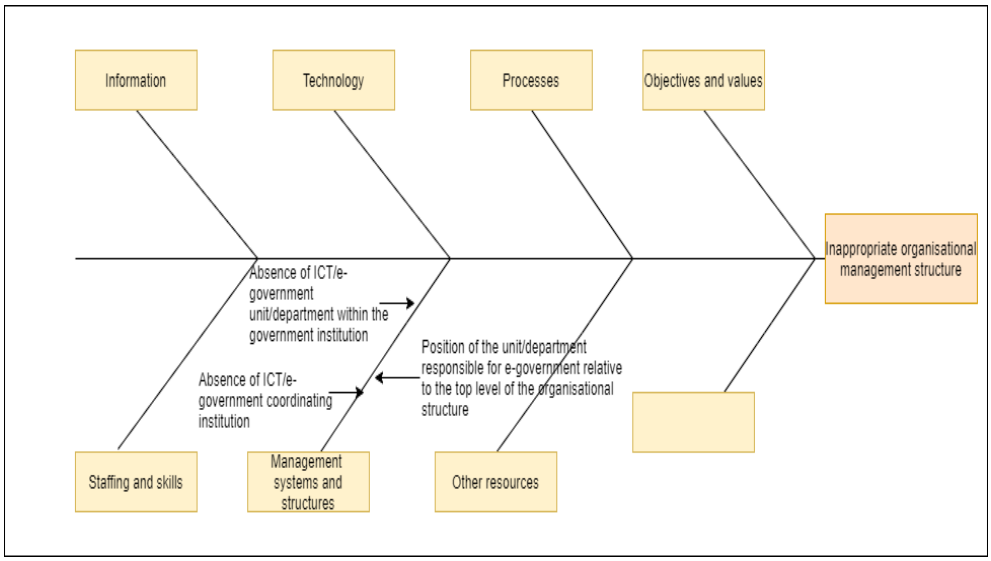
Figure 18: Political interference



Inappropriate organisational management structure

Government institutions are structured to support their core mandates. They employ a hierarchical structure with bureaucratic leadership, tight relationships, and rigid rules and procedures (Matte, 2017). Organisational structure is a critical element of e-government governance. Organisations implementing e-government initiatives must undertake the necessary reforms to accommodate and manage the e-government system's changes. The root causes of inappropriate organisational management structure are shown in Figure 19.

Figure 19: Inappropriate organisational management structure

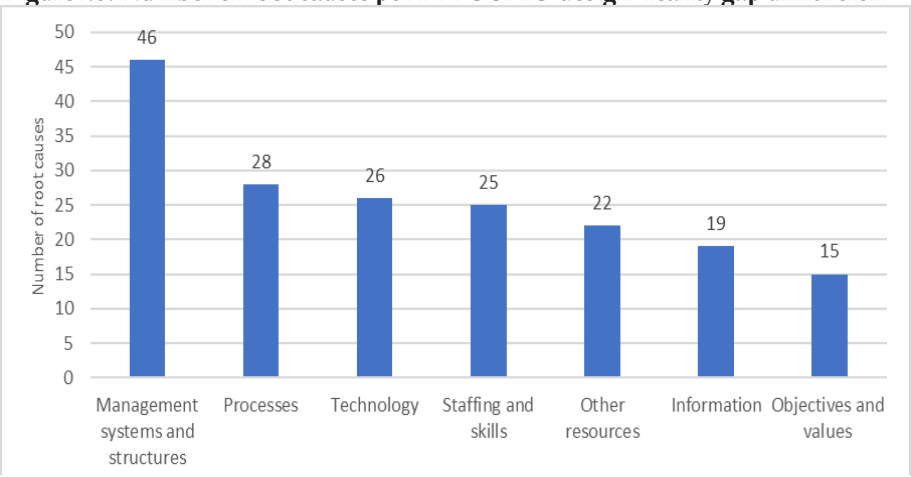


4. Analysis and conclusions

Design–reality gaps

The findings show that developing-world e-government IS projects fail due to root causes linked to all seven ITPOSMO design–reality gap dimensions suggested by Heeks (2003). The ITPOSMO *management systems and structures* dimension had the highest number of root causes, totalling 46. In this dimension, most of the root causes were found to fall under seven of the 18 identified casual factors: *inadequate project planning*, *inadequate project management*, *inadequate top management support*, *procurement and contractual issues*, *inadequate BPM*, *insufficient change management*, and *inappropriate organisational management structure*. The *processes* and *technology* dimensions were the second and third most prominent problematic ITPOSMO dimensions, with 28 and 26 root causes respectively. Figure 20 shows the number of root causes found to be linked to each of the seven ITPOSMO design–reality gap dimensions.

Figure 20: Number of root causes per ITPOSMO design–reality gap dimension



Causal factors

Among the 18 identified causal factors, *inadequate systems requirement engineering* was found to have the highest number of root causes, totalling 22. *Inadequate project management* and *missing or incomplete features* were the second and third most prominent causal factors, with 19 and 16 root causes respectively. Figure 21 shows the number of root causes per causal factor. The causal factors having a large number of root causes are likely to be the ones that require the most attention in order to mitigate their potential to lead to e-government project failure.

Figure 21: Number of root causes per causal factor



E-government information systems are complex, as they tend to have numerous components serving multiple stakeholders with different needs, views, preferences, and operating environments. This study reveals that e-government IS projects do not fail due to a single reason but rather due to a combination of several factors associated with design–reality gaps. Therefore, the successful implementation of an e-government IS project requires broad multi-dimensional strategies that address all seven potential design–reality gap dimensions.

This study provides both theoretical and practical contributions in the e-government IS domain. From a theoretical perspective, the study extends design–reality gap theory by identifying the root causes of such gaps for each identified cause of e-government IS project failure. From a practical perspective, the study findings may be useful to researchers, policymakers, and practitioners seeking to understand the necessary components of appropriate e-government IS interventions in developing-world settings. Understanding the root causes of problems is essential to developing practical solutions. Future studies can focus on establishing theoretical and methodological frameworks and tools to address the challenges identified in this study.

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