

# Governance Failure in Light of Government 3.0: Foundations for Building Next Generation eGovernment Maturity Models

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**Abstract** Demographic, economic and other challenges is putting the public sector and service deliver under increasing pressure. ICT as an enabler of increased efficiency, effectiveness and transformation has long been recognized as part of the solution. National experiences show that the potential of ICT has not been fully realized, especially not in relation to Government 3.0 (Gov3.0). Existing public administration, information systems management and eGovernment literature and individual studies all point to the role of governance and cross-organisational cooperation in successfully introducing eServices and citizens actual use of them.

With a specific focus on eGovernment and eGovernance maturity and stage models, the literature attempt to unearth the underlying reasons why countries with similar infrastructures and eService availability experience very different levels of online interaction with the public sector, and in particular whether existing stage models address governance and cooperation.

Unfortunately, the review highlight a number of gaps including: Focus on outcomes and actual use is missing; most lack a real understanding of core government service concepts; decision-making should not be considered an eGovernment maturity level; front-office service provision and back-office integration is mixed-up; none addresses governance directly; most models are merely restructure or adjust existing ones, and none address Gov3.0 as such.

## Introduction

With demographic, economic and even climatic changes, the public sector and service delivery will to face change in the coming years. In this regard the potential of Information Communication Technology (ICT) as an enabler of public sector

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efficiency, effectiveness, modernization and transformation as long been recognized by academia, international organisations, governments and public administrations alike.

Gov3.0 is loosely defined as the capture next generation infrastructure, organizational structures, process and services required for the ICT-enabled transformation of the public sector (Janssen et al. 2009). Through openness, sharing, increased communication and cooperation the public sector, citizens, businesses and non-governmental stakeholders, the aim is for government to be more service-oriented, competent, and transparent, to proactively provide personalized and customized public services and generate new jobs in a creative manner by opening and sharing government-owned data to the public and encouraging communication and collaboration between government departments (Charalabidis 2015; Ministry of Interior Korea 2016).

As technology change, so do the skills, rules and regulations, costs, organisational models, service types and delivery channels required to transform government functions and public service delivery in light of Gov3.0 (Pollitt 2014; Frissen et al. 2007). Various case studies and international benchmarks show that individual authorities and governments have had vastly different degrees of success in utilizing the benefit of ICT in public administration, especially in light of rapid technological change. Still the failure of public administrations to successfully the full potential of ICT is not fully understood. This chapter will emphasis the need for strong governance and cross-governmental models of cooperation in order to harness ICT efficiently and effectively to transform public sector, service delivery and relationship between the public sector, business and citizens (EC 2012; OECD 2014; UNDESA 2014; Christine Leitner et al. 2003; Millard et al. 2007; Huijboom et al. 2009a).

Governance and cooperation has long been the focus of academic discourse, including: Public administration, in particular ICT enabled public sector reform (Brown and Magill 1994; Heeks 2005; Bannister and Connolly 2011; Pollitt and Bouckaert 2011; Cordella and Bonina 2012); information systems (IS) management (Brown and Magill 1994; Brown and Grant 2005; Klischewski and Scholl 2008; Ross et al. 2006; Weill 2004; Poepelbuss et al. 2011), and; electronic government and governance research (i.e. eGovernment and eGovernance) (Heeks and Bailur 2007; Millard et al. 2008; Huijboom et al. 2009b). Several authors have highlighted failures to address specific issues including merely digitizing existing processes (Bannister 2001; Traunmüller and Wimmer 2003; de Bri and Bannister 2010), only addressing technology and supply (Janssen et al. 2012; Lips 2012; Meyerhoff Nielsen 2015), and ignoring the outcome and impact of ICT use (Cordella and Bonina 2012; Bannister 2007; Andersen and Henriksen 2006). The aim of this chapter is to identify and review the existing literature to assess the degree to which governance and cooperation is addressed – elements which are essential if public authorities are to realise the potential of ICT and Gov3.0.

First public administration, IS management and eGovernment literature will be explored. The aim is to identify the most relevant stream for a literature review (section “[Background](#)”). The literature review methodology (section “[Methodology](#)”) and its findings are presented and discussed (sections “[Stage and Governance Models](#)” and “[Review of Existing Stage Models](#)”). The article concludes by recommending potential further research (sections “[Conclusion](#)” and “[References](#)”).

