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Organisational, Technological and Governance Factors Influencing T-government

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Abstract
Governments around the world have invested significant sums of money on Information and Communication Technology (ICT) to improve the efficiency and effectiveness of services being provided to their citizens. However, they have not achieved the desired result because of the lack of interoperability between different government entities. Interoperability is a critical success factor for achieving a mature level of e-government to enable a citizen centric approach to the provision of services. This paper presents a better understanding of transformational governments and the need for t-government; it investigates the various dimensions to t-government, and addresses the Organisational, Technological and Governance factors that influence t-government based on a literature review of the studies related to t-government.

Keywords
Transformational Government (T-Government), E-Government, Interoperability, Transformation

I. Introduction

Many nations have put in place e-government applications to enhance the efficiency of the public sector and streamline government systems to enable creating connections between different government organisations in order to create further efficiencies states that this should be the goal of a transformational government [1].

Nowadays, the concept of a transformational government (t-government) needs to be viewed on an international scale. In order to facilitate more centrally-connected and citizen-centric e-government services, and put the needs of individuals and businesses at the centre of online processes, many governments have started shifting away from the original concept of e-government towards a much more transformational approach towards the entire relationship between different government departments and users of public services, which can be termed as transformational government (t- government) [2-3].

This paper is organized as follows. Section II discusses the meaning of t-government, and how it is different from e-government. Section III presents a review of the existing literature and a definition of e-government interoperability. Section IV reviews some of the international interoperability frameworks that have been developed, in order to identify the most appropriate theoretical background. Section V presents the main findings of the study which is a set of 13 factors that influence t-government. These factors are organized into three dimensions, namely: organisation, technology, and governance. In Section VI, the paper concludes with an outline of the requirements for future research.

II. From E-Government To T-Government

The concept of e-government refers to the use of information technologies (such as Wide Area Networks, the Internet, and mobile computing) by government organisations, in order to transform their relations with their citizens, local businesses, and other government organisations. The purpose of these technologies includes better delivery of government services, improved interactions with local business and industry, citizen and more efficient government management. The use of technology can lead to improvements such as lower levels of corruption, increased transparency, greater convenience, revenue growth, and reductions in the cost of delivering services [1].

A. E-government Types of Interaction

There are three main types of interactions within e-government, which are classified by United Nation Public Administration Program (UNPAP)[1]: Government-to-Customer (G2C),Government-to Business(G2B),Government-to-Government (G2G). However, within the G2G interaction, the relationship of government and its employees (G2E) can be separated:

- G2C: the objective is to replace face-to-face transactions by developing online transactions which give citizens better access to public services.
- G2B: the aim is to provide better services to business through online transactions in many areas such as customs and tax, or to facilitate the government to use e-procurement to reduce purchasing costs.
- G2G: the goal is to share data and to shift all transactions, where possible, through ICT in different layers of the government.
- G2E: the goal is to emphasize redesigning the process of operations of government employees to make government administration more effective and efficient.

B. Connected or Transformational government (T-government)

The transformational phase, or T-Government phase of providing online government services is the highest level of maturity, thus it is also the most difficult level to reach. T-government is seen as a dramatic change in the way government s services are provided both internally and externally. This ultimate stage in providing e-services it is often referred to under different names such as horizontal integration, transformation, transforming government and fully integrated or single point of access [4-8].

John B[9], point out that, t-government can be defined as a managed process of ICT-enabled change, which puts the needs of citizens and companies at the centre of the process and which achieves significant improvements in the efficiency and effectiveness of government. This transformational stage involves re-engineering the provision of government services from a single point of contact to citizens and businesses to make the government more transparent and increasingly efficient [10-11].

