

Transaction Stage of e-Government Systems: Identification of its Location & Importance

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Abstract

All e-Government maturity models identify a Transaction stage along the pathway to full systems integration. The evidence suggests that a significant number of project failures occur at this stage and thus frustrate the endeavour to achieve a coherent uniform means of access to Government. Clearly, research to identify and overcome the challenges presented at this stage is critical. In this paper the Transaction stage is clearly delineated as the point at which online technology ceases to be peripheral to the agency's activity. Hence, it presents the first real organisational challenge and an appropriate research strategy is defined to uncover the problems that arise at this point.

Keywords: e-Government, Transaction stage, Research methodology.

1. Introduction

The terms used to define e-Government are nebulous and it means many things to different stakeholder groups. However, in extrapolating common strands from the taxonomies proposed by Al-Sebie [4] and in the various definitions that have been proposed [25, 29, 30, 31, 35,], the following key issues feature prominently:

- Technology to deliver government services electronically.
- Transaction processes and the transformation of E-Government services.
- Benefit portfolio for delivery of government services electronically to the public
- Citizens as the central focus of service delivery.
- Delivery of government services through a single online point of access.

Kei Ho [21] claims that the early 1990s was the starting point of the concept of e-Government. The reason for this was the use of electronic mail, list-servers and the World Wide Web to deliver services and information to its citizens.

By the end of the 1990s, governments worldwide were pursuing e-Government projects to provide information and services to citizens and businesses electronically [6]. Since these early implementations of e-Government, successive governments have increasingly recognised the problems of successfully developing ICT systems that are significant when set against the backdrop of funding allocated to e-Government project.

The UK Central Government public spending review of 2002/3 allocated £6bn over three years to government electronic service delivery, which is set to be reviewed again towards the end of 2005/06 [27]. In 2003, the Public Accounts Committee (PAC) reported that the UK Government had 100 major information and communication technology (ICT) projects underway, with a total value of £10 billion [26, 27]. However, the parliamentary office of science and technology (POST) recently reported that the cost of cancelled or over-budget Government ICT projects over the last six years is greater than £1.5bn [27].

The adoption of information systems clearly provides a powerful tool for modernizing governments. As with all ICT projects, improvements in efficiency, through reducing errors and improving the consistency of outcomes by automating operational tasks, remains high on management's agenda. In addition to these benefits, e-government projects are seeking efficiency and effectiveness that can be achieved by reducing cost and layers of organisational processes through reengineering and streamlining transactional procedures [12, 36]. However, simple cost saving is not the main objective behind adopting e-Government [20, 39]. E-Government initiatives propose to enhance efficiency of government

organisations, improve the quality of public sector organisation services through quicker transactions, improve accountability, better business processes, and create new services [14, 19, 31].

Advances in ICT and the ability to increasingly 'piece' together once disparate ICTs through the power of Enterprise Application Integration (EAI) have shifted the expectation of realizable benefits to a more citizen-focused as well as service-chain agenda [15, 32]. From a cross-departmental or even cross-government perspective, it enables the transformation to new e-Government facilitation, which emphasizes increased collaboration and cooperation that have a resulting impact on the citizen. Further potential benefits of an electronic Government infrastructure is enabling public sector organisations to interact directly and work better with businesses, irrespective of their locations within the physical world. This includes digitising procurement services from and to businesses to improve their service quality, convenience, and cost effectiveness. Clearly, the challenge lies in realising the benefits anticipated, managing costs portfolios and mitigating risks, and in doing so, preventing ICT project failure.

In the remainder of this paper we set out some background, review maturity models and define the transaction stage, and propose a research strategy to identify the challenges presented.

2. Avoiding Failure through Level Process Management

Despite Governments substantial financial commitment towards e-Government, many express their discontent with the performance of their information systems deployments at both a tactical and operational level. Much of this concern appears centred around the complexity associated with process management; especially at the transaction stage [3].

Notwithstanding this, much of the concern surrounding success or failure of information systems is not new but, merely re-resonating itself in e-Government. Indeed, Remenyi [28] claimed over a decade ago that there are as many failed information systems implementations as there are successful ones, with Booty [9] later reporting that up to 33% of attempts to introduce enterprise-wide solutions end in failure. In the US for example, an estimated \$59.5 billion were expended on fixing software defects, with Anonymous [5] reporting that an estimated 80% of development costs go towards identifying and correcting software errors.

