

Services Integration in Tanzania e-Government Systems

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Abstract:- The interoperability of information systems for public organizations is a significant opportunity for improved delivery of e-government services. However, the lack of e-government services integration is one of the issues preventing services from effectively reaching citizens in many developing nations, especially in this era of information technology advancement. Consequently, this paper aims to provide background information and a framework for comprehending the relevance of Tanzania's integration of e-government services. To understand the current state of the art and the prospects for system integration in government procedures, a thorough government institution Information Systems analysis was done to understand the magnitude of the problem. The survey revealed that the absence of electronic data exchange between public information systems leads to information system silos, which hinder efficiency and synergy in the provision of electronic services. A framework for e-government service integration is proposed utilizing a design science research approach to explain the possibilities of service integration in the public sector. The framework suggests harmonizing public institutions in e-government project plans, communicating e-government systems through a unified network, and establishing the e-government service catalog.

Keywords:- Information System (IS), Information and Communication Technology (ICT), e-Government Service (eGS), e-Government Information Systems (eGIS), e-Government Customers (G2G, G2C, and G2B).

I. INTRODUCTION

Information and communication technology (ICT) has been widely adopted by many public institutions in developed countries, especially in Europe and Asia (Nations, 2023), whose information systems (ISs) serve citizens with a focus on information exchange. Initially, they faced the challenges of having unconnected services and situations that escalated to users, especially when they required services that involved the use of multiple systems and services from the same facility. Developed countries have successfully solved the challenge of integrating these services by considering the evolution of ICT in context (Adaba, 2022; Amanbek et al., 2020).

ICTs are now widely used by many public institutions in developing countries, including Tanzania, and the challenges of unintegrated services provided by ISs are the same as those in developed countries many years ago. The e-

Government Index for each developing country is measured differently because of different countries' levels of ICT progress and different ways of implementing e-government projects (United Nations, 2020). Integration issues in developing countries require attention for their economic development (Adaba, 2022; Almahmoud, 2020; Wahid, 2018).

In Tanzania, the increased utilization of ICTs has boosted the public's demand for electronic government services effectively and efficiently. This is because of the considerable progress made by Tanzania (Adaba, 2022; Gil-Garcia & Flores-Zúñiga, 2020; UN, 2020). Interaction is measured as the current stage of e-government in Tanzania, and the number of online government websites and ISs has increased in the sense that they provide information about the activities, products, and services offered by the government, but still, a visit to public institutions to perform and complete a transaction is involved (Adaba, 2022; Nations, 2020).

Tanzania's public services offered to citizens and businesses depend on each other in several ways which make its automation consider the integration of their output, e-government services (eGS) from e-Government Information Systems (eGIS) Interoperability of new emerging technologies like Cloud Computing, Big Data, and the Internet of Things into legacy, existing, or new government ISs and eGSs will need to be considered and combined with several platforms of the nature of e-Authentication, e-Signature, and e-Identification, which can open up a new perspective on the use of e-government for security-sensitive areas like e-Immigration, e-Health, e-Banking, e-parliament and many more. Meanwhile, owing to the diversity and complexity of e-government programs, a wide range of obstacles and barriers to implementation and management exist (Protopappas et al., 2020).

Implementing eGS integration entails achieving interoperability across eGIS. Owing to technical, semantic, and organizational considerations, there are still many hurdles and constraints (Glyptis et al., 2020; Margariti, 2018; Protopappas et al., 2020). Integrated e-government implementation can be affected by several factors, including technology, organization, and the environment, along with perceived benefits (Meiyanti et al., 2019; Y & Olumoye, 2017).

In addition, the implementation of integrated e-government can face several factors, many of which are common in developing countries and the same as in Tanzania, according to a literature review: a lack of ICT literacy,

insufficient infrastructure, a digital divide between the rural poor and the emerging urban middle class, uncertainty about data privacy and security, the absence of comprehensive ICT policies and legislation, a lack of an ICT culture in government and traditional economic components, and questions about the government's ongoing financial commitment to ICT (Mohammed & Hakizimana, 2019; Samsor, 2021).

The problem of eGS integration in Tanzania may be caused by technological challenges, although it is not for nothing as the development of e-government has progressed rapidly compared to previous years (Adaba, 2022). Several eGISs developed to strengthen public service delivery with the ability to exchange information such as Enterprise Resource Management Suite (ERMS), Government e-Payment Gateway (GePG), and Electronic Office Management System (e-Office), although not for all public institutions (eGA, 2017). This is because of the interoperability of these eGISs intended to facilitate access to eGS to the public. Political and organizational factors play a major role in hindering eGIS interoperability, resulting in non-integrated eGS.

The lack of awareness of appointed government officials in e-government and eGISs interoperability, the lack of ICTs policies for several public institutions even though eGA provides templates as a guide to comply, the existence of organizational prohibitions, organizational culture, and even political motives can be sources of eGIS that do not share information and cause inconvenience to citizens when using eGS (Fountain & Amherst, 2014; Samsor, 2021). This study aims to improve the accessibility of government

services for citizens by proposing an eGSs integration framework.

II. THE CURRENT SITUATION

Interdependency between eGSs from various service providers typically involves the confirmation of a service requester's information. For instance, to request a Tanzania national ID from NIDA, an applicant needs to submit a birth certificate from RITA to confirm his or her citizenship. In this case, where NIDA services are dependent on RITA services, it is necessary for NIDA ISs to communicate with RITA ISs. Instead of using a complex system of birth verification between the ISs of two government authorities, one must produce a printed and verified birth certificate to NIDA ready to upload into ISs for reference. If that is accomplished, it might be called an interoperability state of the ISs and the integration of e-Government Services (eGSs) provided by those two governmental entities (Putri et al., 2020). The configuration of e-government implementation for the bulk of institutions in Tanzania can be seen in the information silo that exists between these two government entities (NIDA and RITA), their ISs being rigid in e-data interchange, and their lack of interoperability.

Generally, when a citizen requests a service from one of the government institutions, the interdependencies of numerous eGSs create a requirement for from both a system and service perspective. Figure 1 illustrates the process and interdependency of eGSs from various service providers (government institutions) in the elaboration of the eGS delivery procedure.

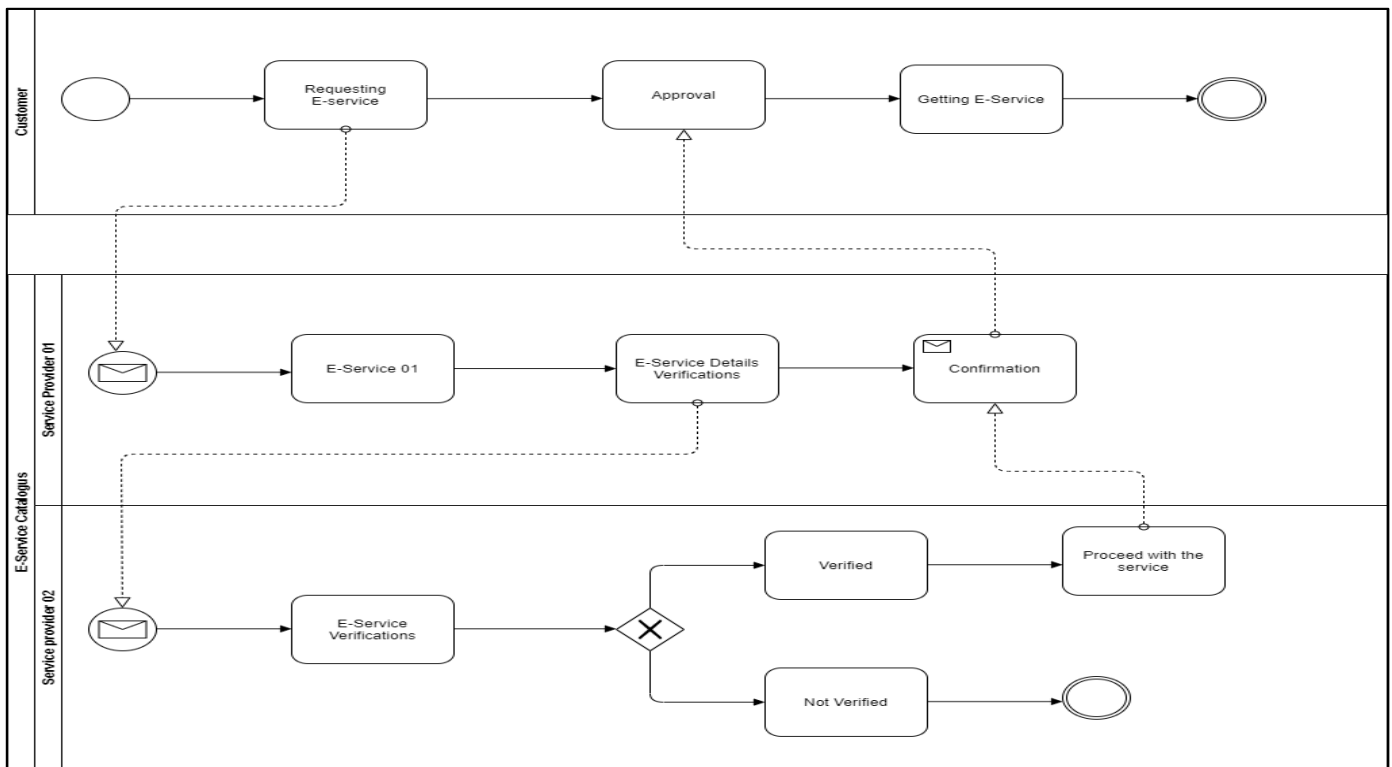


Fig 1: e-Government Service Delivery Business Process Modeling and Notation

The customer pool and the eGS catalog pool are the two pools shown in Figure 1. The first service provider in the eGS pool is the owner of the initially requested service, and two lanes involve two service providers from two distinct government institutions. Customers seek the service at the outset by visiting the institution's website or online applications. After receiving the request from the client, the first service provider must verify some information from a second service provider that we suggest the integration. The second service provider, provider 2, receives the request for verification and checks to see if the customer is authorized to receive the service or not. If so, feedback is sent to provider 1, and a confirmation of the services is given otherwise.

III. STUDY'S APPROACH AND DESIGN

This study was conducted with some of the e-government stakeholders, and staff from both the public and private sectors as all are involved in e-government projects, and both random, as well as purposive sampling techniques were used. Also, observation is one of the techniques used in this research to analyze the interoperability of eGISs in different public institutions. Purposively, It involved five institutions that applied in the case study used to validate the study's artifact (Used Motor Vehicle Clearing Processing), three of them are public institutions (Tanzania Revenue Authority – TRA, Tanzania Port Authority – TPA, and Tanzania Bureau of Standards - TBS) and two are private institutions (Clearing Agents), and with three eGIS from those public institutions (Tanzania Custom Integrated System-TANSIS, Services Online Application System - TBS-OAS, and Cargo Service - TPA-CS), this is because services which are delivered from those eGISs are not integrated, they are widely used by citizens and time-consuming (Etikan et al., 2017; Ministry of Trade, 2022).

Randomly, the sampling strategy was based on registered public institutions, 900 institutions as of June 2021, and private institutions (NBS, 2016, 2020). In each institution, one ICT person was used whether as an ICT personnel, a manager, a professional, or associate ICT personnel, based on those 900 total ICT staff derived from public institutions. These considerations were applied in the study because ICT personnel, managers, and associate ICT personnel are among the key stakeholders in e-government implementations in which they are fully involved in performances (Goel et al., 2012).

A. Study's Design

The phenomenon under investigation was studied using the DSR approach, as the research topic of eGS integration necessitates new realities for solution recommendations. Elimination of siloed eGISs which produce eGSs to be supplied to the citizens by public institutions requires relevant and accurate knowledge to build its solution recommendations.

Consequently, four cycles of the DSR approach, namely, 1) Problem Analysis, 2) Solution Suggestion, 3) Solution Development, and 4) Solution Evaluation was adopted to model the research process of this study (Peffer et al., 2007; Rossi et al., 2006).

Framework developed from study findings. A motor vehicle clearing processing was considered a case study and used to validate the proposed Framework, its ability to depict the problem stated in this research is high as it involves not less than 23 procedures to be followed by Tanzania car owners or buyers and a public servant during the process of completing clearance and obtain a car registration card. Completion of each procedure leads to one service to the buyer (citizen). Not all procedures are automated, they are not integrated too but all of them can be automated (Ministry of Trade, 2022). All those procedures to be followed by car owners or buyers and a public servant during the car clearance are accommodated in six steps which are pre-clearance documentation, obtaining a valid certificate of roadworthiness, custom declaration, verification of consignment, obtaining TRA release order, obtaining delivery order, port clearance, and finally obtaining car registration card.