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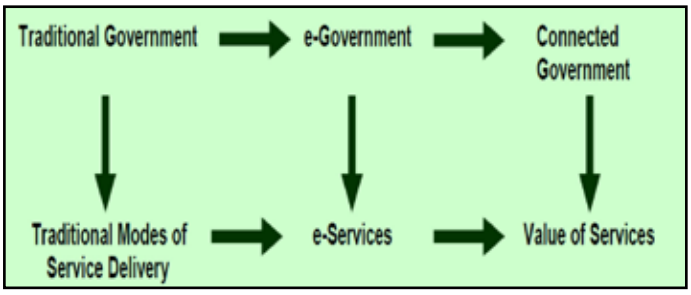

Fig. 1: Connected Government [11]

C. Metrics for E-government Interoperability

In order to provide an effective and efficient t-government requires the interoperability of e-government systems. Depending on the observed maturity stage of an e-government system, different forms of interoperability are needed. Therefore, the stage of maturity an e-government system can be identified through analysis of the mechanisms for interoperability and their purposes, as follows [12]:

1. Emerging

Interoperability requirements at this level are minimal, since communication between system components is low and basic. Essentially, a system at this stage it is focusing on supplying asynchronous information to concerned individuals. Therefore, the interoperability is only to assure Web access to available information for G2C and G2B communications.

2. Enhanced

Information and services available at this stage of maturity are slightly more sophisticated when compared to the emergent stage. However, the requirements of interoperability are still low as most of the focus is on provision of information and any type of two-way interaction is minimal.

3. Interactive

At this level, the beginnings of an interactive portal or website with services to enhance the convenience of citizens are evident. Some level of interactivity to end users is available such as downloading statistics or information from the government's website. These operations can require the integration of information from different Government agencies and therefore some level of G2G communication is often required. The implementation of this sort of communication in an integrated system may necessitate the development of technical interoperability as well as semantics interoperability.

4. Transactional

At this level all relevant categories of communication for an e-government system (G2C, G2B, C2G, B2G and G2G) occur in the system. As well is this, governments begin to transform themselves by introducing more sophisticated two-way interactions between the government Department and its end-users. Interoperability between different e-government systems is now of utmost importance. Technical and semantic interoperability is crucial and some level of organisational interoperability is also often needed.

5. Transformational or Connected

At this stage governments transform themselves into a connected entity that responds to the needs of its citizens by developing an integrated back office infrastructure. The activities must be integrated seamlessly and reliably and flow across different government departments. All categories of communication are present and all kinds of interoperability should be taken into account. Organizational and technical interoperability becomes crucial at this stage [12].

D. Differences Between T-Government and E-Government

This section will focus on explaining the four major ways in which transformational government programs differ from traditional e-government programs. First, transformational programs involve initiatives to provide typical frontline public services over electronic platforms. Second, they focus on perceiving citizens and businesses as active users of services and participants in the creation of public services. Next, they take a holistic view of the relationships between the government and its citizen and businesses. Finally, they should look for the most efficient way of managing the cost base of the government by looking at the government's as a whole instead of on a department by department basis. The following table summarises ways in which transformational government programs differ from traditional e-government programs [9].

Table 1: The Different Between E-Government and T-Government [9]

E- Government	Transformational Government
Government centric	Citizen centric
Supply push	Demand pull
Government provides citizen services from disconnected departments	Government provides information from multiple departments from a single access point
The government owns and manages “identity”	citizens to own and manage “identity”
Public data is difficult to access	public data is freely available for use and reuse
Citizens are only the receivers and consumers of services	Citizens are owners and co-creators of service
Online services	Multichannel service integration
IT is seen as a capital investment	IT is seen as a service
Producer-led	Brand-led

III. The Important of Integration and Interconnected (Interoperabiliy)

Integration is the combination of separate systems into a new system functioning as a whole, whereas interoperability is the ability of systems to share information and functionality with another system based upon common standards. While interoperability can be seen as creating a level playing field for predictable and efficient integration, it is in itself insufficient to lead to system integration. While integration works well in closed, single jurisdictional and less complex situations, interoperability is better suited to environments that are multi-jurisdictional, require cross-boundary connectivity, and open to external inputs and actions. A fully integrated government provides horizontal and

vertical cross-service providers. Government integration results in the presentation of the a single government view to the citizen, instead of a fragmented set of departments, and allows citizens to access government services from single access points [13]. In its broadest sense, an integrated government has the ability to get different government departments to work together. At the technical level, different government departments share ICT systems or exchange information in order to improve governance [12,14]. Clearly, interoperability is a key feature of e-government systems.