Much of this cost, which is often seen as failure, has been evaluated and can be classified as being human, organisation or technically focused [17,18]. Indeed, many

management panaceas such as Business Process Reengineering and Knowledge Management have come, been applied in the public sector and then gone out of fashion. However, what remains has been quaintly expressed by Stewart [34; p.25] as:

'to change structures without changing the process [is] designed to sustain an empty action'

This quote is considered very appropriate, as structures should not only be interpreted as organisational but should also be reflected in technical structures that take a process level form, as for example in transactional process.

3. Models of the Stages of E-Government

To develop a robust e-Government infrastructure demands a staged approach, which develops from the immature to the mature, where the latter offers full integration with public administration and will have required the fundamental re-think and change of Government and its constituent components. An advantage of having a staged approach is the ability to generate momentum that can then be maintained. This will allow public sector organisations to attract more and more citizens to using e-services to a point where it becomes natural, as well as securing business trust and confidence to deal with an e-Government portals as part of their standard service chain operations.

The process of implementing an e-Government system passes through different stages until it reaches its highest potential stage. That is the integration of government information and services in different departments, for different functions and at different levels of the government system thus, enabling customers to obtain government services and information online from a single point of access.

The normative literature is in agreement that there are different stages in e-Government provision [7, 8 22, 23, 24]. An evolutionary perspective where the information systems and grows and evolves with confidence, acceptance and resources is one advocated, with Governments going through a number of stages before reaching maturity. The approaches can be divided into concepts that focus on aspects of development, i.e. simple information portals, providing communication facilities, transaction process, and finally, fully realising the integration of government systems [39].

There remains a lack of consensus regarding how many stages of maturity an e-Government system goes through. Some believe that only three stages are necessary, others believe that four, five or even six stages are required. The various models of the stages of e-Government and their perceptions can be seen in Table 1.

The purpose of this table is to identify and locate the different models presented within the table will be transaction stage within the different models and the discussed briefly.

Table 1: Different Classifications of the Stages of E-Government

Stage	Perception	Reference
Stage 1: Publish Stage 2: Interact Stage 3: Transact	<ol style="list-style-type: none"> 1. Information about activities of government available online. 2. Enables citizens to have simple interactions with their governments such as sending e-mail or ‘chat rooms’. 3. Provides citizens with full benefits from transactions over the Internet, such as applying for programmes and services, purchasing licences and permits. 	Howard [16]
Stage 1: Information Stage 2: Interaction Stage 3: Transaction Stage 4: Integration	<ol style="list-style-type: none"> 1. Delivery of government services online. One-way communication between government and citizens. 2. Simple interaction between citizens and governments. 3. Services that enable transactions of value between citizens and government. 4. Integration of services across the agencies and departments of government. 	Chandler and Emanuels [10]
Stage 1: Cataloguing Stage 2: Transaction Stage 3: Vertical integration Stage 4: Horizontal integration	<ol style="list-style-type: none"> 1. Creating websites and making government information and services available online. 2. Enables citizens to interact with their governments electronically. 3. Focuses on integrating disparate at different levels. 4. Focuses on integration of government services for different functions horizontally. 	Layne and Lee [22]
Stage 1: Emerging Stage 2: Enhanced Stage 3: Interactive Stage 4: Transactional Stage 5: Seamless or fully integrated	<ol style="list-style-type: none"> 1. Creating a government website with limited / static information. 2. Updating information regularly. 3. Provides users with reasonable levels of interaction enabling them to download forms and 4. Enables users to complete transactions such as obtaining visas, licences, passports, birth and death records, etc. online safely and securely. 5. Provides services across administrative and departmental lines with the highest level of integration. 	United Nations – DPEPA [38]
Stage 1: Information publishing Stage 2: Official’ two-way transactions Stage 3: Multi-purpose portals Stage 4: Portal personalization Stage 5: Clustering of common services Stage 6: Full integration and enterprise transformation	<ol style="list-style-type: none"> 1. Creates websites by departments and agencies. One-way communication. 2. Enables customers to have electronic interaction with government services such as renewing television licences and paying parking tickets. 3. Enables customers to obtain government services and information from a single point. 4. Provide customers with opportunities to customize portals according to their need. 5. With portals becoming better, government departments will disappear where government will seek to gather common services to hurry the process of delivery. 6. Government departments will disappear others will appear; some departments will keep the same names but become entirely different internally. 	Deloitte Research cited in Silcock [33]

Howard [16] divides the stages of an e Government system into three, namely: publication, interaction, and transaction. However, there is a shortcoming in Howard's study because it does not go as far as an integration stage. This is important because it is only the integration stage that facilitates any flow of government information between different levels of agencies and departments. This is essential to enable the citizen to obtain government services from a single point. Although the integration stage of e-Government has been given different names, including transformation, almost all normative sources have included it as one of their final stages.