B. Data Collection, Sampling Techniques and Assumptions

Yamane's formula of 1967 with a confidence and certainty level of 90% used to formulate a sample from the desired potential stakeholders population (Adam, 2020). The characteristics of the collected data represent the total population, with a margin of error (e) of 0.05. $n=N/(1+N(e)^2)$ is the formula that was used to calculate a sample. After that, a qualitative and quantitative survey was performed to assess the prospects of the proposition from the perspectives of potential stakeholders.

Tanzania has 900 registered public institutions, Local Government Authorities (LGAs), and independent departments as of June 2021. Each institution is assumed to have one ICT personnel, a manager, a professional, or associate ICT personnel. Some institutions may have more than two ICT staff, but the survey only considered one staff. Based on that assumption, 900 total ICT staff were derived from public institutions. As the private sector employs twice as many people as the public sector (NBS, 2016, 2020), another assumption is that non-government institutions in Tanzania have a total of 1800 ICT staff, with each institution having one ICT staff, one managerial ICT staff, professional, or associate ICT staff. However, some institutions may have more than two ICT staff. As a result, the total population N in a survey is 2700. According to Yamane (1967), the sample population is calculated as follows;

$$\text{From } n=N/(1+N(e)^2), N=2700$$

$$\text{Then } n=2700/(1+2700(0.05)^2)$$

$$n=348$$

Therefore, the sample population consists of **348** employees.

IV. PROBLEM ANALYSIS

The Government of Tanzania enacted e-Government Act No.10 of 2019, which establishes the e-Government Authority (e-GA) as a public institution mandated to Oversee, Coordinate, and Promote e-government initiatives, as well as make Enforcement of e-government-related Policies, Laws, Regulations, Standards, and Guidelines within public institutions, to reduce siloed information systems and

partially enforce the 2016 ICT Policy (Government, 2019). Despite the fact the Act is now operational, public institutions continue to offer some of their services online without considering the flexibility of information exchange or the interoperability of their systems, in short, most of the eGISs used are silos and provide duplicate functions. This results in non-integrated eGSs provision to the public resulting from individual institutional information Systems as depicted in Figure 2.

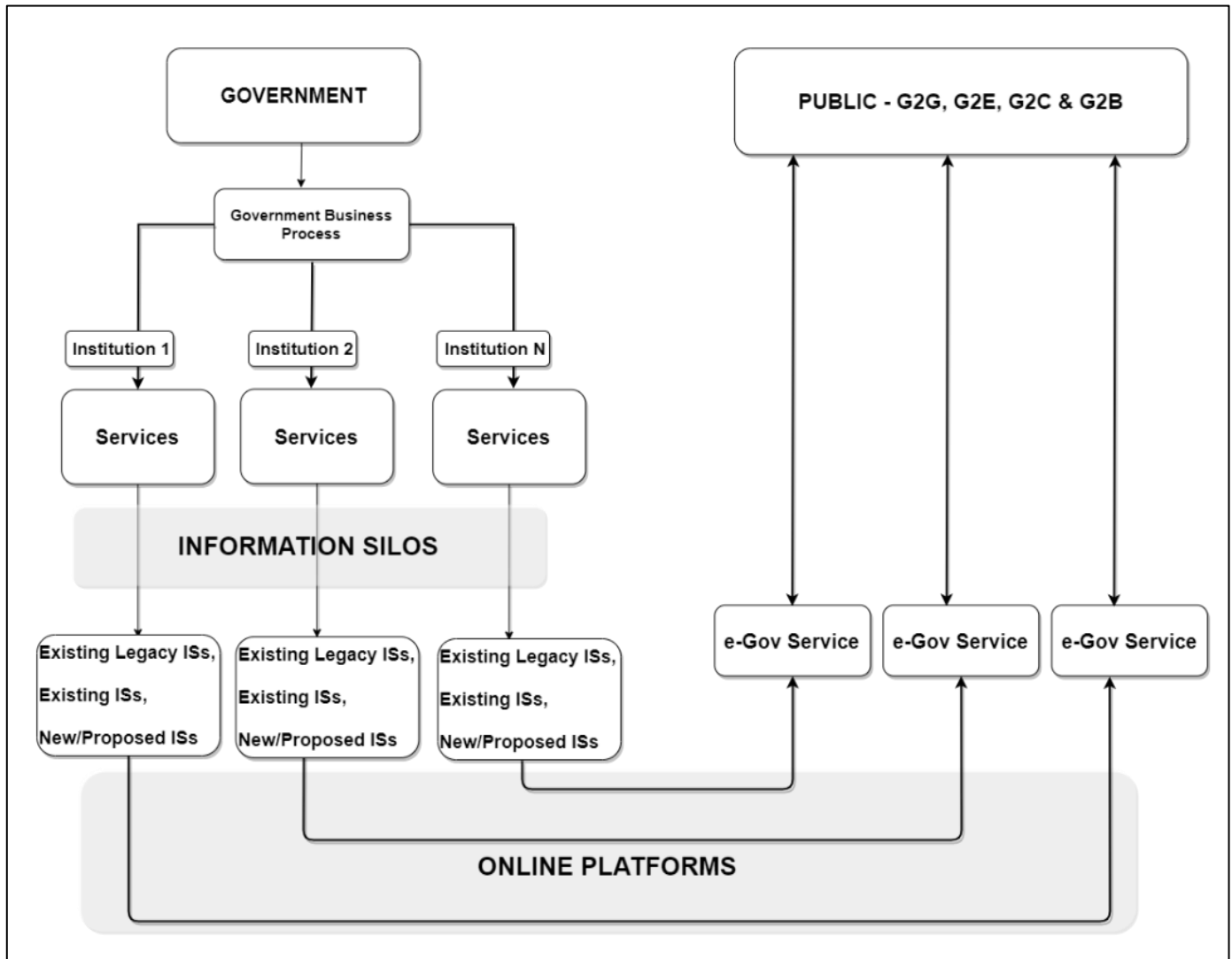


Fig 2: Current e-Government Service Delivery by Majority of Government Institutions

To better understand the extent to which the problem of eGS integration exists in Tanzania, an analysis of almost all eGISs in public institutions has been carried out. Open-ended and Close-ended surveys and analysis were based on understanding the dependence and interaction of public institutions' ISs, especially receiving and sending information from other ISs, which means integration input numbers, and integration output numbers. Integration input involves the number of systems in which institution IS depends on their data in its e-Government service provision. In contrast, integration output involves the number of ISs from other public institutions in which they depend on specific IS data in

the completion of the e-government service provision (Mohamed et al., 2013).

In collecting eGIS information in the relevant office, key questions such as system name, system functional category, system accessibility platform, type of eGS provided by the system to the e-government stakeholders, dependency of the system with other eGISs, system integration input, and system integration output were asked to institutions eGov key stakeholders. The analysis revealed that establishing integrated eGISs is lower than Non-integrated eGISs in Tanzania, as shown in Figure 3.

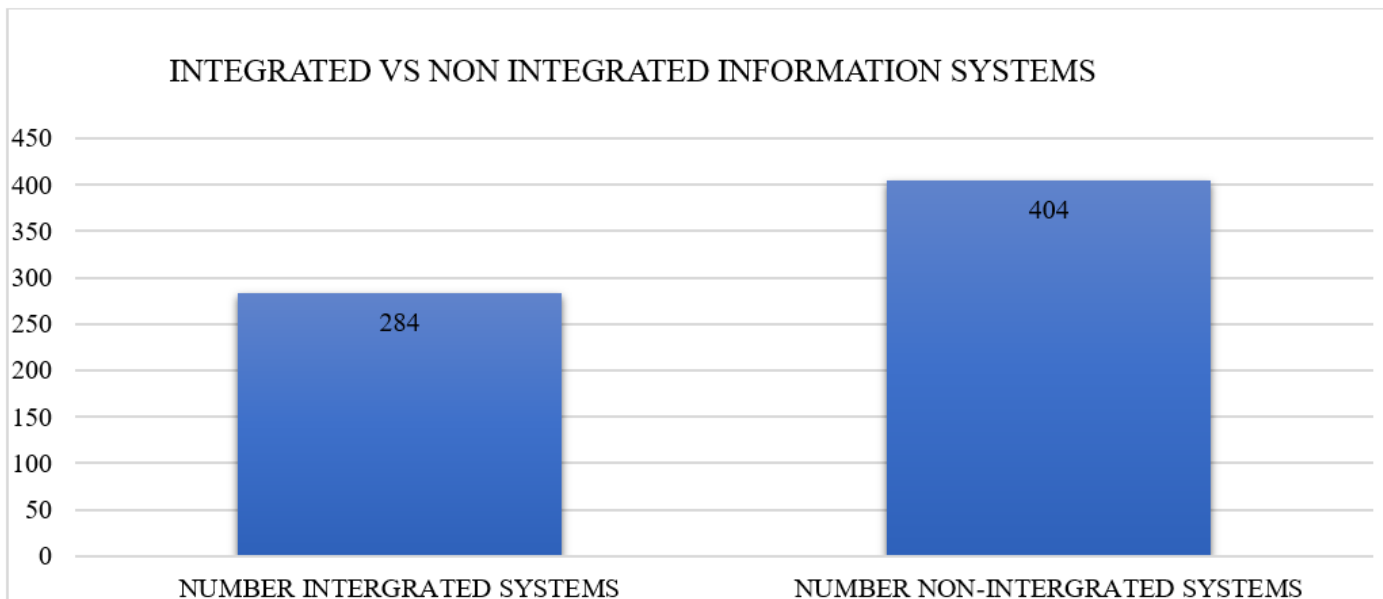


Fig 3: Integrated eGIS vs Non-integrated eGIS

The total number of eGISs analyzed is 688 from different 900 public institutions, 284 integrated systems, and 404 not-integrated ones. Among these systems only 41% are

shared and 59% are not shared. System analysis with several integrated eGISs is shown in Figure 4 with its definition.

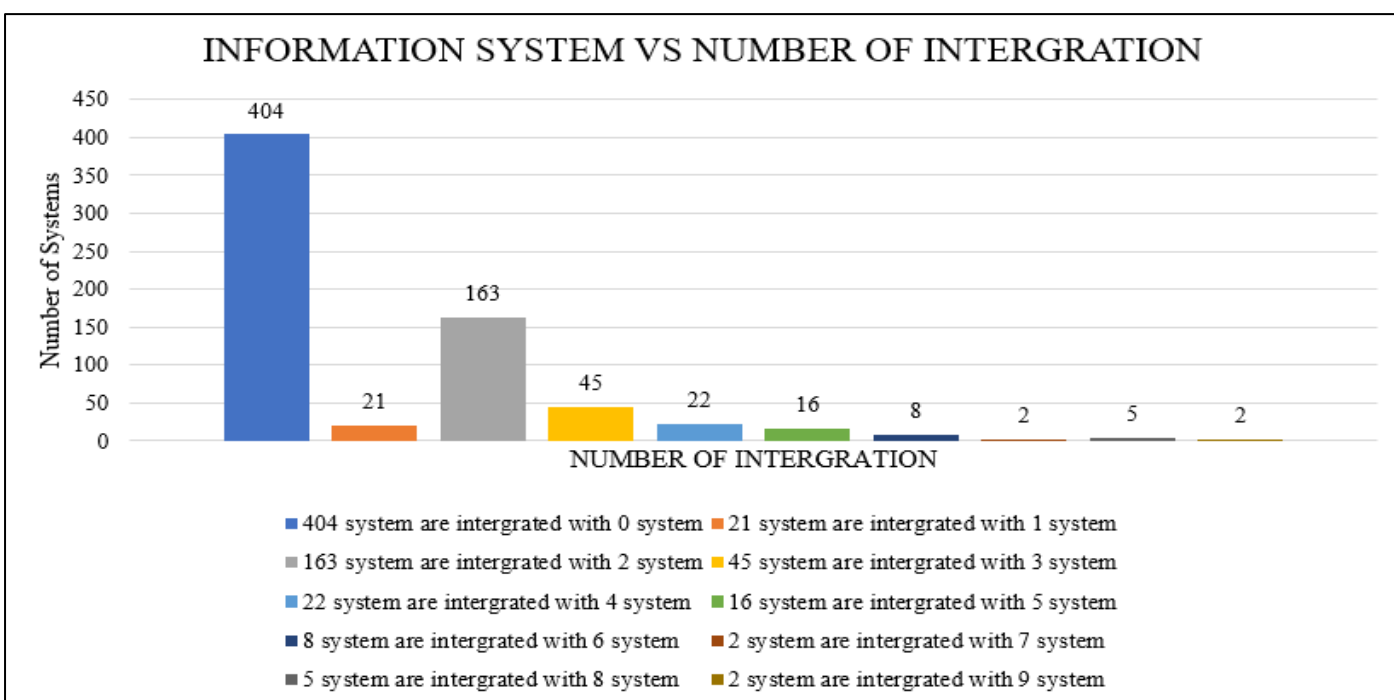


Fig 4: Analysis of Systems Versus Number of Integration

The survey revealed that 59% of all eGISs are not integrated, which means they are not exchanging information in their operation. Even though their databases are siloed, it frequently happens that the data in them are interdependent. Given that the integration of the eGISs that produce eGSs is a prerequisite for the integration of the eGSs themselves, it is challenging to integrate the services that are offered by them (Ahmadzai, 2019).