Table 2: Interoperability Definitions from Various Sources

Definition	Source	Interoperability Types
"The ability of government organisations to share information and integrate information and businesses by use of common standards."	NZ e-GIF	Technical, Semantic, e-government
Interoperability means the ability of ICT systems and of the business processes to use common standards in order to use the information and functionality of another system or process.	European Public Administration Network	Technical, Business Process, e-government
Interoperability describes the ability of all different pieces of equipment to work together to deliver seamless services in a, standardised and efficient manner across different IT systems.	Australian Government Technical Interoperability Framework	Technical, Information, Organisational, e-Government
Interoperability is the ability of a system or process to exchange data to allow the sharing of knowledge and information.	IDABC	Technical, Organisational

Many government departments are deploying new ICT systems with specifications and solutions relevant to their specific requirements and not with a view to the need to connect exchange and re-use data with other agencies' ICT systems. As a result a patchwork of ICT solutions is emerging where the systems of one department are incompatible with the systems of another. As a result many e-government programs do not provide interoperability. This is becoming an increasingly salient issue, as many ICT investments have reinforced traditional barriers which make government decision-making difficult and the access of citizens to public services challenging. This also makes it unlikely for many developing countries to achieve, by 2015, their Millennium Development Goals (MDGs). In response to those many governments are quickly finalizing the design of national e-government strategies and are busy implementing the highest priority programs [15].

Interoperability as needed to improve efficiency, reduce costs and facilitate the ability of government departments to respond to developments in public policy. Interoperability contributes to the availability and accessibility of government information and to transactions with the government. In order to create interoperability data needs to flow through networks beyond the limits of a single government department and also through public organizations, citizens and businesses, by providing a number of specific benefits [16]. The main advantages of interoperability are that it leads to cost savings, by allowing the reuse of existing resources and capabilities; it creates systems that are easier to use, by integrating systems together; it increases flexibility, by allowing the interchange of components, and it assists with developing new capabilities, by composing new functions out of existing ones [17]. The next section discusses some international interoperability frameworks. The figures (2) summarise the needs that interoperability addresses and also the benefits that are derived from it.

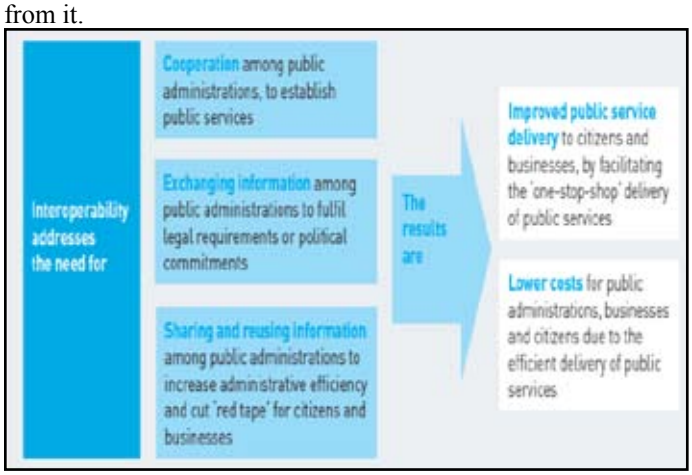

Fig. 2: Towards Interoperability for European Public Services [19]

IV. Some International Interoperability Efforts

T-government is emerging on a global scale. Governments in different countries are establishing different frameworks for establishing their t-government. This section will examine the efforts made here and for different areas which are the Australian Government Technical Interoperability Framework (AGTIF); UK e-Government Interoperability Framework (e-GIF); European Interoperability Framework for Pan-European e-Government Services (EIF); and the Estonia Interoperability Framework (EstIF).