Many studies – such as Chandler and Emanuel's [10], and Layne and Lee [22] (see Table 1) – have divided e-Government into four stages and most, including Chandler and Emanuel's [10], mention the stage of interaction. This makes an important distinction between facilitating unrestricted two way communication, with technologies like email and discussion boards, and explicit transaction processing whereby citizens carry out a complete transaction via an online interface.

Interestingly, Layne and Lee [22] do not mention the interaction stage, instead, they move directly to the transaction stage. However, they have provided a unique contribution to the division of the stages of e-Government by dividing the integration stage into vertical and horizontal integration phases. Traditionally government departments and organisations have maintained separate databases that are not normally connected to other government departments at the same level or with similar departments at a local or central level. The integration stage addresses breaking down these barriers.

Vertical integration addresses the challenge of integrating government departments and organisations that operate the same or related systems at different organisational levels. Consequently, vertical integration leads to the computer systems of different levels of government being connected to or at least communicating with each other. These various levels of systems are connected and talk to each other so the results of transactions from one system can be interchanged with another system. For instance, if a citizen performs a certain transaction at a local department or agency in one area, the information and results of this transaction will be propagated to city and central counterpart in another. This level will remove the organisational barrier that promotes agency-centric solutions (bespoke), and instead, promote customer-centric solutions [7].

Proposition 1:

Vertical integration requires long and thin integration.

Horizontal integration is defined as integration across different functions and services where real transformation of government structure takes shape. Transaction and information in one organisation can lead to automatic checks against data in other functional organisations. For example, when a citizen applies for a driving license after moving to another city, the basic residence record could be propagated to different functional service branches of government such as city council administration and the city election authority so that the citizen does not have to fill out a personal record form for each governmental organisation [2, 11, 22].

Currently, there are a small number of examples of public sector organisations that have achieved this stage. Success at this stage requires implementation of a sophisticated technology infrastructure that is scalable, built on open standards, and focused on integrating existing legacy systems. In addition, it requires a sufficient number of qualified IT staff to implement applications' integration of heterogeneous databases located in different sites and resolving conflicting system requirements across different functions and organisations. As well as providing adequate technology tools to maintain security of transaction and privacy of personal data, such as encryption/decryption technique, digital signature and online certificate.

Proposition 2:

Horizontal integration requires short and fat integration.

The successful development of an e-Government infrastructure depends upon a clear implementation programme and framework. Government development teams must lay out a roadmap for the adoption process by fitting every stage of adoption into the appropriate timetable and determining the ICT and organisational requirements and barriers before starting to implement and adopt the initiative. Regardless of integration types, both levels of integration demand specific integration solutions, which in figure 1 have been mapped onto the work of Layne and Lee [22].