V. SOLUTION SUGGESTION AND DEVELOPMENT

Several studies have been done addressing the issue of eGS delivery in public, researchers discussed the factors that can influence eGS integration, and frameworks proposed and applied in different countries contexts. Environments, where researchers applied their frameworks, are quite different from Tanzania and even factors can be applied in their context rather than in Tanzania (Al-omairi et al., 2020; Almahmoud,

2020; Bayaga, 2020; Oumkaltoum, 2020; Owais, 2017; Protopappas et al., 2020; Putri et al., 2020; Saham Abd Elrahman, Mohammed Hassa, 2018; Sedek et al., 2018; Utama et al., 2020; Y & Olumoye, 2017; Yasin et al., 2018). Solution suggestions and recommendations have been made due to the current situation in the e-government projects implementation and the way several eGISs work in Tanzania.

There are several initiatives on eGISs development and eGSs delivery in Tanzania such as e-Passport, e-Vibali, Enterprise Resource Management Suite (ERMS), and Government e-Payment Gateway (GePG) to strengthen public service delivery. Some eGISs have been developed with data sharing and information exchange in mind like GePG and ERMS, however, the vast majority of eGISs are still not connected and function in silos like NIDA ISs and RITA ISs. Several Government departments are working according to establishment mandates or regulations making them have distinct agendas and work with separate sets of data, which makes it difficult to communicate and collaborate (Ahmadzai, 2019). For e-government customers to complete online transactions to access eGS, one may involve separate use of online systems providing eGS from different public institutions which consume time and degrade the eGS delivery efficiency. This is caused by the existence of siloed MISs whereby information or knowledge exchange through ISs is little or not happening at all (Shawren Singh, 2018). This problem has resulted in non-integrated eGSs that have to be delivered to the public. The current Government ISs setup misses the point where different institution ISs come together for the sake of providing eGSs.

A. *Harmonized Information Systems Mechanisms*

The need for Tanzania public institutions to coordinate in formulating ISs intended for efficient eGSs delivery to the public cannot be avoided in this century of ICT advancement (Abdulkareem & Mohd Ramli, 2021; Viik et al., 2019; WHO, 2018). Strategic development of an interoperable e-service ecosystem in public institutions is significant; the idea is to have an e-government system in Tanzania containing systems as a digital ecosystem (Saleh & Abel, 2016). Coordination among public institutions during eGov projects plan and implementation is not to centralize decision-making processes and even not advance technical capacities, but to support eGS delivery modernization in all public institutions in a harmonized way. It may avoid eGov project duplication efforts and Government over-investment (Viik et al., 2019).

By the establishing Tanzania e-Government Authority, tools like policies, regulations, proper budgeting and monitoring, common standards and guidelines, nationwide data reuse, electronic data exchange, software solutions reuse, and the rapid development of online services can be applied to ensure coordination (Government, 2019). Tanzania's public institutions need to harmonize their IS development plans, establish standards to enable technical interoperability and consider service-oriented architectures (Chen, 2008).

With the concept of eGS integration, elected ministers in each sector should be in line with their secretary generals in ensuring that the targeted services to be provided to the public through eGIS are served transparently based on their dependencies to reduce disruption to the public. Awareness of interdependent services provided by various public institutions is required for the appointed Government officials to facilitate the creation of eGISs that exchange information to have integrated eGSs. This will help when they are required to approve various eGov project kickoffs.

It is known that frequent appointments for Government top officials are done ranging from the Central to Local Governments within different regimes of the Government which makes those appointed officials/leaders have lenient times for being acquainted with various e-Government Laws and Regulations.

eGS implementations within various public institutions have to be managed and set together with common rules to be transparently accessed by e-government stakeholders through a common communication platform. To form eGSs integration for e-government stakeholders, ISs developed by different public institutions should be connected through a single interface (Communication Data Line) and interoperate their desired services based on several IT rules and configurations. Interoperability must be achieved through a unified computer network infrastructure that makes service exchange and accessibility simple, as well as defined formats, syntax, and semantics that involve data exchange, codification, and interpretation and produce useful results as defined by information exchange system end-users (Government bodies).

e-Government stakeholders can access integrated eGSs from a single platform via online platforms and a unified computer network. The proposed Framework for integrating eGSs in Tanzania is depicted in Figure 5 with a description of semantic elements to a graphical notation used in its construction in Table 1.

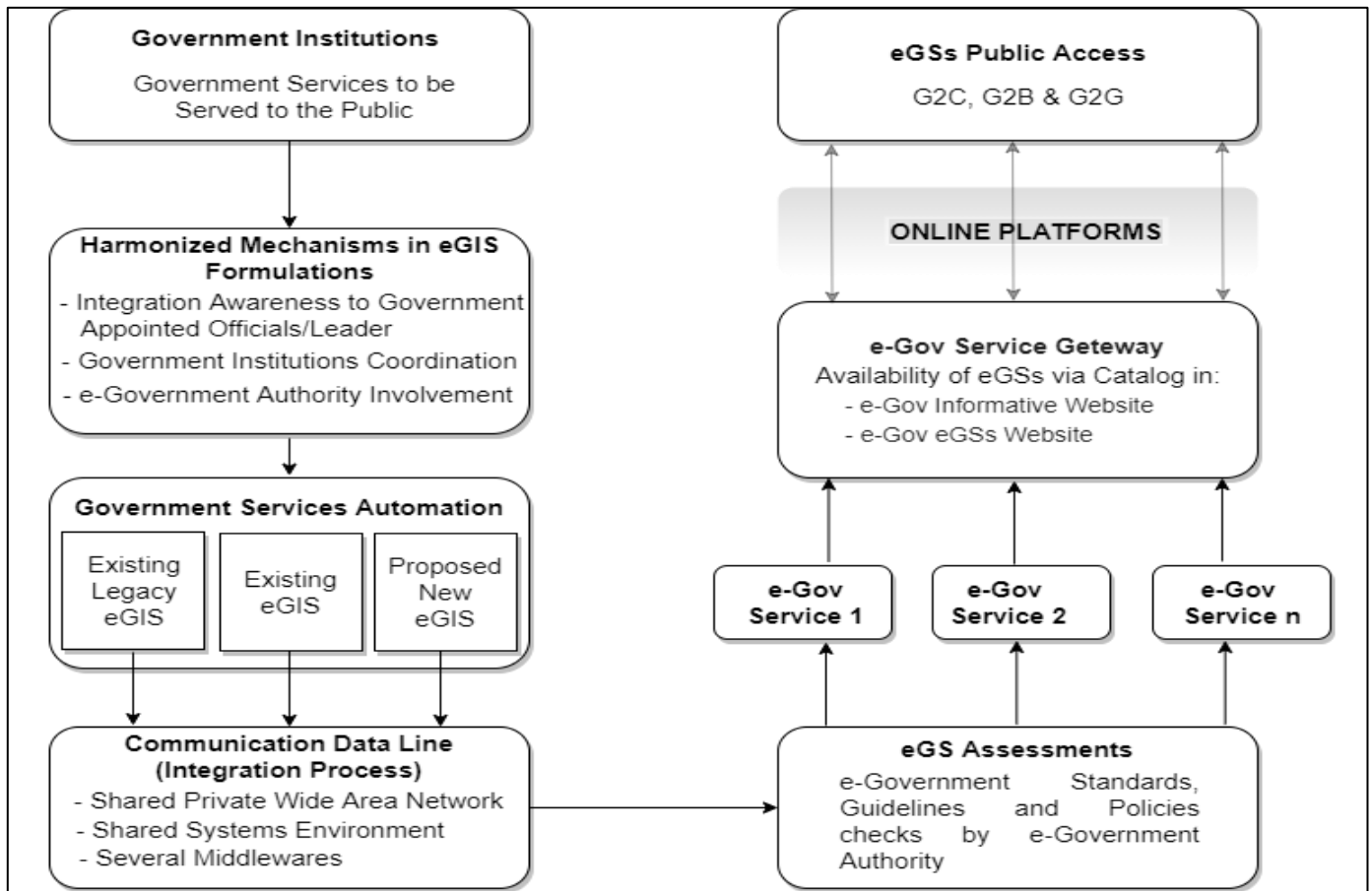


Fig 5: e-Government Services Integration Proposed Framework

The difference with the current eGS business flow shown in Figure 5 is that different Government ISs need to be formed together or considered together for integration before the provision of services and having an eGSs catalog that

provides an easy room for the public to access and obtain eGSs. Table 1 and Table 2 describe semantic elements in a graphical notation used in constructing the Framework and the proposed Framework components respectively.

Table 1: Semantic Elements in a Graphical Notation Used in Constructing the e-Government Services Integration Framework

Component	Definition	Graphical Symbol
Source	Starting Step in the Framework Flow.	
Input	Continuation of the Flow from the Beginning Step.	
Interaction	Interaction in the Need for Services.	
Informant eGS	Details in Various Framework Stages. e-Government Service.	
eGIS	e-Government Information System	
Media	Internet, Smartphones, Mobile phones, iPads, and computers	

Note: Not all ANT's semantic elements to a graphical notation were used in constructing Actor-Network for this study, other notations didn't use as they are not fit the study.

Table 2: e-Government Services Integration Components

	Component	Description
1	Harmonized Mechanisms in eGISs Formulations	Definition of data in which each institution has to share. eGSs to be offered to customers from each institution through ISs must be well defined and understood by all stakeholders (Government Sectors). eGSs relationship has to be well understood and agreed upon by all stakeholders (Government Sectors). Collaboration of public institutions in e-GISs development projects has to be considered. eGSs Awareness to Political Appointed Leaders as well as e-Government Authority Involvement in all associated e-Gov Projects.
2	Government Services Automation	Consideration of the importance of all ISs beginning with the legacy ISs to the new planned ones for the goals of government services automation.
3	Communication Data Line	Access to shared government data and services for all public institutions has to be through a single communication data line. It is a point in which a middleware service for newer systems/applications and old legacy systems is allocated (solving the problem of how to link them) It includes one application gateway, common security and communication protocols, shared systems environment and the main data line (Common Network).
4	eGS assessment	Established e-Government Authority assesses all eGSs to be offered to e-government customers. Do the systems meet standards?
5	e-Gov Service Gateway	A platform where e-government services are offered via online media, continuously and securely, with a focus on the requirements of the public and trying to improve citizens' lives. Opens a link to the e-Gov informative website and Integrated eGSs website. e-Gov Informative Website list public institutions with all services they provide electronically and get them from the e-government integrated services website/eGSs website. It has to be available all the time and not during working or business hours.
<p><i>Note.</i> Through having harmonized mechanisms in e-government project implementations within public institutions (ISs development), assessment of eGSs as the output of developed ISs by the established e-Government Authority along with a comparison of the existing ones, and common communication data line for the public institutions, eGSs integration for e-government customers can be achieved (Government, 2019; WHO, 2018).</p>		

B. Communication Data Line

This is where system integration may occur; all siloed ISs will need to connect, communicate, and securely exchange information. The communication data line must be used to access or share government information and service provisions between public institutions (G2G). Computer clients and servers hosting various ISs must adhere to the technology and standards used in communication data lines. The communication data line is where the enterprise service

bus approach must be considered, a tool that can be used for component integration and distributed computing, to construct a service-oriented architecture by iteratively integrating all types of isolated applications into a decentralized infrastructure (Churchville, 2023). Application Gateway, Agreed Communication Protocols, Security Protocols, Data Communication Line, and Data Storage Unit are examples of communication data line components. Table 3 depicts the elements of the data communication line.