A. Australian Government Technical Interoperability Framework (AGTIF)

The Australian Government Technical Interoperability Framework (AGTIF) emerged in 2003 and was updated in 2004. The framework introduces three interoperability aspects which are Technical, Information, and Organisation. The AGTIF has a technical viewpoint and provides a set of guidelines and standards for implementation across Australian Federal Agencies. The work provides a classification scheme for standards and also a set of case studies describing how these standards should be used by government departments to deliver national solutions. Although

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the framework is currently limited to technical guidance there is a plan to deliver a National Government Interoperability Framework (NGIF). This framework will have a broader design that will guide and promote interoperation between government departments for not only technical aspects but also semantic and organisational aspects [16].

B. UK e-Government Interoperability Framework (e-GIF)

The U.K.'s framework was one of the first frameworks to emerge. The five main outcomes of the work are the framework itself, the Technical Standards Catalogue, an e-Government Metadata Standard (e-GMS), long-term initiative backing through guides, toolkits, working groups, and related activities, and a centrally agreed information schema repository supported through the GovTalk website . The government's e-GIF defines the technical policies and specifications governing information flows across different government departments in the United Kingdom. A Technical Standards Catalogue contains general specifications regarding policy, management, implementation, and compliance components. For instance, e-GIF identifies the use of XML as a standard protocol for government websites and XSL9 for information schema definition. All government exchanges of information are required to adhere to these policies and specifications [15, 18, 19].

C. European Interoperability Framework for Pan-European e-government Services

In 2004, the European Union developed its own Interoperability Framework to create an Interoperability Framework for the EU, based on the frameworks of France, Germany and the UK. The framework is an enabler for pan-European interoperability rather than delivering interoperability. It supports the delivery of e-Government services across the EU through the standardisation of information content as well as technical policies and specifications. The EU has some unique challenges such as the complexity of cross-border interactions which necessitate the use of different languages; higher layers of security, due to the need to exchange information between nations; greater issues of privacy, due to different laws and legal systems; and a wider range of uses of standards and software applications between different nations. The EU has made great progress in all three dimensions of interoperability, which are; organisational, semantic, and technical interoperability. However they are facing greater challenges in terms of having to provide information in different languages to different governments of different nations with different levels of responsibilities to provide information to their citizens [20].

D. The Estonia EstIF (Estonia)

The EstIF is oriented explicitly toward improving democracy in a post-Soviet nation where democracy is still a relatively new concept. Its specific goals are to improve the quality of services, both at the Estonian and the EU level in order to increase public sector efficiency in Estonia. To achieve this there is a focus on transforming the institution based public administration into a service centered one. This is based on the principles of authenticity and integrity), openness and availability, and confidentiality (of restricted data, sensitive personal data).

In order to achieve this is based on a service-oriented architecture and government departments are being requested to make use of XML and the provision of services over the internet. Large investments have been made in infrastructure, for example, in Estonia's highly successful Public Key Infrastructure and X-Road initiatives. Part of this success appears to be due to the clean slate approach taken by Estonia's government and also a high level of cooperation between various factions within the government and also cooperation with the private sector role [17].

V. Dimensions the Influence T-Government Integration and Interoperability

Many dimensions that affect t-government have been identified in the literature. The following section describes each dimension in more detail. From the extant literature a total of three main dimensions can be identified:

- Organisation dimension
- Technology dimension
- Governance dimension

Organisation dimensions include (business process management, organisation structure, funding, stakeholder and IT staff), technological dimensions include (back office systems, architecture, standardization and data management), and governance dimensions include (leadership, legislation and policy, strategy and citizen centric). Fig. 2, illustrates these dimensions in detail.

A. Organisation Dimension

1. Business Process Management

Business processes are considered to be one of the most important constituents of t-government interoperability [21-22]. This realization of t-government will only be achieved when different government organisations collaborate, streamline their business processes and integrate systems that have been historically fragmented. This is called business process interoperability [16, 23].