## Background

Research related to IT and technology use in public administration has progressed, and consequently the focus has shifted over time. Researchers such as Bannister (2007), Brown and Grant (2005), Heeks and Bailur (2007), Scholl (2009), Yildiz (2007), and ongoing research by Jukić et al. (2015), illustrate the changing focus of academic discourse. Initially the focus was on measuring and evaluating the maturity of ICT in public administration (from 1999/2000), followed by analysis of environmental and precondition issues (e.g. awareness, infrastructure, digital divide, etc.). The focus shifted to the evaluation of the availability of eGovernment services (i.e. supply, maturity level, etc.). Subsequently the research focus has moved to the actual use of eGovernment solutions (i.e. demand usage, the gap between interest and use, the factors that affect the use, etc.) and the evaluation of eGovernment impacts (i.e. effectiveness, efficiency, equity, etc.). Of late, the innovative use of ICT in “SMART city” and decision making (e.g. eParticipation and eDemocracy) has been in vogue.

The term ‘electronic government’ was first coined in 1993 by the US National Performance Review, while the abbreviated form ‘eGovernment’ became prominent around 1997 (Heeks and Bailur 2007). That said, ICT has played a role in public sector service delivery since the middle of the twentieth century – as exemplified by Gammon’s 1954 review article on the automatic handling of paper work in the public sector (Gammon 1954). In this chapter, eGovernment is defined as “the use of ICT and its application by government for the provision of information and public services to the people” (UNDESA 2014).

The definition of eGovernment stands in contrast to electronic governance (i.e. eGovernance), which encompasses all processes of governing, whether undertaken by a government, market forces, a network (e.g. family, tribe, professional), formal or informal organization, a geographical territory or whether through laws, norms, power or language (UNDESA 2014). In other words, governance refers to what the ‘governing bodies’ responsible for eGovernment do to ensure success.

Governance and cooperation in relation to public sector service delivery matters for a number of reasons. An early estimate indicates that top performing companies generate up to 40% greater return than their competitors for the same investment in ICT (Weill 2004).

## *ICT Enabled Reform in Public Administration*

ICT use in public administration is in the literature seen in two ways: As a tool to rationalize existing process or as an instrument to rethink the public sector, re-engineer processes and organisations (Cordella and Bonina 2012).

ICT as a tool to increase public sector performance and efficiency is closely associated the New Public Management (NPM) literature (Cordella and Bonina 2012; Cordella 2007; Demmke 2006). NPM brings the private sector corporate way of thinking to public administration, thus shifting the focus from effectiveness to efficiency through a new management culture and a focus on measurable results, often cost savings (Pollitt and Bouckaert 2011; Cordella and Bonina 2012; Self 2000).

The expectations of ICT enabled NPM reforms has nonetheless be questioned due to the complexity of organisational change and the political ramifications (Cordella and Bonina 2012; Peters and Pierre 1998; Iribarren et al. 2008). Authors like Bannister highlight the ability of ICT to transform the public sector, creating a Joined-up Government (JUG) where inter-governmental collaboration and coordination is supported by technology (Bannister 2001; de Bri and Bannister 2010).

In contrast to NPM, JUG (also known as collaborative public management or Gov 2.0), aim to reintegrate the public sector often fragmented by NPM reform (Cordella and Bonina 2012; Huijboom et al. 2009b; Christensen and Lægred 2007; O’Leary et al. 2006). Lips’ definition of Public Administration 2.0 (Lips 2012) goes as far as dropping the “e” in order to accommodate the complex and dynamic non-technical and contextual aspects of public administration reform.

What classical public administration literature seem to lack, is the merger NPM and JUG, i.e. the role governance in the introduction of ICT in public administrations in combination with measuring maturity levels and ICT take-up.

## *IS Management*

Like the definitions of ‘public administrative reform’ and ‘eGovernment’, IS management and computer science literature offer a host of definitions and semantic variations (Brown and Grant 2005). A simple one states that, “IT governance represents the framework for decision rights and accountabilities to encourage a desirable behavior in the use of IT” (Weill 2004). This definition is in line with the chapters earlier definition of governance, i.e. what the ‘governing bodies’ responsible for eGovernment do to ensure success.