Table 3: Communication Data Line Elements

	Component	Elaboration
1	Application Gateway	Secure application intermediaries allow applications to talk to each other from different institution ISs.
2	Communication Protocols	Syntax, semantics, format and rules, and synchronization of digital communications of computer applications from different institution ISs.
3	Security Protocols	Rules and Protocols for securing the communication.
4	Data Communication Line	unified network protocols and infrastructure
5	Data storage unit	Agreed Data Storage Technologies with common database management Systems.
<p><i>Note.</i> Using agreed ICT standards and technical specifications, public institutions can set up and maintain information sharing with other institutions by themselves (Vallner, 2017).</p>		

C. e-Government Services Getaway

As shown in Table 2, the Framework suggests that the Government has a platform where eGSs are offered via online media, continuously and securely, with a focus on the requirements of the public and trying to improve citizens' lives. Opens a link to the e-Gov informative website and

Integrated eGSs website. The informative website must provide all necessary eGSs information, a list of public institutions and all services they provide electronically, and explain how to obtain a service linked to the eGSs website, which carries all services. The eGSs website lets e-Government stakeholders interact with the Government via

an online platform to obtain services. Its availability must be consistent throughout the year and not limited to working or business hours.

VI. FINDINGS AND DISCUSSIONS

The proposed e-Government Services Integration Framework Validation and Evaluation as well as the study findings are presented and discussed in this chapter. The information presented here was derived from the collected and processed data. Different e-Government IS development experiences were also used to enrich the discussion's content.

A. Framework Validation

The proposed Framework can facilitate interoperability by acting as a blueprint for connecting public institution ISs via a communication data line. However, eGSs provided to

citizens via ISs are less efficient and effective because some do not exchange information electronically, and some procedures are not even automated. As part of DSR, for more understanding of the problem context the Tanzania Motor Vehicle Clearing Process case study was used to validate the proposed Framework.

➤ *Case Study – Motor Vehicle Clearing Process*

Consider a Tanzanian intending to import a used car from Japan. For him/her to complete clearance procedures and registration of the imported car, there are 24 steps to be accomplished that involve five (5) parties which are the Importer, the Clearing Agent, the Tanzania Ports Authority – TPA, Tanzania Revenue Authority - TRA, and Tanzania Bureau of Standards - TBS as illustrated in Figure 6 which involves the interaction of non-communicated online ISs.

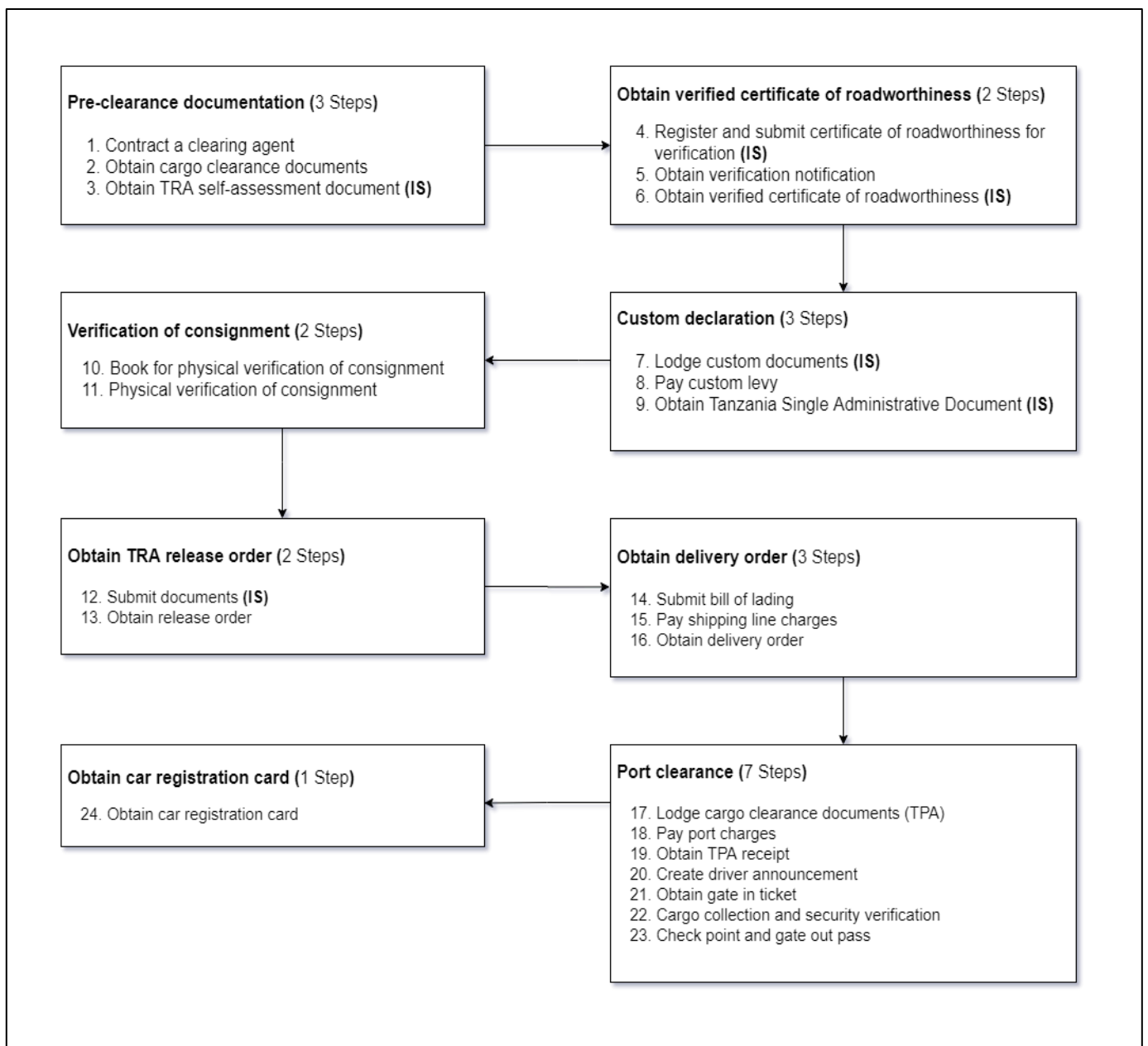


Fig 6: Used Motor Vehicle Clearance Procedures (Ministry of Trade, 2022)

The first thing to do is to get pre-clearance documents. Afterward, the importer must hire a clearing agent to get cargo clearing documents. Public servants from TRA, by Tanzania Custom Integrated System, TANCIS work to get the documents for the importer.

To get a certificate of roadworthiness that the TBS has checked, the importer has to register and send in a certificate of roadworthiness for verification by interacting with the Tanzania Bureau of Standards Online Application System - TBS-OAS. The importer will get a confirmation letter and a roadworthiness certificate that has been checked.

Custom Declaration is the third step. importer has to send in customs documents, pay a customs levy, and get a Tanzania Single Administrative Document through TANCIS.

The fourth step is to make sure that the consignment is real. The importer has to make an appointment to see the consignment. Again, there is no way for the importer to interact with information in this step.

In the fifth step, the importer has to send a document through an IS, TANCIS and get a release order for the car.

The sixth step is the delivery of the order. The importer must send in a bill of lading, pay shipping line charges, and

get a delivery order. There is no way importer to interact with IS in this step.

The seventh step is called Port Clearance. TPA employees use the TPA Integrated Electronic Payment System Portal - TEPP to send cargo clearance documents to the Tanzania Port Authority. First, the importer has to pay Port Charges and get a TPA Receipt. Then, a public servant from TPA makes a driver announcement, gets a gate in the ticket, collects cargo and security checks, goes through a checkpoint, and gets a gate out pass.

Finally, the importer will get a registration card for his/her car. To make things easier, ISs that are involved in different procedures have to work together by exchanging information electronically to make the process easier. This can be done by ensuring that all of the institutions involved in the service are working together to ensure that the service is delivered (Car Registration). In addition, ISs can be made to automate other things that can share information through the communication data line. These systems and other systems that can be made to automate other things can deliver their services to e-government stakeholders through different online platforms. When you look at Table 4, you can see all the steps and how they work.

Table 4: Motor Vehicle Clearing Procedures Dependencies

Step	Procedure	Description	System	Procedures Dependency
One	1	Contract a clearing agent	None	None
	2	Obtain cargo clearance documents	None	None
	3	Obtain TRA self-assessment document	TANCIS	7,9,12 (TRA and TPA)
Two	4	Register and submit the certificate of roadworthiness for verification	TBS-OAS	5,6 (TBS and TPA)
	5	Obtain verification notification	TBS-OAS	4,6 (TBS and TPA)
	6	Obtain a verified certificate of roadworthiness	TBS-OAS	4,5 (TBS and TPA)
Three	7	Lodge custom documents	TANCIS	3,9,12 (TRA and TPA)
	8	Pay custom levy	None	None
	9	Obtain Tanzania Single Administrative Document (TANSAD)	TANCIS	3,7,12 (TRA and TPA)
Four	10	Book for physical verification of consignment	None	None
	11	Physical verification of consignment	None	None
Five	12	Submit documents	TANCIS	3,7,9 (TRA and TPA)
	13	Obtain release order	None	None
Six	14	Submit bill of lading	None	None
	15	Pay shipping line charges	None	None
	16	Obtain delivery order	None	None
Seven	17	Lodge cargo clearance documents (TPA)	TEPP	17 (TPA)
	18	Pay port charges	None	None
	19	Obtain TPA receipt	None	None
	20	Create driver announcement	TPA-CS	20 (TPA)
	21	Obtain gate in ticket	None	None
	22	Cargo collection and security verification	None	None
	23	Checkpoint and gate out pass	None	None
Eight	24	Obtain a car registration card	None	None

The fact that the ISs involved in procedures are not connected, there is no interoperability to complete the task of obtaining a car registration card. Assume that all of those

steps are contained within a single dashboard of an IS accessible via an e-Government integrated service website, then, the entire process could be streamlined, and significant

time could be saved. A research survey was conducted on all 3 public institutions and 2 Clearing and Forwarding Agencies to simulate the interdependencies of their procedures and have a close understanding of the ISs and their eGSs integrations. Purposively 8 employees participated in the

prepared questionnaire, 6 of them are ICT staff from TBS, TRA, and TPA, and among them, 3 are the senior staff. 2 non-ICT staff respondents were employees of two legally recognized clearing and forwarding agents as shown in Figure 7.

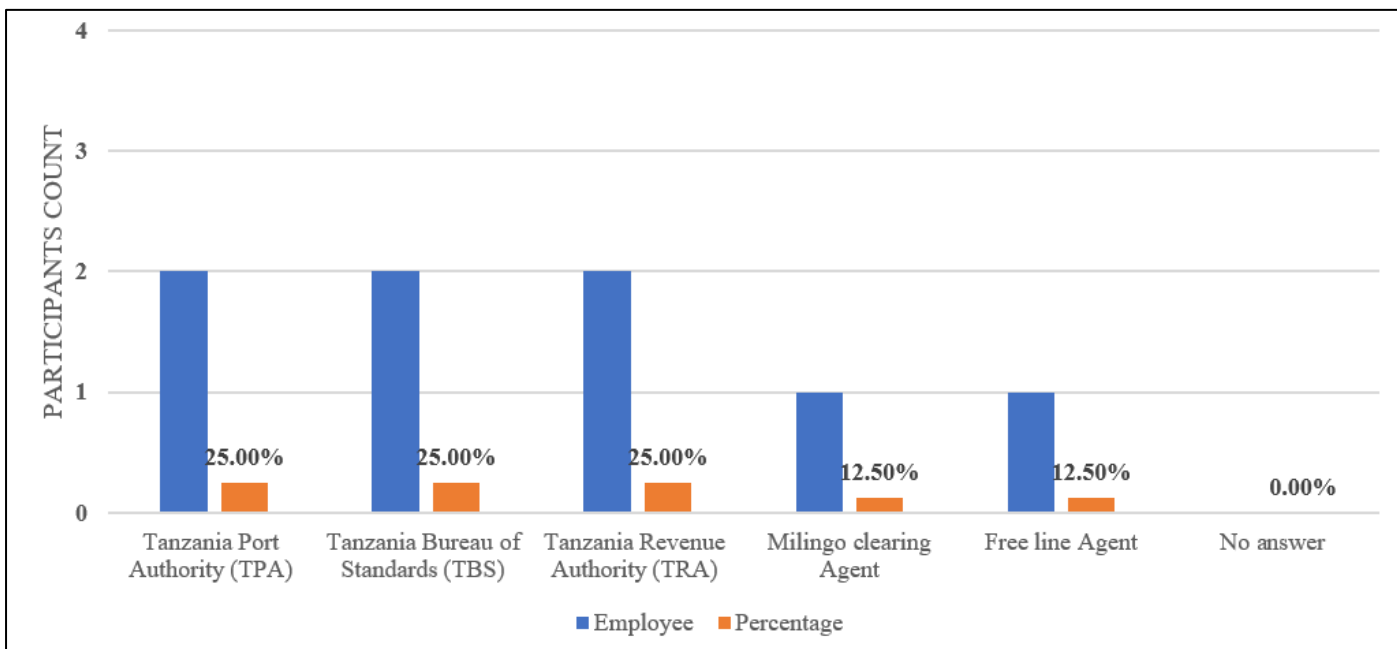


Fig 7: Question - Candidates per Participated Institution

The questions involved understanding their ISs dependencies (TANCIS, TBS-OAS, and TEPP) along with all procedures of automation, in the question concerning the applications of ISs - TANCIS, TBS-OAS, and TEPP systems, all steps in Motor vehicle clearing procedures are automated regardless of the interdependencies? 2 respondents answered

YES, 5 answered NO, and 1 answered didn't know, 62.50% of the respondents equal to 5 respondents showed that the automation of all 24 procedures in the process of car clearing and registration is still not yet done, the same as the dependence of the services is not well handled by simplifying the procedure as indicated in Figure 8.