The main impetus for business process interoperability stems from the increasing need for collaboration within and between government organisations in the delivery of public services, the development of policies, and the implementation of programs or projects. This is because different government organisations are usually involved in the provision of these. However,

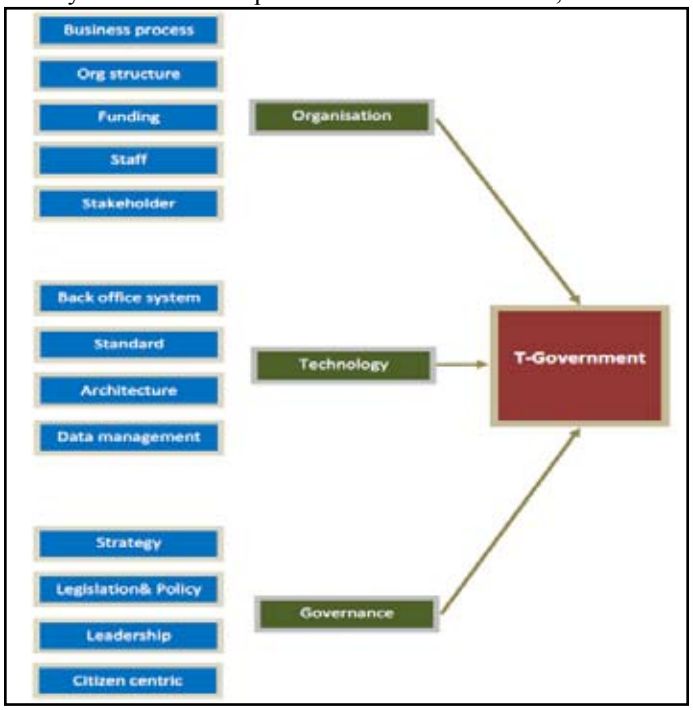

Fig. 3: Factors Influencing T-government

public business processes are often difficult to change, because the public sector often operates along the lines of a traditional bureaucracy [21, 24]. Greater flexibility is needed because processes must be re-engineered where necessary, and systems must be able to interact with those of other government organisations [23].

The main drivers for collaboration and integration include the need to provide services to citizens who are more demanding and better informed, the ability to respond to more complex social and environmental problems, advances in information and communications technologies that enable changes, and the need to more effectively manage limited resources [21, 25]. Business processes are essential to enable government organisations to engage in the ongoing process of governance and align its people, processes, and systems to optimise the internal and external exchange and re-use of information [26, 27]. This clearly necessitates the integration of business processes between various stakeholders such as, employees and citizens, different government organisations, and business partners [28].

2. Organisation Structure

A major challenge to achieve t-government is the structure of the public sector [26, 27]. This is because public sector organisations are highly fragmented, established for accomplishing specific tasks, with a relatively high degree of autonomy. Therefore, this makes changing the organisational structure of the government organisation to form a service delivering chain a challenging process [24]. In addition to this, another challenge to changing the structure of a public organisation is that they are often structured along the lines of a traditional bureaucracy, which were built to be resistant to change [21, 29].

Therefore, there is a need to establish cross-boundary information sharing in order to create the clear pathways necessary to enable effective information sharing [25]. Government organisations should be aware of the importance of restructuring their organisations in order to maximise their value to the user, but also they need to be aware that they are likely to have to overcome considerable internal resistance when implementing change. Several governments have started to introduce new organisational government structures to handle the strategizing and implementation of e-government initiatives [27].

3. Funding

Another critical challenge to the integration and interoperation between different government departments is funding [30-32]. Limited financial resources is the Achilles' heel of many e-government project [33]. A lack of funding is a major limitation to the full realization of t-government [31, 34], as t-government usually requires a large budget to build projects and train staff. In its early stages establishing e-government does not need a lot of money; however, this is not true for the latter stages (t-government), especially when the project first gets deployed.

With regards to financial resources there are many challenges that require consideration. First, government organisations can face difficulties in obtaining the level of funding they have requested, especially if funding is drawn from a pooled budget that is meant to support multiple initiatives. Second, issues can arise concerning how funds are to be managed and made available [27]. The typical annual budgeting system may not be a suitable mechanism for funding an interoperable project [35]. This is because the cost of integration and interoperation might outweigh the potential benefits, in the given timeframe. Lau revealed[36], that development of back-office requirements represents almost 90% of e-government initiatives in the final phase of their e-government system. Therefore, it is critical to analyse and manage the long-term sustainability of an integration and interoperation project [37].