Two parallel streams of research emerge as dominant in the IT governance literature. One focus on forms of IT governance, the second on IT governance contingency analysis. IT governance forms is summarized by Brown and Grant (2005) in an attempt to define the various structural forms that governance models may take. Moving from a debate on the merits of centralized vs. decentralized design,

researchers have explored less rigid alternatives. These in turn are modelled on the operational realities of public sector organisations including vertical and horizontal integration, centralized, federal, decentralized organizational forms of government.

In contrast, IT governance contingency analysis unanimously agree that no universal best practice IT governance structure exist (Brown and Magill 1994; Brown and Grant 2005). Research therefore explore the basic structural options available, and attempt to unearth the logical and best options for different types of organisations. Similarly research focus on the contingencies which influence the adoption of a particular IT governance model, the role of actors, organisational maturity, size, structure, time frames, psychological climate, extra-organisational situations, resources, rank and location of responsible executives and steering committees, risk adversity, degree of centralisation etc. (Brown and Grant 2005).

For over 40 years, a recurring subtopic in this literature has been staged maturity models: models that morphed into capability maturity models (CMM) for assessing software development processes in the 1980s and, since 2002, the integration of product and service development, management, and acquisition (Poeppelbuss et al. 2011; Röglinger et al. 2012). While IT governance models, such as the US Federal Enterprise Architecture (Peters and Pierre 1998) and Chilean CMMI-inspired eGovernment maturity model and toolkit (Iribarren et al. 2008), address political and legal dimensions, most focus on business processes in single organisations, not the cross-organisational, national, or international ones of PA and eGovernment (Pöppelbuß and Röglinger 2011). What the IT governance literature lack, is the political and legal dimensions found in the public administration and eGovernment literature.

## *eGovernment and eGovernance*

Two avenues of thinking dominates the eGovernment literature when it comes to ICT use in public sector. Both are similar to the public administration literature and sees technology as a tool to increase efficiency of existing processes, or as a way to radically transform the way government function (Cordella and Bonina 2012). This is mirror by authors like Lips (2012), Millard et al. (2007), Huijboom et al. (2009b), Traunmüller and Wimmer (2003) who see the role of ICT in public administration as changing over time. That is from eGovernment 1.0 where technology is seen as driving change in public administration and governance, to eGovernment 2.0 and 3.0 directly (Cordella and Bonina 2012; Cordella 2007; Demmke 2006). ICT is explicitly seen as an enabler of transformational change of government processes and its external relationships – including for SMART City concepts, transparency and democracy decision making (Huijboom et al. 2009b; Edelmann et al. 2008).

A stream within the eGovernment literature has since 1999 focused on the so-called stage and maturity models for use of ICT in public administration. Models have focused on mapping capabilities, maturity and progressive. Layne and Lee

(2001), West (2004), Moon (2002), Heeks (2015), Andersen and Henriksen (2006), Traunmüller and Wimmer (2003), Klievink and Janssen (2009) etc., have all argued in favour of the usefulness of stage models to guide policymakers and to stimulate the developments of capabilities needed by organisations to migrate from one stage to another – albeit from different perspectives.

A gap in the stage models and eGovernment literature is a clear link between the role governance and cooperation play in the successful implementation and subsequent use of ICT and eServices solutions. Similarly, most models merely focus on supply and technology, and less on outcomes or results.

### *Other Streams of Discourse*

In addition to the academic discourse, relevant analysis and data is published by international organisations, including the European Union (EU), OECD (Organisation for Economic Co-operation and Development) and United Nations (UN). The 2014 EU digital scoreboard (EC 2014) and the UN eGovernment Survey (UNDESA 2014) highlight the rapid rise in Internet use (e.g. 72% in the EU) and the provision of high-speed broadband (e.g. 62% in the EU) over time. The EU, OECD and UN has traditionally focused on the availability of Internet and eServices, key technical enablers such as, data registries and unique identifiers and electronic identification (eID) (EC 2014). In their latest reports, the focus has shifted and now highlights effectiveness (OECD 2014), accountability (UNDESA 2014), and transparency and user-centricity (EC 2014) as critical enablers of eGovernment. Still, the mere introduction of technology do not guarantee success or additional value creation. The challenge of increasing the use of the digital service delivery channels and to increase public-sector efficiency and effectiveness persist. This is exemplified Japan (among others) where ICT infrastructure is well established, but actual use and efficiency gains have been limited or stagnant, due in part to fragmented organisational and project-governance structures (Meyerhoff Nielsen 2014, 2016a; Meyerhoff Nielsen and Igari 2012; Meyerhoff Nielsen and Mika 2014).