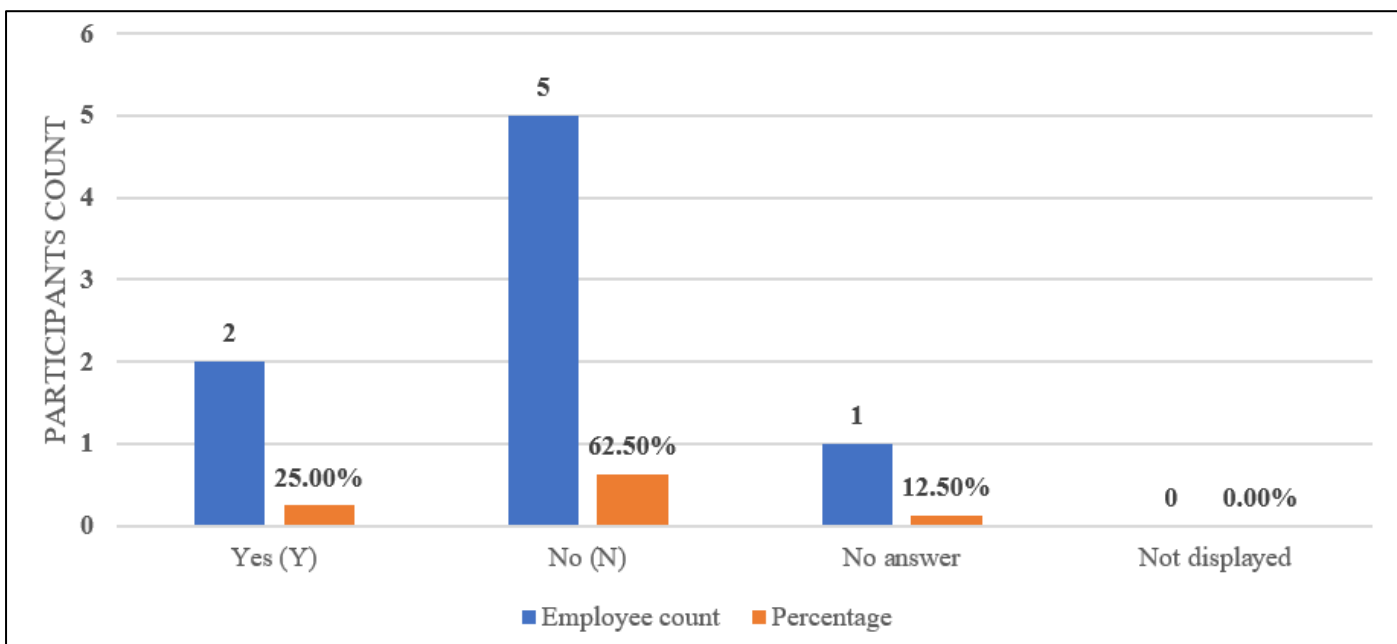


Fig 8: Steps and Procedures Automation Status Regardless of the Interdependencies in the Motor Vehicle Clearing Procedure in TANCIS, TBS-OAS, and TIEPSP Systems

Regarding integrating ISs that lead to eGS integrations, responses to question TANCIS, TBS-OAS, and TEPP systems, are they fully integrated were 7 persons to 1 person, NO to YES answer responses respectively as indicated in Figure 9. This implies that 87.50% of the survey respondents replied that there is no integration of TANCIS, TBS-OAS,

and TEPP systems involved in clearing and obtaining a car registration card. From Table 4, it is shown that several procedures from both institutions depend on each other, implying that eGSs are provided individually and eGISs need to be integrated.

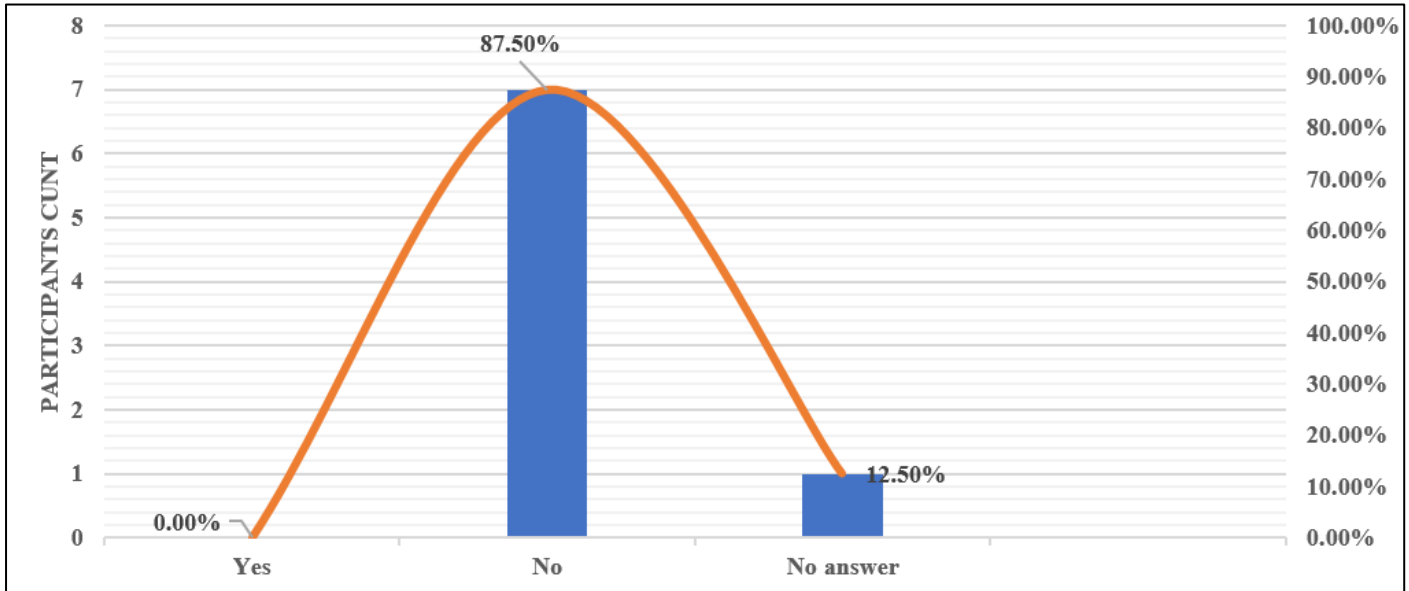


Fig 9: Candidates' Responses Regarding the Interoperability Status of the TANCIS, TBS-OAS, and TIEPSP Systems

The following questions were structured seeking the reasons behind the non-integration of the involved ISs regardless of the procedure's dependencies. The responses are shown in Figure 10 and Figure 11 respectively. Reasons are; "no ICT Policies to be followed by the institutions, no

Enterprise Architecture for this business Process, and ICT Police Guidelines are available but not followed, Institutions fear sharing information to maintaining confidentiality, no definition of data to be shared by institutions, and also Connecting to public institutions' monolithic ISs".

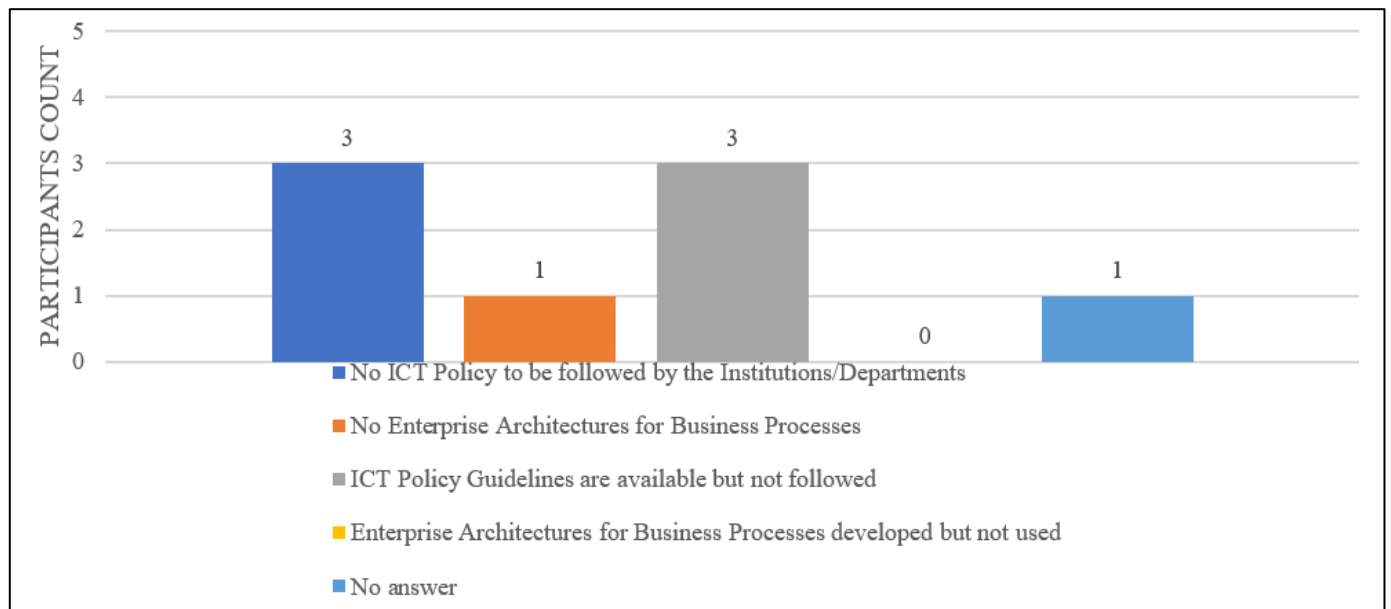


Fig 10: Candidates' Responses Regarding the Non-Interoperability of the Involved Iss Regardless of the Procedures' Dependencies

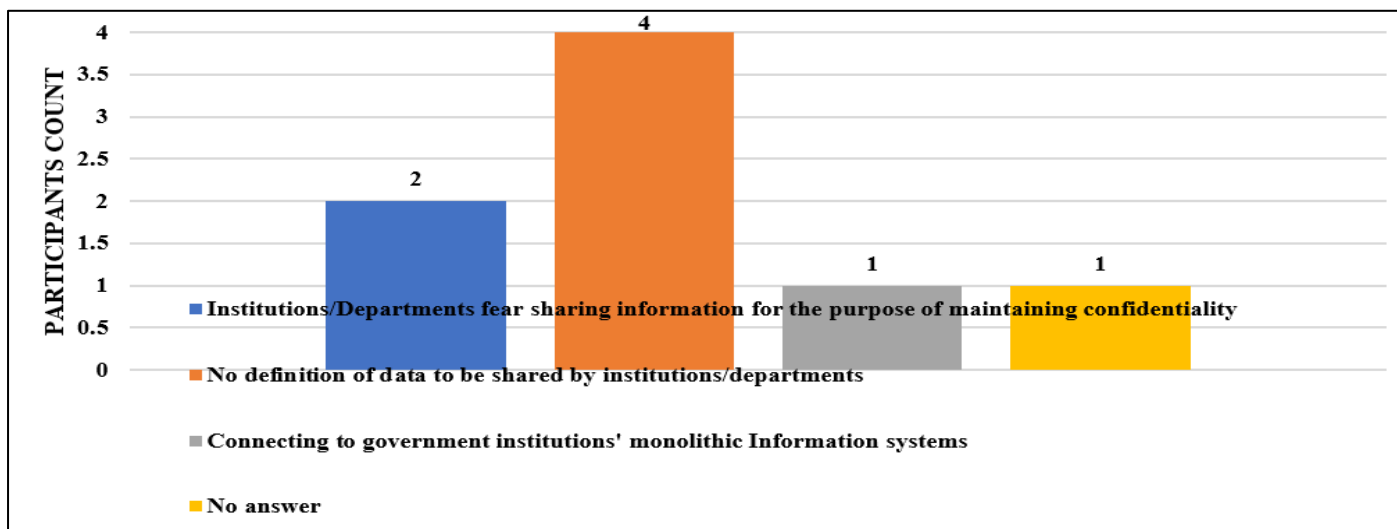


Fig 11: Candidate's Opinions Regarding Challenges within Systems Interoperability in Tanzania's Used Motor Vehicle Clearance Procedures

In this case study, it has been observed that there is an initiative to standardize a process of clearing by involving all public institutions that are involved in the cargo clearing process in a single project i.e., the Tanzania e-Single Window System - TeSW. The institutions involved are TPA, TRA, TBS, Tanzania Medicines and Medical Devices Authority - TMDA, the Government Chemist Laboratory Authority - GCLA, and the Tanzania Atomic Energy Commission - TAEC. Any Institution that needs a clarification of another institution step ahead of the cargo to be cleared has to interact with a TeSW in which it has to interchange information with each institution IS. Only the Institution's Payment systems are integrated with GePG and the rest have been developed without integration in mind and others are old and legacy systems too. TPA has two ISs for ship control and Cargo control (Terminal Operating System - TOS and Port Operation Application System - POAS) but public servants from TPA have to feed that information into TANCIS which is a TRA system and TRA has a Tax Payer Identification number - TIN application system with no application tracking and TIN generation mechanism but also a public servant from

TRA has to feed client TIN information in Vehicle Registration System - VRS which is TRA system too. This reveals that those services are not integrated simply because ISs are yet not integrated.