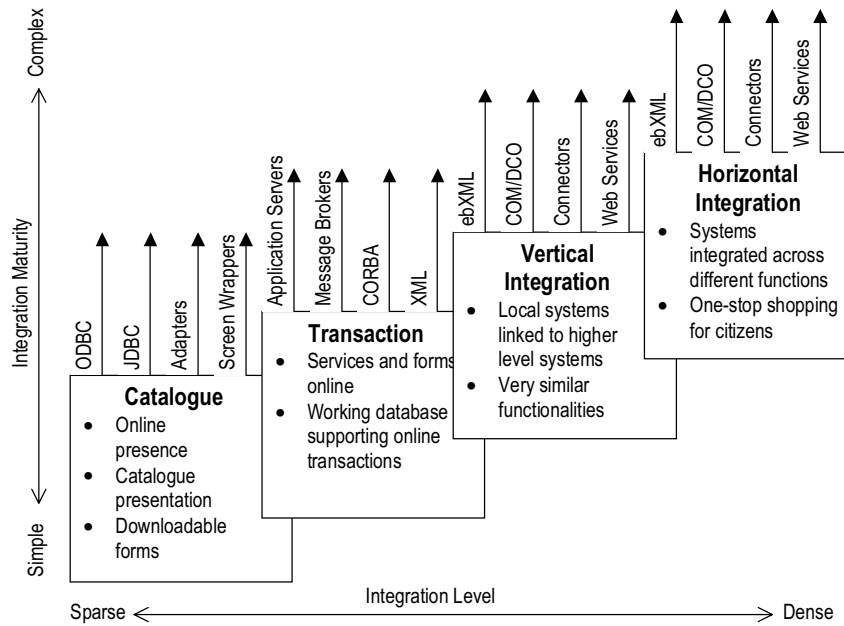


Figure 1: Mapping Technologies to e-Government stages

A few studies – such as those shown at the end of Table 1 – have divided e-Government systems into five and six stages. A report prepared by the United Nations (Division for Public Economics and Public Administration) divides e-Government into five stages [38]. It splits the ‘publish’ stage (Howard [16]) or the ‘information’ stage (Chandler and Emanuels [10]) into two by adding a new ‘enhanced’ stage that is not mentioned within any of the three and four stages model discussed earlier. The DPEPA authors of this paper argue that the enhanced stage could be seen as embedded or encompassed into stage one because of its function, which is that of updating information. It does not include any interaction functions and the upgrading of information can be done within stage 1 (emerging) that DPEPA define as just to create a government website with limited, basic and static information.

Research by Deloitte, cited in Silcock [33], divides e-Government into six stages (see Table 1). As with Layne and Lee [22], the interaction stage is not preset and the model moves directly to the transaction stage from stage one (information). It should also be noted that from stage three to stage five, the Deloitte Research focuses on delivery of government services from a single point by using a portal which provides a full range of services and enables customers to make easy and single access to government services without the need to know which agency is responsible for which service. The authors of this paper argue that because stages 3, 5 and 6 have similar functions, but do not make something like Layne and Lee’s clear distinction between vertical and

horizontal integration, they could be embedded or encompassed into one integration stage. Stage 4 (portal personalization) is clearly an enhancement to the quality of service but it is unclear why it must come at a specific point in the growth of an e-Government system and the authors of this paper do not see it a step change in the nature of the online service.

Given the representation in Table 1 and based on the previous discussion, the following points give observations and reflections on the current state of e-Government maturity models:

- There is acceptance that the stages required by an e-Government system have been classified into three, four, five or six stages.
- Although scholars have called stage one of e-Government systems by different names – information, publishing, information publishing or dissemination and emerging – they have agreed on the purpose of this stage, i.e. that it makes government information available online without any interaction.
- Although scholars have called the last stage of e-Government systems by different names - integration, full integration and enterprise transformation and seamless or fully integrated - they have agreed on the purpose of this stage, i.e. that it leads to integrated government services and information from a single point of access.
- Different models of the stages of e-Government reveal that: firstly, almost all models mention the transaction stage of the e-Government system;

and, secondly; the transaction stage of e-Government usually arises between the first and the final stages of e-Government systems, except where models like Howard’s [16] stop short of the integration stage. As indicated in Table 2 the

transaction stage almost always arises as a third stage before integration (final stage). This tends to be confirmed by such comprehensive literature reviews such as Backus [6] and Adam et al [1].

Table 2: The location of the transaction stage within different models of an e-Government system

Location of transaction stage (Within different models)	Reference
Stage 2	Layne and Lee [22]
Stage 4	United Nations – DPEPA [38]
Stage 3	Backus [6]
	Baum and Di Maio cited in, Seifert and Petersen [8]
	Chandler and Emanuels [10]
	Howard [16]
	Adam et al [1]

4. The Importance of the Transaction Stage of E-Government

The fact that all e-Government maturity models mention a transaction stage of some form indicates the importance of this stage. A similar conclusion was also drawn by Ebrahim et al., [13]. However, the importance of the transaction stage of e-Government comes from its impact on implementing e-Government systems in their broader organisational context. The roles of the initial stages, such as information and interaction (see Table 1), are only to reduce the need for physical resources (paper) to inform or communicate with customers (citizens, businesses, public administrations). Although there may be a direct cost saving this has little impact on their level of satisfaction with the service [1]. The maximum benefit of these initial stages is in downloading forms and returning them by email. These initial stages enable one-way (or limited two-way) communication ‘push e-Government’ services where government information is pushed by government organisations to be available for customers online. The transaction stage, on the other hand, enables two-way communication ‘push/pull e-Government’ where government services are pushed by government organisations to be available for customers online, where data can be pulled from customers online. Therefore, the transaction stage enables customers to carry out complete transactions, such as renewing a visa and paying bills, with specified government organisations online. This means that the transaction stage can reduce both costs and time [1, 37]. It leads to a high level of interactivity between government organisations and customers. Consequently, government organisations

might seek to reach the transaction stage of an e-Government system for several reasons such as saving time, effort and cost of delivery of services by increasing the efficiency of internal government processes as well as making the delivery of external services quicker, and enabling customers to implement complete transactions electronically.