### *Research Stream and Potential Gaps*

The technology and supply-side focus of most evaluations (incl. benchmarks, indexes and rankings) fail to provide an explanation for the discrepancies between the availability (i.e. supply) and the use (i.e. demand) of online public services (Meyerhoff Nielsen 2014; Meyerhoff Nielsen and Igari 2012). Wimmer (Traunmüller and Wimmer 2003), Leitner et al. (Christine Leitner et al. 2003), Huijboom et al. (Frissen et al. 2007; Huijboom et al. 2009b), Millard et al. (Millard et al. 2007; Millard 2013) and Bannister (de Bri and Bannister 2010) all highlight a lack of a

holistic approach, while Brown (Brown and Magill 1994) recommend an merger of the classical IT governance streams of thinking.

To illustrate the importance of governance models and outcomes is the discrepancy between Denmark and Japan online address changes (via the Internet). In Denmark close to 80% of address changes are made online, while this is a scant 0.0002% in Japan (Meyerhoff Nielsen and Igari 2012; Igari 2014). Statistical analysis also fails to shed light on the underlying reasons why Danes use the Internet to interact with public administration (85%) more often than their Dutch and Swedish counterparts (79% and 78%, respectively) – although similar numbers of households in Denmark, the Netherlands, and Sweden pay for having access to the Internet (all in the 90+ percentile), and why their citizens have similar patterns of Internet use (also in the 90+ percentile) and private sector services such as online banking (all, 82%) (EC 2014; Meyerhoff Nielsen 2014, 2016b; Eurostat 2016).

In light of these challenges, the OECD on 15 July 2014 adopted a number of recommendations for public sector digitisation and eGovernment strategies (OECD 2014). The recommendations address the strategic direction of eGovernment, implementation, governance, and cooperation models. The OECD's recommendations are anchored in the realisation that, in order to successfully introduce ICT infrastructure and online services for improved public-sector efficiency and effectiveness, more than just a technological and supply-oriented approach is required (OECD 2014; O'Leary et al. 2006).

These practical examples hint also at potential limitations in current research. This chapter will therefore review the existing literature in an attempt to unearth the underlying reasons why countries with similar infrastructures and eService availability experience very different levels of online interaction with the public sector, and in particular whether existing stage models address governance and cooperation (sometimes known as maturity models).

Based on the initial exploration of current literature (above), an appropriate theoretical framework to assess and map the degree to which governance and cooperation models ensure the successful supply and use of online eServices, is found in the eGovernment stage model literature, and therefore be the focus of this chapters literature review.

## Methodology

### *Framing the Literature Review*

To address the two potential gaps identified in current eGovernment and governance research (in section “[Background](#)”), this chapter sets out two questions:

1. Does the literature address the degree to which, and in what way, governance and cooperation models ensure success supply and use (i.e. demand) of online citizen services?

2. Does the literature identify the success factors and are they mapped and developed into a universal governance model for successful digitisation of public sector service delivery (i.e. supply) and eService take-up (i.e. demand) by citizens?

To address the two research questions, a literature review is carried out. The focus of this review included the identification of existing models and their key differences (i.e. can the identified models and theories be mapped). What does current academic and practitioner debate focusing on? What is the current state-of-affairs? What are the clusters of theory, models and critique? What is the real life applicability of the theories and models?

### *Classic Literature Review*

The literature review follows a classical pattern for systematic information retrieval as outlined by e.g. Roberts (1977) and the Walsh and Downe (2005) qualitative meta-synthesis procedure. The seven-step Walsh and Downe model is adapted to include 'berrypicking' (Bates 1989). The adapted methodology consists of the following six steps: Frame the exercise; Locate relevant studies; Decide what to include and a degree of 'berrypicking'; Appraise studies; Compare and contrast, and finally; Conclude.

### *Locating Relevant Studies, Models and Concepts*

Primary and secondary key word searches were used. Primary key words were: eGovernment and stage, or model, or level, or tier, or development. Secondary key words included: eGovernment and/or maturity, governance, cooperation models, technology maturity, transformation, benchmarks, indexes. Other secondary key words were: Use, take-up, benefits, impact, output, efficiency, effectiveness, return of investment, eGovernment Readiness Index, eGovernment Benchmark.