4. Stakeholders

Stakeholder support is essential for a successful integration project between government agencies. Identifying stakeholders and understanding their influence is very important for t-government. Several researchers have highlighted the importance of involving stakeholders in government integration projects [24, 29].

Integration projects involve many stakeholders such as: heads of IT departments who make decisions about whether to invest in integration projects; project managers, such as those who lead integration projects; support engineers and service delivery managers, who are actively involved in the implementation of integration projects; and system integrators, who apply their technical expertise [29]. However, coordinating the stakeholders is a difficult task [33]. Government departments should start by identifying the stakeholders who possess the required knowledge and expertise, prioritize their relative level of knowledge and expertise, and deciding which stakeholders are most important at different phases of the integration project [29].

5. IT Staff

Another important factor for a t-government stage is the staff [27]. It is critical to have sufficiently qualified IT employees during integration projects. Ideally the necessary management and technical skills should exist within the organisation to prevent the need for outsourcing [31]. In addition, staff training is important in integration projects, as a lack of staff knowledge can cause resistance to an integration project [24]. Another challenge involves the coordination of staff. As with stakeholders, it is necessary to identify and prioritise the staff with the required knowledge and expertise for the different phases of the integration projects [25, 27].

B. Technology

1. Back Office Systems

A distinction can be made between the front and back offices of public service delivery organizations [26]. The interaction between citizens and civil servants occurs in the front office, while the back office system receives and processes the information, which the user of a service enters in order to produce and deliver the desired service [38].

Back office cooperation is essential for t-government due to a range of interoperability issues [22, 38, 39]. As government departments are usually quite fragmented the back office systems are critical to successful t-government interoperability, and they require flexibility to enable coordination and integration between different back-offices systems [38]. In addition, an integration of different government organisations' back office systems is particularly challenging due many being run on proprietary mainframe systems, rather than as network integrated systems. In other words, it is often difficult to integrate the back offices of different government departments because they run on different mainframe systems, which are not networked or designed to be interoperable with other systems [27].

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2. Architecture

Related to the previous issue is the need for a unified architecture and this is another challenge to t-government [25, 39]. Many government organisations have their own internal technical platforms which are isolated from the outside. A lack of architecture interoperability is another barrier to government integration [27]. Therefore there is a need to move towards establishing an architecture that is interoperable across all government departments in order to allow back offices of different departments to be integrated and share information and access services [27, 39]. Some governments have begun to address the issue of architecture interoperability through the definition of interoperability standards such as the United Kingdom's e-government Interoperability Framework (e-GIF), and the Italian government's Authority of Information Technology in the Public Administration (AIPA) [27].

3. Standardisation

Standardisation is a critical issue in t-government [22, 27, 31]. It covers the platform, security, and data exchange formats for data that is shared between government organisations [25]. Standardisation has been identified as a major barrier to the integration between government departments by many researchers. Successful collaboration between government departments relies on clear IT standards. In cases where there are incompatible or different hardware and software systems and often leads to a failure of e-government integration [27, 31]. A standardised model or framework can help different government departments overcome issues with interoperability and deliver genuinely transformational ICT-enabled change in the public sector [35]. Governments must therefore establish standards that will enable interoperability between all the government departments and only leave minor customisation to be determined by individual government departments [37].

4. Data Management

The sharing of data between government departments is an important requirement for t-government [27, 39, 40]. Government organisations manage and control data and the flow of data for an efficient outcome. In e-government integration, ontology-based data integration can be used to combine the data and information coming from multiple heterogeneous sources [39]. Policies with regards to data ownership can increase confidentiality, and encourage data sharing across government organisations [27, 32]. As well is this, the legalisation of rights to access certain pieces of data would facilitate the integration between government organisations [37]. However, it is also important to monitor data protection, privacy and system security within the organization to limit the scope of t-government and prevent issues of citizens right to privacy being violated [39, 40].