B. Research Findings

The survey was conducted on 351 people from different public institutions in the data collection process. The major consideration was to find IT stakeholders in the government who were involved in one way or another in e-government projects because it leads to estimates to find answers to research questions. The number of public ICT senior and junior servants did not overlap much in our survey, 31.91% to 33.90% respectively equal to 112 public senior servants to 119 public junior servants among 315 survey candidates. Others are 99 public servants and Managerial positions, which included Directors, Managers, Heads of ICT Departments, 6 public servants, and non-ICT staff, without leaving out other important stakeholders in IT projects in the government who are non-government employees linked to the private sector (non-public institutions), see Figure 12.

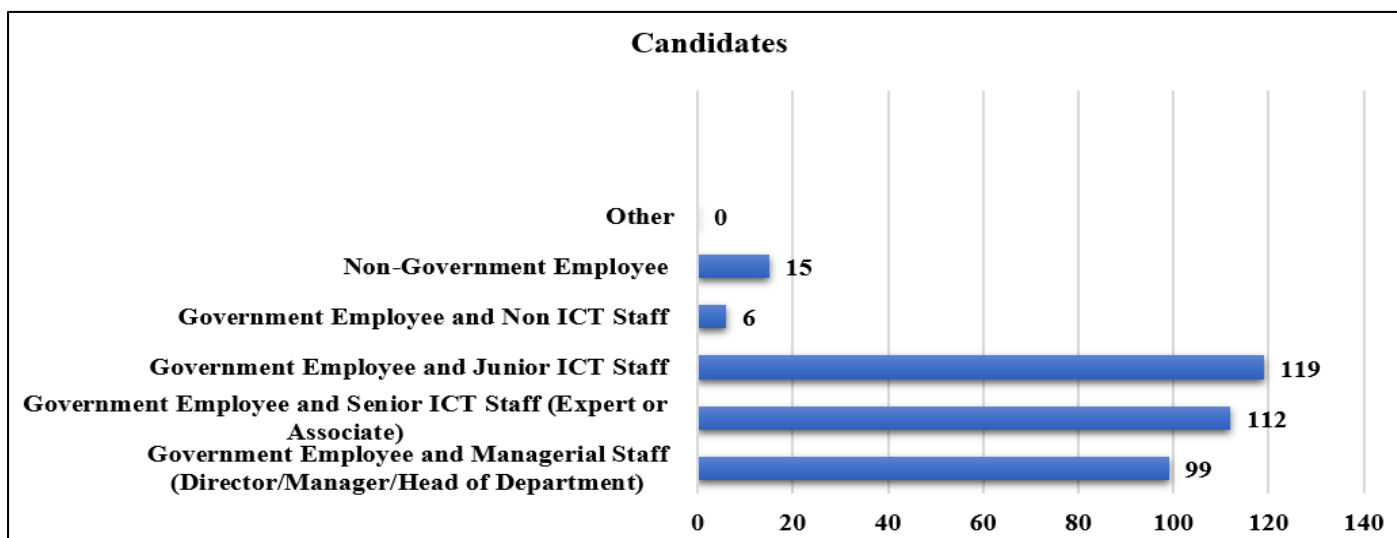


Fig 12: Categories of Employees with their Positions Participated in Survey

Consideration for survey respondents in public institutions is to know their participation in various e-government projects at any stage and their roles, and also to know how public institutions ISs are created with regard to their dependence and data interchangeability. It is based too on the ISs available in other public institutions apart from respondents' institutions ISs only, instead of how they depend on and interchange data or even to public institutions that do not have ISs but expect to have ISs in the future, this is because the integration of eGSs from government ISs depend on the integration and ability to exchange data of their ISs. The followed question of a better understanding of whether the products of the projects they participated in are siloed EGISs or integrated with other existing eGISs and to know

exactly what are the reasons that led to the existence of non-integrated eGISs where to lead to not getting eGSs integration.

96.30% of the candidates were involved in different e-government Projects at different stages equal to 338 candidates, and 62.43% of them participated as project managers, equal to 211 public servants as indicated in Figure 13. 10 public servants who could not participate in any project have indicated that in their next projects, they will participate in various roles including security experts, monitoring and evaluation, system integrator, system administrator, database administrator, project initializer for the institution, quality assurance manager, analyst as well as project manager.

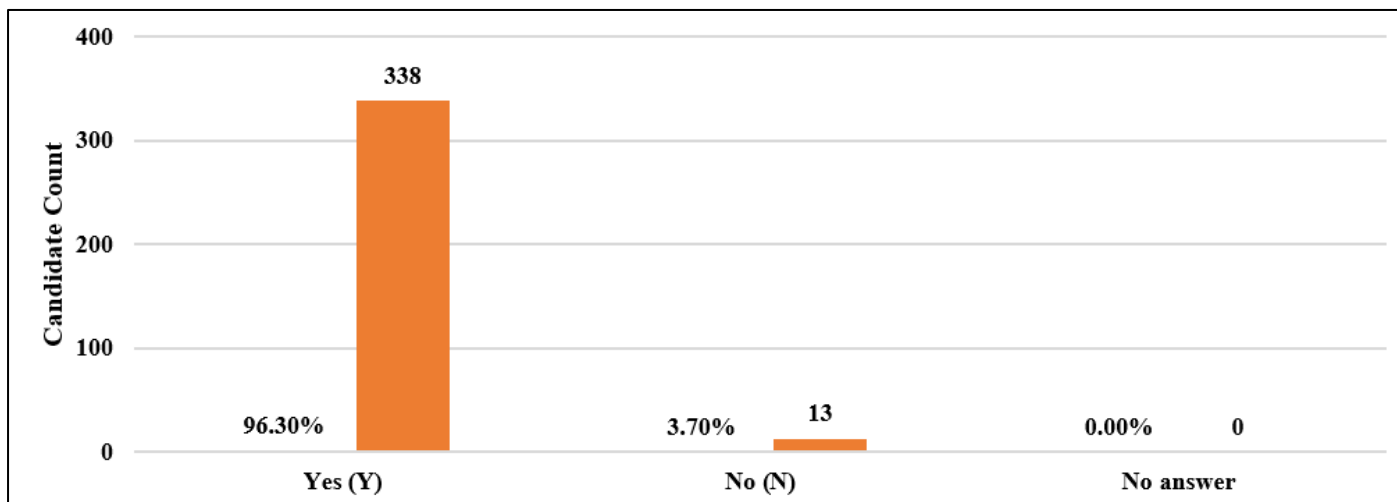


Fig 13: Candidates' Involvement Status in e-Government Project at Any Stage (ICT Project)

Getting the response of their thoughts of other public institutions that their system will depend on their data in one way or another, 243 of the public servants answered that question YES that they did put into consideration in their eGIS project, and 95 public servants equal 28.11% of those

who somehow participated in various eGIS projects (338 candidates) responded NO as indicated in Figure 14 which means system integration in eGIS projects is still prior not considered in project plans.

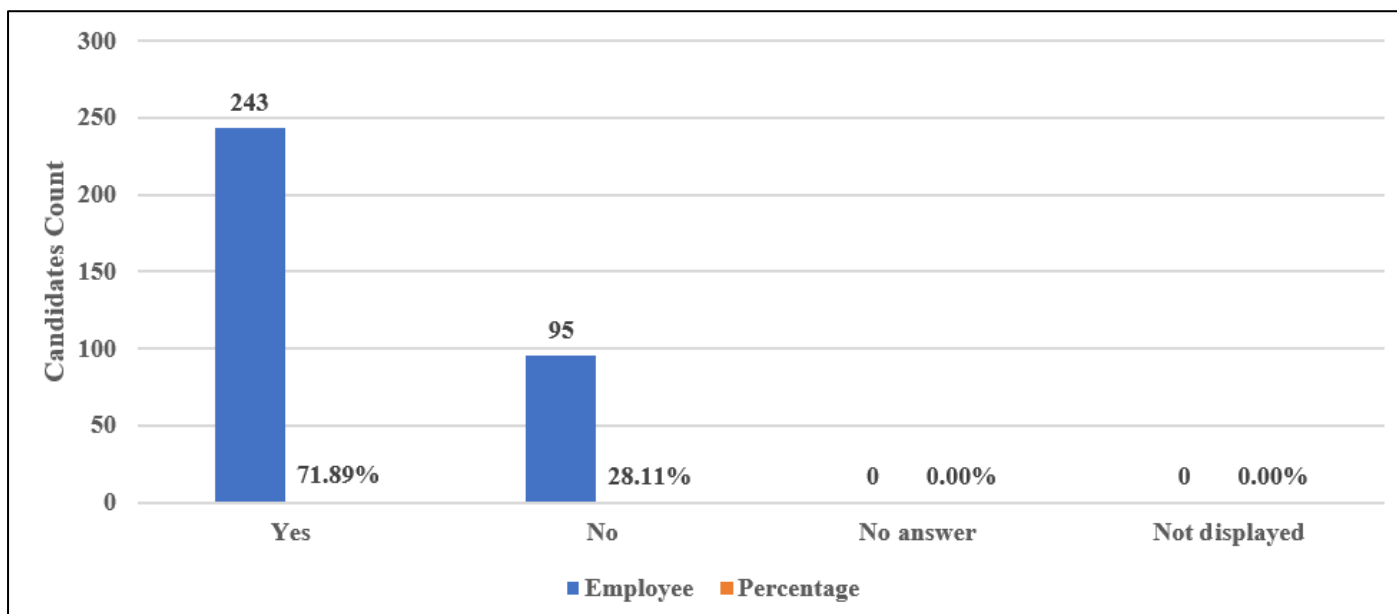


Fig 14: Candidates' Responses in Data Dependencies of Other Public Institutions on their ISs

Thoughts of how they may get the data from their developed eGISs if other public institutions have ISs or how two eGISs may interchange the data and interoperate if ISs are available, 145 candidates out of those 243 responded YES, they have/had the idea, and the remaining 89 candidates and 9 candidates responded NO and NO idea respectively as

indicated in Figure 15. This makes 98 public servants engaged in eGIS projects out of 338 candidates who didn't plan for their ISs integration. That means eGSs integration won't be easy for the output of their systems as well as other dependent eGSs from other government eGISs.