To ensure that relevant literature and arguments were identified, Web of Science managed by Thomson Reuters, Scopus managed by Elsevier and EGRL - E-Government Reference Library (version 11.5) managed by the University of Washington, Information School online libraries were selected based on their relevance, scope and size to the literature review. Each of the reference libraries were searched and cross-referenced to ensure as complete and up-to-date picture of the academic discourse and the state-of-affairs as possible.

To ensure the quality of the literature review, the reference libraries were complemented with online research for number of secondary sources including key topic journals i.e.: GIQ – Government Information Quarterly by Elsevier, MIS Quarterly – Management Information Systems Quarterly MIS Quarterly by the Management Information Systems Research Center at the Carlson School of Management, University of Minnesota, and Information Polity by published by IOS Press.



Other complimentary sources are non-academic reports related to stage- and maturity models, benchmarks and rankings. Key publishers were the United Nations for the UN eGovernment Readiness Index, relevant surveys and country studies, the European Commission for the EU eGovernment benchmarking, studies, factsheets and good practices.

### ***Deciding What to Include***

To frame and define the parameters of the literature review, a publication had to be published in English, in the proceedings of an academic conference or in an academic journal (preferably GIQ, MISQ or Information Polity) or a recognized international body (mainly UN, EU or OECD), been subject to peer review (exception possible if published by the UN, EU or OECD), a minimum seven pages (or approx. 3700 words) in length including references, after 1 January 1995.

Where appropriate a second stage of screening, or ‘berrypicking’ as outlined by Bates (EC 2014), is applied. The robustness of the theoretic models identified, secondary sources and key words is of particular relevance in this regard.

### ***Appraise Studies***

As eGovernment is maturing as a distinct field of study, and Gov3.0 is only just emerging as a concept, it is important to weed out low quality studies and models in the appraisal stage of the literature review. Studies and models which highlight the same points are identified based on their relevance to the research frame and questions, the models and studies robustness and contribution to the literature. Depending on the finding the rigor of the theoretical foundation on which the model is founded is applied with various degree, i.e. ‘berrypicking’ (Bates 1989).

Models are compared and contracted in a mapping exercise (in section “[Stage and Governance Models](#)”) to identify homogeneity or heterogeneity between the various models, their strengths and weaknesses. The purpose is to identify potential areas of future research in the in the area of stage, cooperation and governance models for successful introduction and use of eServices.

## **Stage and Governance Models**

In light of the potential research gaps identified in section “[Background](#)”, an appropriate theoretical framework to assess and map the degree to which governance and cooperation models ensure the successful supply and use of online eServices, may be found in the eGovernment stage models literature and the IT governance models,

developed in the field of IS management and computer science. This section therefore outlines the characteristics and focus of number of key eGovernment stage and maturity models.

### *Stage Models Identified and Described*

Layne and Lee refer to the experiences of eGovernment as chaotic and unmanageable, arguing for the division of development into distinguishable stages (Layne and Lee 2001). To this effect eGovernment research has largely focused on stage, or maturity, models.

Multiple stage models has been suggested by researchers, consultants, national authorities and international organisations. In this context academics differentiate between three types of stage-models (Fath-Allah et al. 2014; Persson and Goldkuhl 2005):

- Governmental models: Models developed by governments, consultants and academics to help authorities identify and improve their level of maturity (generally using predefined models and toolkits).
- Holistic approach models: Models designed to assist authorities (generally predefined models, toolkits and indicators) in project implementation and to determine if the project will be successful or not.
- Evolutionary eGovernment maturity models: Models which focus on sequential evolutionary steps, for instance from immature to mature eGovernment with improved quality (often from an academic perspective).

The primary focus of this review is on governmental and evolutionary stage models, since the holistic maturity model approach focuses on project implementation and organisational capabilities, and particularly relevant in relation to IS management and CMM literature (Ross et al. 2006; Poepplbuss et al. 2011; Persson and Goldkuhl 2005).

Using the methodology outlined in section “[Methodology](#)”, 42 stage models are identified. The following subsections clusters the various models based on their respective characteristics.

*ANAO – Australian National Audit Office’s* (ANAO 1999) 1999, four-stage maturity model was introduced to categorize and evaluate process to guide agencies in their decision as to what services could and should provide. The model is national in character and takes an abductive-deductive approach to eGovernment maturity. The model is developed based on experiences in Australia. The levels of maturity are: Publishing and information; Interaction; Transaction of secure information (incl. login), and; Sharing information with other agencies (incl. business and citizens).