C. Governance

1. Leadership

Leadership is critical to that success of t-government initiatives. It is important to have leaders with sufficient levels of authority to access resources and mobilise support to achieve t-government [25, 37]. Leadership is needed in order to communicate a coherent vision for an initiative, build support for the vision, and to reach out to the leaders of other government departments in order to get their support for the t-government initiatives. Sharing leadership across government departments is important because of the need to integrate the different departments [37].

Also, the required level of t-government requires special leadership skills to cultivate the appropriate management to support the transformation to interoperability [35]. These skills include the ability to develop strategies, manage technology, and engage stakeholders [41]. A charismatic leader with sufficient knowledge of information technology is one of the most essential requirements for the government when implementing a t-government project [30]. They can speed up the process of integration of the different government departments by gaining a long-term commitment of resources, and they can ensure that there is smooth and efficient cooperation between the departments[30, 41].

2. Legislation & Policy

T-government requires identifying the most appropriate government organisations to begin to provide services and share information with other government departments that may require the provision of their related services [35]. As well is this, to enable e-government integration projects it is often necessary to pass legislation, so that different departments are able to share information and ensure that this information is kept secure [25, 37].

If policies relating to t-government are unclear this can be a major barrier for interoperability and integration of the IT systems of different departments [27].Therefore, t-government policies are required at the outset of a government integration project, and policies should be clearly defined and designed to support the integration projects [35, 37].

3. Strategy

The most critical element in t-government is a commitment to the objectives of the transformation [22, 27]. This often requires a paradigm shift in an organisation's thinking and strategic direction [32]. The central government needs to develop a national agenda or strategic plan for t-government. At the same time, the central government needs to propel government departments to align their own t-government goals to this national agenda to enable t-government interoperability across society [27]. Therefore, it is essential that the strategy for the transformation to a t-government is translated into an effective and clear roadmap that can be easily interpreted and followed by all government departments and that the requirements and responsibilities of each department are clear [25, 32].

After a roadmap is created, it is essential to set clear objectives and goals, and for these goals and objectives to be agreed upon by different government departments [27, 31]. Without a common set of goals and objectives it is difficult to plan projects that span multiple government departments [32]. Therefore, there is a need to clarify the roles and responsibilities of each government departments that is involved in the transformation project and there must be a coherent shared vision of goals and directions [22]. This is a challenging task as government departments are run according to different missions and purposes and according to different priorities [32].

4. Citizen Centric Design

A citizen centric design involves the provision of services from the end-user's point of view rather than the perspective of the

government department [42-43]. A t-government should have a citizen centric design. However, citizen-centric service delivery is complex issue with many perspectives that need to be considered at the very beginning of a transformation project. The provision of citizen-centric service has been identified by some researchers as a critical success factor [44]. Therefore, t-government should be provided in a way that enables citizens to easily access information and complete their transactions. In order to assess the level of success of the provision of citizen centric services end-user satisfaction should be regularly measured [42-43].

VI. Conclusion

This paper is based on a literature review to discover the critical elements for successful t-government within the public sector. In the first part, a review of the literature was done to establish the meaning of t-government, and how it is different from e-government. The second part looked at the range of definitions of interoperability in the literature and analysed the importance of interoperability for t-government. Based on the analysis a comprehensive definition of interoperability is proposed. The definition covers technical as well as non technical aspects of interoperability such as organisational and informational aspects.

The third part of this paper reviewed the literature with regards to some existing international interoperability frameworks in order to identify the most appropriate theoretical background.

Finally based on the analysis of interoperability constituents, the main dimensions that influence t-government integration and interoperability are presented. These dimensions are technology, organisation, and governance

Having identified these dimensions, research is needed to quantify and validates these factors. There are several significant issues that lie ahead, including the development of the correct research instrument, validation of the instrument, and the collection of data from the most appropriate entities. Empirical studies of the factors that influence t-government can lead to a model to better support t-government, such as refining the current stages of growth models to reflect the complex nature of transformation and the difficulties in achieving a stage of transformed government. Such a model could support decision makers and present them with key information and areas for focus in establishing t-government, as well as enhance leadership understanding and their ability to respond to challenges to providing t-government, by defining a comprehensive approach addressing organisation, technology, and governance approaches to realizing t-government.

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