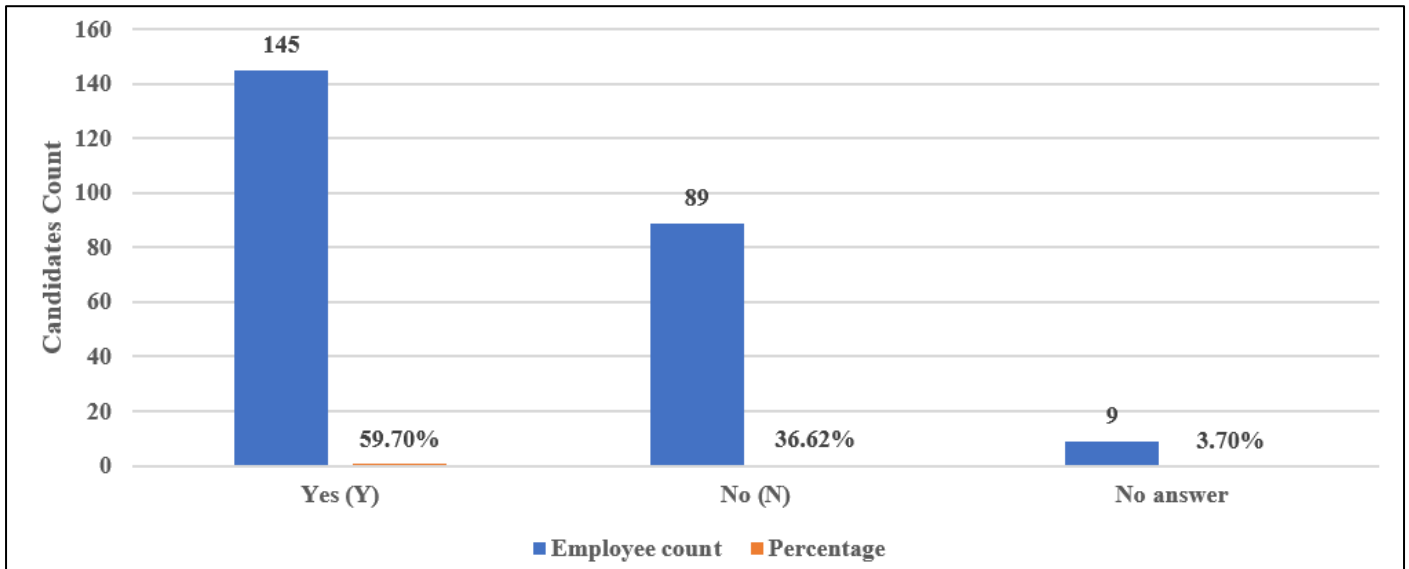


Fig 15: Candidates' Responses on How they May Get the Data for their ISs or How ISs May Interchange the Data and Interoperate

Of those 243 candidates, 141 responded that their ISs are Siloed, 69 responded that their ISs are integrated with other public institutions' ISs, and the remaining 33 didn't respond to the question is your IS siloed (Fragmented) or

integrated with other ISs, see Figure 16. This may lead to less efficiency of eGSs provision to the public caused by more than 141 eGSs being provided to them with siloed eGISs.

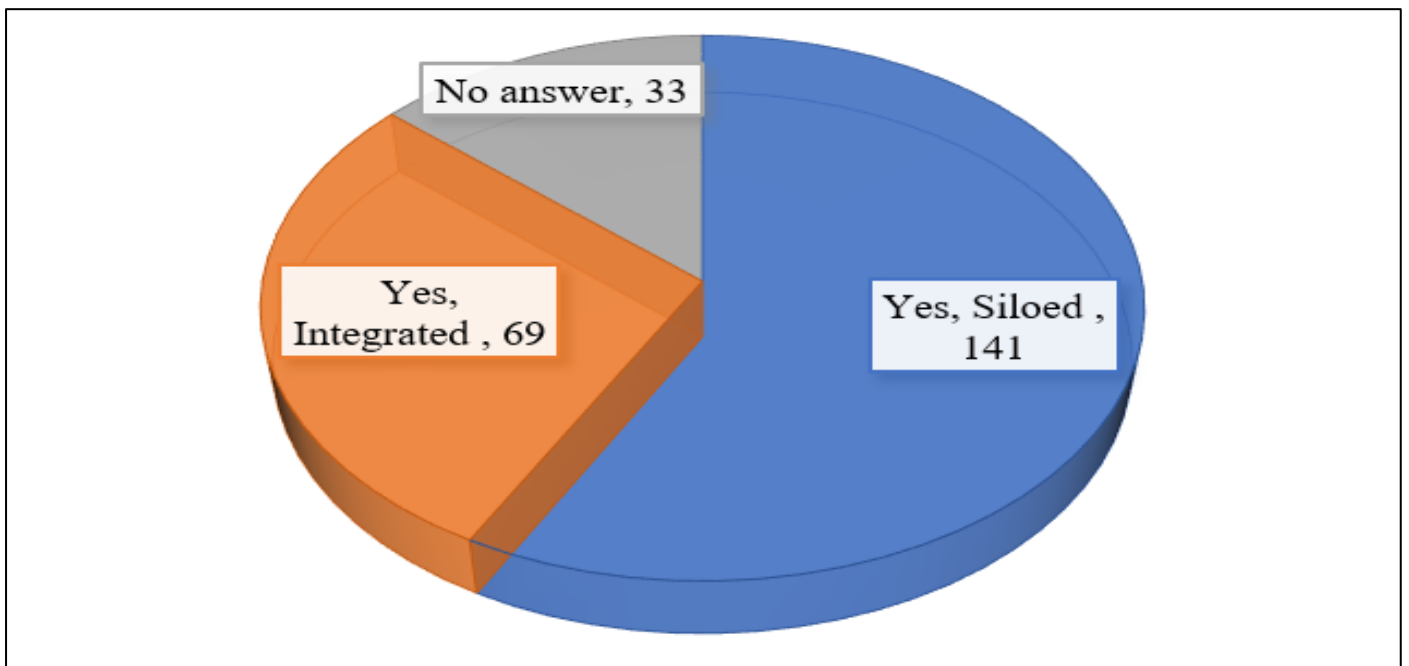


Fig 16: Candidates' Responses on their IS's Interchange Ability Status with other Institutions' ISs

For the 69 survey candidates who answered that their ISs are integrated with other public institutions' ISs, we asked them to name which ISs they integrated with, only 21

candidates were able to answer this question, which is equal to 52.50% of those who answered YES, their Systems are integrated with other ISs as indicated in Figure 17.

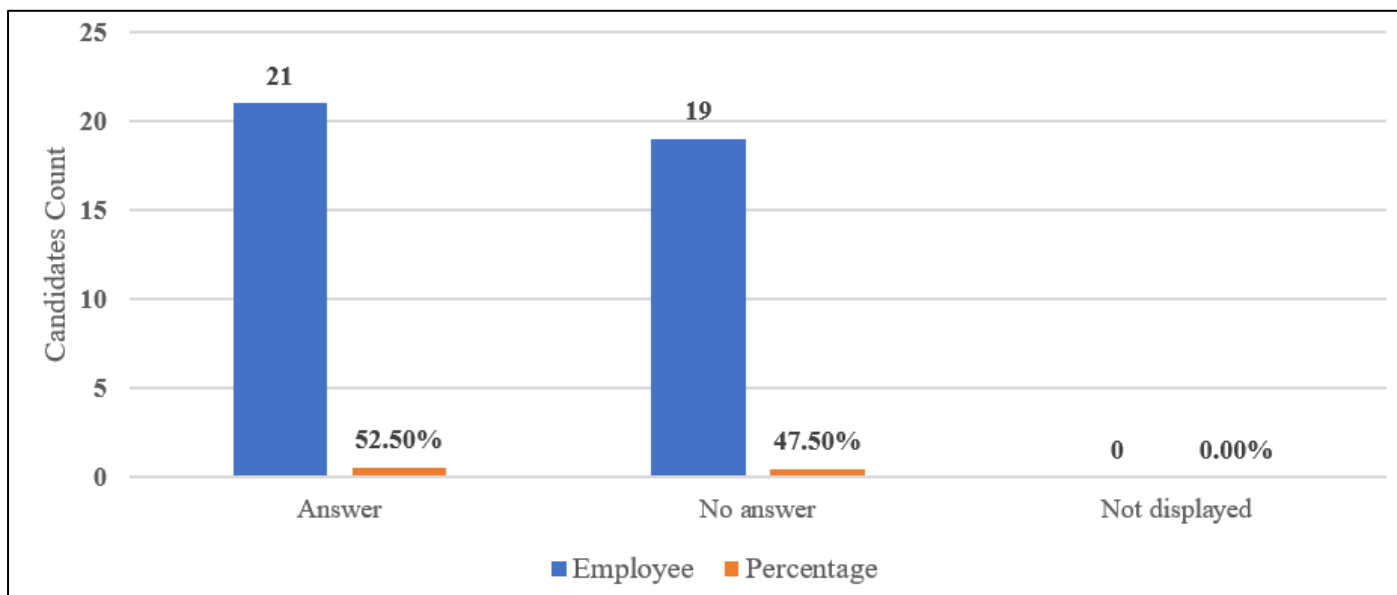


Fig 17: Candidates' Answers about ISs that Exchange Information with their ISs

This means that the remaining 19 candidates who did not have ISs mentioned that they interoperate with their ISs and earlier answered that their ISs are integrated, it may not be true. Subtracting them from 69 candidates, we get only 50 candidates whose ISs integrated and 160 candidates whose ISs are siloed. This also means that the problem still exists of having many systems that are not integrated, which means finding eGSs that are simply integrated to remove inconvenience for e-Government stakeholders will still be difficult. The ISs mentioned by the 21 candidates are the NIDA system, TCU integrated System, GMS, ERMS, Online Passport Application System, Voice Infrastructure, GePG, NHIF system, e-Office System, Got, HESLB Management System, HCMIS, Online Business Registration System, PSRS system, Online TIN Application and TAX clearance, GSPP system, SSO, Banking Systems, NECTA, NACTE, and GovESB.

To understand the challenges within eGISs integration in Tanzania, *“If the answer to the previous question is Yes, your system is siloed IS, please state the reason(s)”*, an unstructured question to 141 candidates who responded that their ISs are siloed and the responses from 27.5% of them followed and helped to develop the proposed Framework;

- i) The systems are silos because they are no existing integrated enterprise architecture for health systems that will be able to accommodate and harmonize data and API's.
- ii) Most Institutions operate independently due to various reasons. Some Institutions do not want to share information/ data with others. There is a need for change management, institutions should cooperate for better systems.
- iii) Security purpose.
- iv) Maturity levels difference.
- v) There are some of the existing systems are patricianly integrated, and some are still siloed.
- vi) The main reason for having siloed ISs is because there is inadequate adherence to e-Gov enterprise architecture where EA assists in aligning IT and organization business strategic objectives and ensures that no silo exists in the organization as well as Government as a whole. Therefore, EA awareness should be raised.
- vii) Integration in Process.
- viii) The project was meant for a particular institution to solve a specific problem because some of our systems are only used internally.
- ix) The system was designed for internal use only.
- x) Poor ICT project plan.
- xi) ICT management thoughts of not thinking about the continuation of future systems.

In your opinion, what causes a large number of fragmented (siloed) information systems within public institutions? Structured questions to 141 candidates who responded that their ISs are siloed and the responses from 83 respondents followed as shown in Figure 18 to well understand the challenges within eGISs integration in Tanzania too.

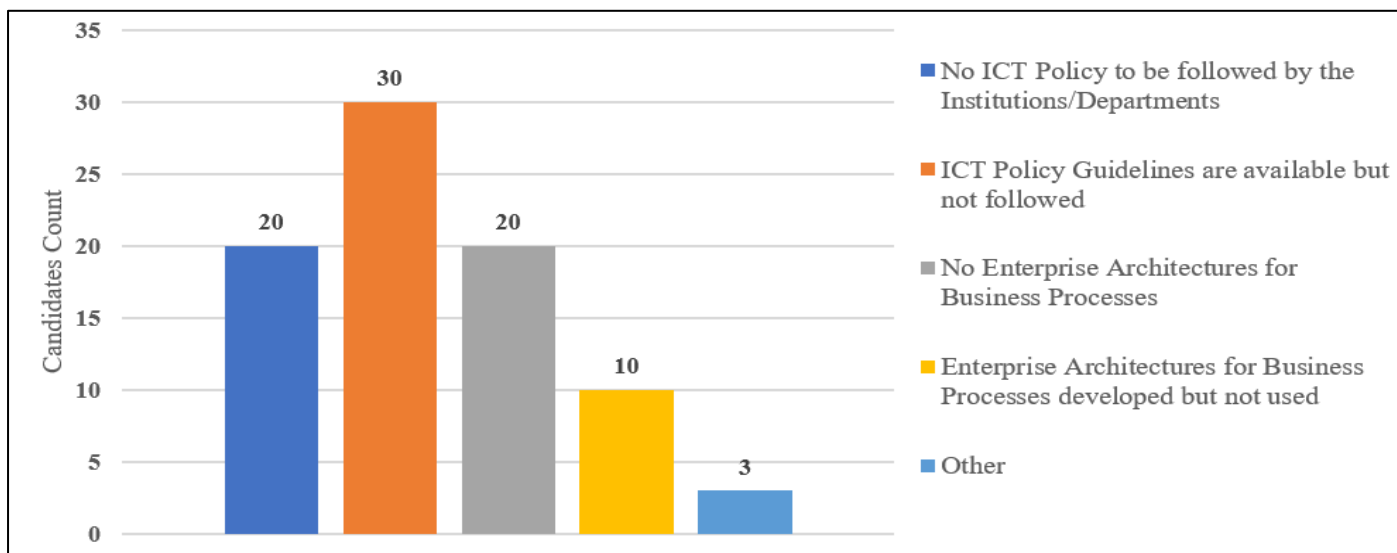


Fig 18: Candidates' Opinions on the Causes of a Large Number of Fragmented (siloed) ISs within Public Institutions

Opinions from those 3 candidates with different answers were as follows: *i) Most of the systems are being developed as a single project without looking into the bigger picture, i.e., its impact on other government business processes. ii) Legacy systems were not built in a way to cater for integration and iii) Poor Controls.*

Another structured question was asked of 141 candidates to have more opinions concerning Government IS integration and also to understand the challenges within eGIS integration in Tanzania. *In your opinion, what are the challenges within eGIS integration in Tanzania?* Responses followed as shown in Figure 19.