*Gartner Group* (Baum and Di Maio 2000) published a four state model in 2000. It is one of the earliest eGovernment maturity models not emerging out of a national context. The Gartner model focus is on supply and technology with a degree of

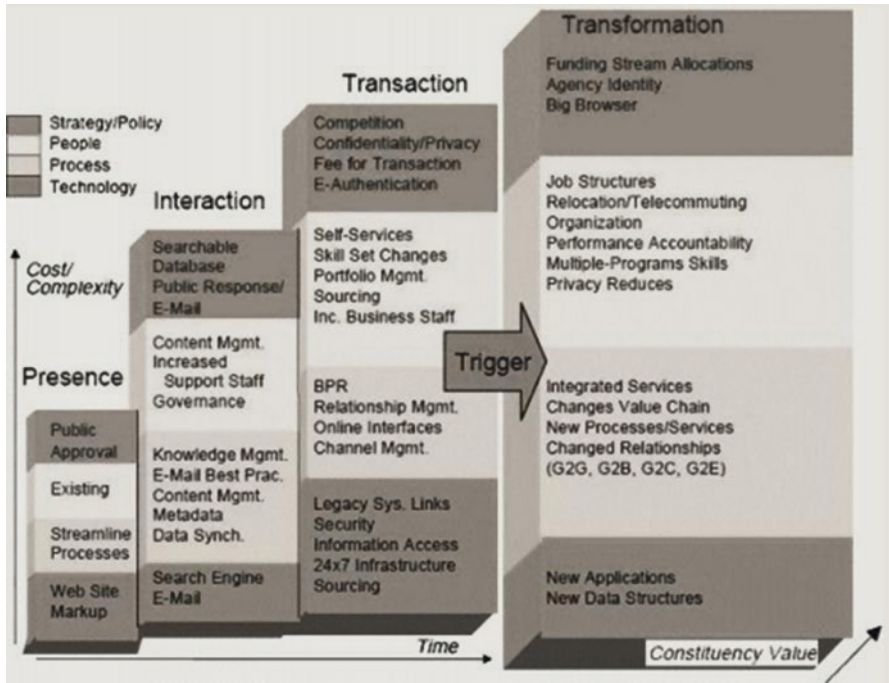


Fig. 1 Gartner four-stage model (Baum and Di Maio 2000)

integration. The model is developed by a consultancy and takes a deductive approach to eGovernment maturity. The stages of maturity are (see Fig. 1): Information incl. information, websites with static content; Interaction such as e-mails and downloadable forms; Transaction incl. integrated websites with transaction (i.e. eService), and; Transformation, i.e. seamlessly integrated websites (i.e. a degree of vertical and horizontal integration).

SAFAD (Swedish Agency for Administrative Development / Statskontoret) (Statskontoret 2000) in 2000 published a four-stage maturity model inspired by the Australian National Audit Office model and Swedish experiences. It was introduced to categorise and evaluate process to guide agencies in their decision as to what services could and should provide. The model is national in character and takes an abductive-deductive approach to eGovernment maturity. The stages of maturity are (see Fig. 2): Websites i.e. packages of information, Interactive websites, Web and communication that is information plus entry and retrieval of personal information, and Website and network functions.

Deloitte Research (Deloitte and Touche 2001) in 2001 proposed a model focusing on supply, technology and organizational integration. It adds a dimension of engagement and co-creation (indirectly by none-governmental stakeholders). The model is developed by a consultancy and takes a deductive approach to eGovernment maturity. The model has been applied to Australia, Canada, New Zealand, UK