Since the transaction stage arises immediately before integration; horizontal or vertical, it can be considered as an introduction to the integration stage whereby each government organisation can reach the highest level of interactivity with the customers.

Proposition 3:

There is much gravitation to integrate around the transaction stage because there is a plethora of integration technologies.

5. Methodology used to Identify Technical and Organisational Challenges

Due to the importance of the transactional stage of the e-Government system, and its positive impact, government organisations will endeavour to reach this stage in search of complete integration. However, reaching the transactional stage of an e-Government system is not easy because at this stage the customers (citizens, businesses and public administrations) should be able to implement a complete transaction with specified government organisations electronically. Since this stage represents a high level of interactivity between

government organisations and customers, it requires, according to Layne and Lee [22] and Ebrahim et al, [13]:

1. A high level of privacy and security of personal data, which is provided as part of obtaining government services. At this stage the organisation system, such as the application servers and database, can be accessed directly by the public via the Internet;
2. The upgrading and reengineering of the internal business process and structure of the organisation before implementation of this stage; and
3. The training of workers to deal with new ways of implementing procedures and management more efficiently, such as using electronic receipts and digital signatures.

Note these needs arise because the transaction stage gives customers access to the back-office of an organisation to complete the transaction processing. The

organisation's administration must therefore address significant process changes at this point.

As discussed earlier, there are several reasons that motivate government organisations to reach transactional e-Government. There are thus power full drivers forcing them to face the multiple challenges that this stage presents. These challenges could be: technical; economic; social; organisational and political. Research is needed to identify the importance of, categorize, and present strategies for overcoming, both the technical and organizational challenges facing a transactional e-Government system.

Table 3 below shows the different stances, strategies and methods available for this type of research and presents the justification for different elements of the research design.

Table 3: Types of approaches chosen, and the justification(s) for the decision

Approach	Types of Approach	An Appropriate Approach	Justification(s) for the Decision
Stances	Critical, interpretivism, positivism, post-positivism	Interpretivism	<ul style="list-style-type: none"> • The technical and organisational challenges facing transactional e-Government system need to be understood from the participants' points of view.
Methods	Quantitative, qualitative, mixed	Qualitative	<ul style="list-style-type: none"> • The research focuses on organisational processes and seeks to understand individual experiences of work. • Qualitative method allows exploration of a phenomenon that is extremely little known. • Rich empirical data is required to give more understanding of technical and organisational challenges facing transactional e-Government system. The need for rich empirical data means that the use of the qualitative methods is more suitable for this research because it enables the processes to be examined in-depth.
Strategies	Case study, grounded theory, ethnography, etc...	Case study	<ul style="list-style-type: none"> • E-Government is a new area with little and limited research. • The case study strategy enables the researcher to study the phenomenon in its natural settings. Thus, they will be able to understand the nature and complexity of technical and organisational challenges. • The case study strategy allows the researcher to understand in-depth the context of the technical and organizational challenges facing transactional e-Government system.
	Single or multiple case studies	Multiple case studies	<ul style="list-style-type: none"> • Multiple case studies enable the researcher to crosscheck and examine the finding of the research through analysis of data across organisations.

6. Conclusions

This paper has presented a research in progress and, at this stage, only limited conclusions can be drawn. However, it is clear from the review of different e-Government maturity models that the Transaction stage is a critical one. First, it is an important precursor to the integration process that represents the ultimate goal of the e-Government agenda. Second, it is the point at which significant project failure rates are beginning to occur.

A partial explanation for this can be seen in that the Transaction stage presents the first real challenge to the broader organizational structure of a government agency. Organizational innovation and change is known to be a complex phenomenon but it is not well understood in the context of e-Government growth and adoption.

We can conclude, therefore, that the case is made out for research to understand and manage this new area of information systems application. Since the research needs to understand, in some depth, the reasons behind these problems and why they arise a multiple case study strategy has been chosen for gathering in depth data.

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