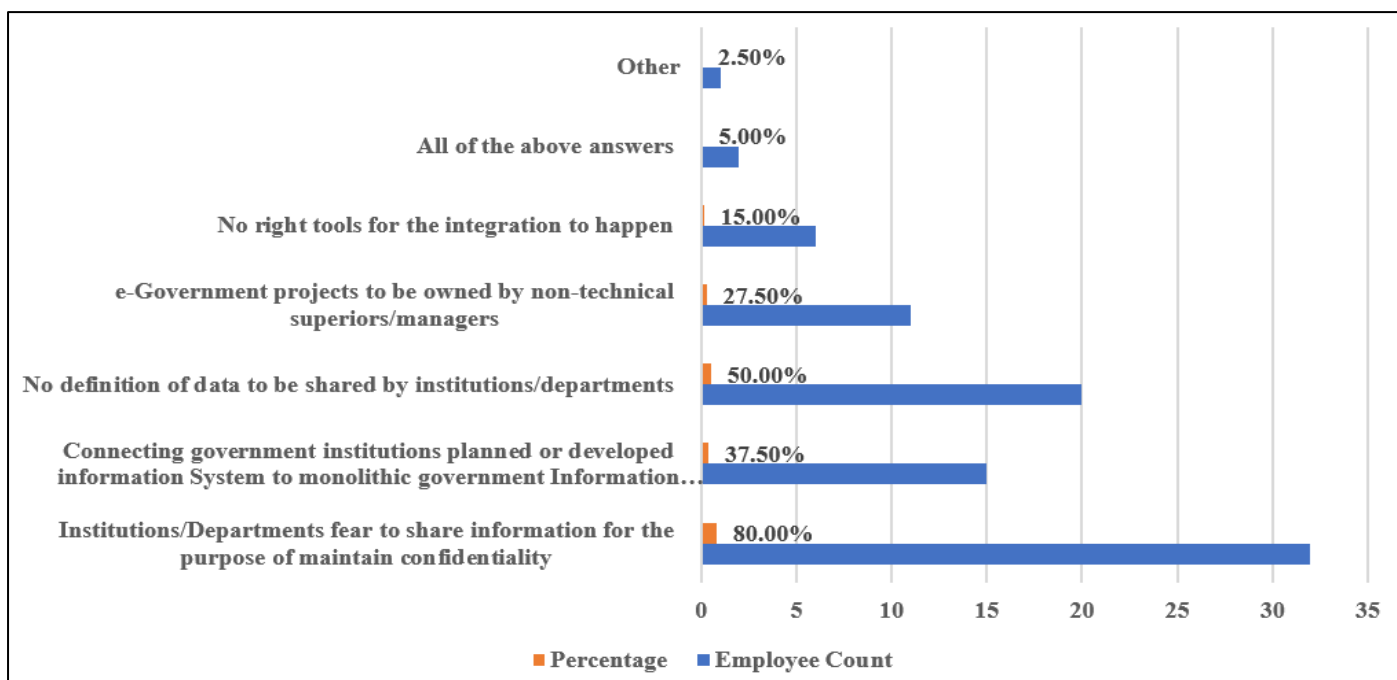


Fig 19: Candidates' Opinions on Challenges within eGISs Interoperability in Tanzania

The response to this question indicates that public institutions' information confidentiality in one way or another blurs the efforts to have integrated eGISs and raises the question of whether all public institutions are not fulfilling the main responsibility of the Government to serve the citizens or each one has its responsibility unique to convey to the public?

A proposed framework is also presented in a survey along with the recommendations made on it to evaluate the

proposed eGS Integration Framework. 351 e-Government project stakeholders who responded to the survey were asked about the framework to be in practice and whether could help to solve the problem of eGSs integration or not, Responses were presented in Figure 20. Not less than 80% of the respondents agreed that the proposed Framework can help in the process of solving eGIS integration as well as eGS integration.

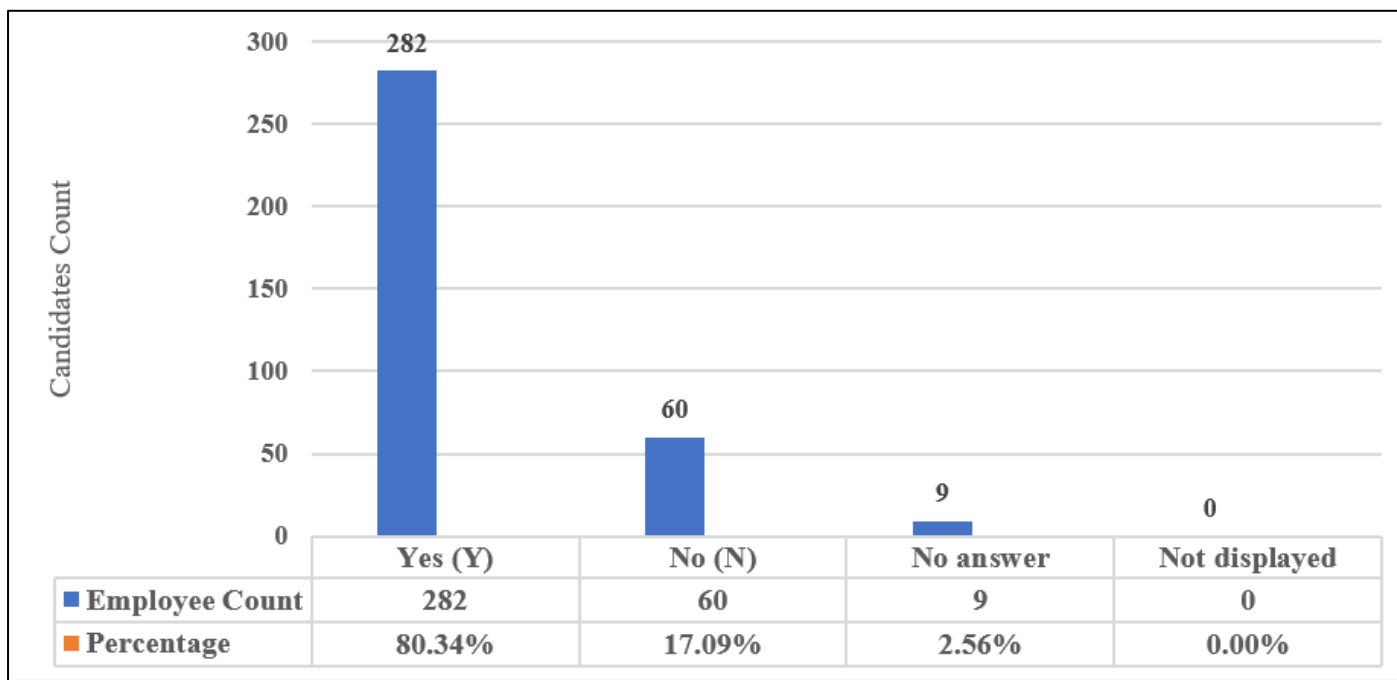


Fig 20: Candidates' Responses on their IS's Interchangeability Problem if the Proposed Framework is put into Practice.

Father more in evaluating the proposed eGS Integration Framework, we asked our candidates about their preferences in the eGSs integration process in Tanzania and we took general statements from them, only 40 of them were interested in stating their views and 25 candidates brought their statements and what we presented here are general statements as we avoid the repetitions;

- Plan for integration and deployment of each system, and remove duplication of effort by having more than one system that does the same activities in various public institutions.
- Plan to harmonize data elements, involve other experts (accountants, M&E, secretaries, etc.) apart from technical, programmers during creating business processes so that they are not left behind, and build interest in the e-government services.
- The e-government services integration team to interact with Institutions/Department teams to collect the specific system requirements that will help to come up with the required IS that will cover the institution's need (i.e., to be open-minded to grasp the necessary information for the required system).
- There is a need for the establishment of clear rules and guidelines for system development.
- Currently there are some initiatives in a few public Institutions though they are not successfully 100%
- All services offered should be integrated so that can be shared.
- To have a unique identification number for all citizens that will enable them to access services across all the integrated information systems.
- eGS integration is possible and it may help to reduce the redundancy project and save money and unnecessary projects.

- To ensure that all government services that are capable of being delivered through mobile channels are made to happen, even though the non-smart mobile phones, and ensure re-use of data instead of each time requiring entering of the same data that already exists in other EGISs.
- EGS integration in Tanzania is a great way to provide centralized information sharing among institutions and in return ease services availability to citizens.
- Public institutions should work as a Team. The question of how the information will be shared between institutions should be considered in the early stage of system design and development.
- Integration of EGSs will help to eliminate unnecessary duplication of efforts that result in the wastage of financial resources.
- Data Privacy Policy/Law should be reviewed and implemented based on current technology, challenges, and future trends to provide stakeholders confidence.
- The proposed framework if implemented will ease the availability and accessibility of government services in real time and avoid duplicates of information to be provided to public institutions to get a particular service.
- The Government should make sure every public institution follows e-government policies
- For the proposed framework, I suggest you look deeply at four aspects people, organization, technology, and the ICT environment as a whole.”

C. Framework Applicability

The proposed solution can be used to guide e-government projects, especially in achieving the goal of connecting the eGS with the intended output of those projects with other existing ones. e-GA is involved in the initial stages of projects, especially in parallel with the participation of institutions with interdependent systems. This supports the

concept of participation of public institutions in e-government projects where coordination needs to occur.

If appointed government officials are involved in the project plan, then it will be convenient to carry out the project, especially where decisions for approvals are needed in institutions to achieve IS interoperability. According to this guide, when the projects are completed, the IS terminations will have to be on a government network that will facilitate their communication to be interoperable because the protocols that have to be used will be similar and even the availability of the service will continue to exist even if internet access is not available because the reliance is on using multiprotocol label switching (MPLS) when the domain names are not involved, just internet protocol address (IP-address) communications.

The availability of all eGS in the e-catalog will make it easier to access government services, and citizen hustles caused by visiting various offices to complete the acquisition of one eGS which depends on the verification of other eGSs in different institutions will no longer be, the interoperability of the government ISs will handle it.

VII. CONCLUSION

The study highlighted the challenges within e-government ISs integration, the e-government Services Integration Framework was proposed and developed based on the challenges found within e-government ISs integration and along with its evaluation. It is highlighted that for e-government Services integration to happen, Government ISs need to integrate and make it easy for them to interoperate by exchanging all necessary information. Also, it is highlighted that it is needed an e-government Service catalog after the service integration for easy access to all government services that are electronically provided to the public. Several limitations of this study are summarized as follows; First, the quality of Public Institutions ISs was not considered in this study, only the availability and integration dependencies. Since enabling eGS integration to happen is dependent on the presence of ISs that communicate and exchange information, the quality of those systems needs to be closely monitored as lack of quality can lead to the state of having only automation of Government services and not good eGSs with standards and productivity for the public that is easy to find its convergence and finally simplify life which is the central concept of the advancement of ICT. Also, the categorization of eGISs based on recognized sectors was not considered. In the problem analysis, all the systems were taken as a whole, considering that it is an IT system used by a certain public institution and helps to provide certain services to the public. e-Government projects planned to be done recently and even in the future by the government in any way, that is, with local funds and even with other funding, have not been considered in this study. Considerations are for existing projects that have ended, that is, those used by the government.

The study is based more on theoretical ways of finding answers to questions, and how to give suggestions to approach the whole issue of eGS integration in enabling eGISs to exchange information. Future work on the study should focus on the technical issues, especially considering the rules, procedures, and guidelines that exist in the operation of government activities through IT, the basic reasons for the use of technology that may be the source of not achieving the entire process of eGS integration. Prospects of emerging technologies used by developed countries like X-ROAD in Estonia and similar ones. Expectations could include producing the findings of the technologies employed in public institutions to provide services to the public and having a report on the inspection of these technologies to determine whether they comply with the e-Government Act of 2019 and all compliance standards.

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