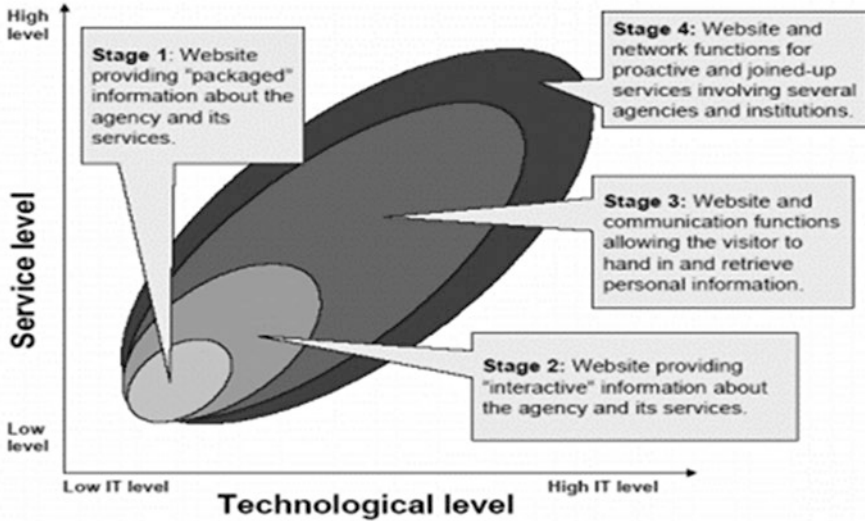


Fig. 2 SAFAD four-stage maturity model (Statskontoret 2000)

and USA. The maturity levels are: Information publishing/dissemination: Websites with static information;

“Official” two-way transaction: electronic identity management (eID) and eServices; Multi-purpose portals: portals (i.e. a degree of vertical and horizontal integration); Portal personalization: basic personalization and life-events; Clustering of common services (i.e. increased personalization and life-event, increase integration), and; Fully integration and enterprise transaction: Life-events, full personalization, user-centric and engagement in service choice and delivery.

Hiller and Bélanger’s (2001) 2001, five-stage maturity models focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It is also one of the most cited models to date. It is a scientific model, with an inductive approach to eGovernment maturity. The maturity levels are: Web presence incl. technological leap-frogging, websites with static information); Interaction such as simple interaction, e-mail and downloadable forms; Transaction i.e. eServices; Transformation/integration incl. back office automation and digitization of processes, aspects of vertical and horizontal integration, and; Participation covering transparency, release of data.

Howard (2001), in 2011, propose a simple three-stage maturity model. It is a scientific model, with an inductive approach to eGovernment maturity and present it as a classical curve consisting of technical sophistication and benefits. The maturity levels are (see Fig. 3): Publish (i.e. static information); Interact (i.e. information increasingly updated, downloadable forms etc.), and; Transact (i.e. eServices).

Layne and Lee’s (2001) 2001 maturity model is the most cited to date. The focus is on technology, supply and organizational integration. It is a scientific model, which takes an abductive approach to eGovernment maturity. The model is devel-

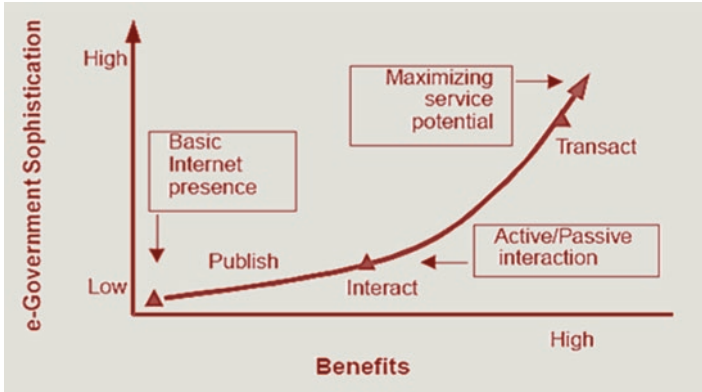


Fig. 3 Howard’s three-stage eGovernment maturity curve (Howard 2001)

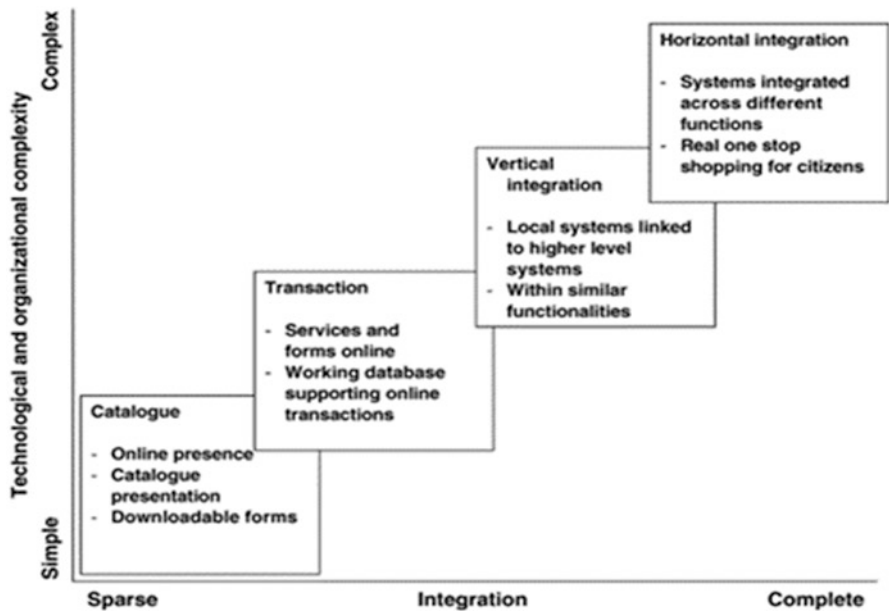


Fig. 4 Layne and Lee model four-stage maturity model (Layne and Lee 2001)

oped based on observations in the USA and earlier models. The four-stages of maturity are defined as (see Fig. 4): Catalogue i.e. online presence (i.e. websites with static information and downloadable forms); Transactional incl. service and forms (i.e. eServices); Vertical integration, that is local system integration, and; Horizontal integration i.e. integration across function (i.e. life-events and personalisation).

United Nation’s (UNDESA 2014, 2008, 2010, 2012; Ronaghan 2002) is best known for its biannual UN eGovernment Readiness Index. The model has been in

use since 2001 when the first Index was first published. It covers pre-conditions such as supply, technology and integration. The original focused has been on the five-stages of maturity. The UN publishes the bi-annual eGovernment Readiness Index, but has in the last few years refocused the models to include additional aspects of engagement and transparency (e.g. the UN eParticipation Index). The model is “international” in character and takes an abductive-deductive approach to eGovernment maturity. The model consists of a biannual ranking of 193 countries. The model has a pre-condition stage, which focus on at network preparedness, access to PCs, the Internet and literacy and digital competences (i.e. TII Index). The maturity levels are (see Fig. 5): Emerging presence such as basic websites with static information; Enhanced presence e.g. emerging portals (i.e. a degree of vertical and horizontal integration), interactivity, and customer services (i.e. eServices); Interactive such as two-way interactivity (i.e. eServices and communication), searchable intranet; Transactional i.e. eServices, and; Seamless incl. sully networked government (i.e. horizontal and vertical integration).

Wescott’s (2001) 2001 model consist of six stages. It is a scientific model, with an abductive approach to eGovenment maturity. It has been developed based on

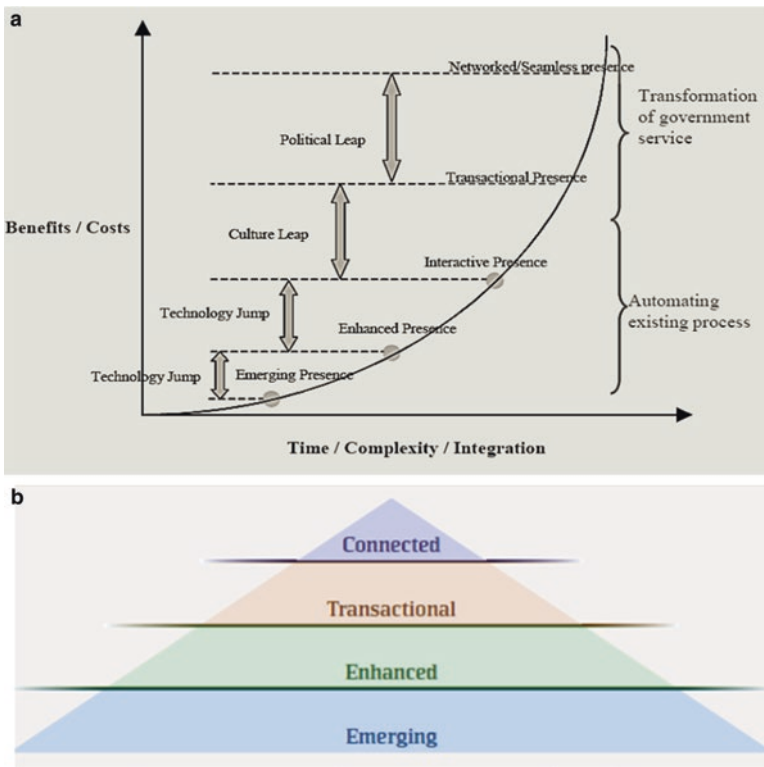


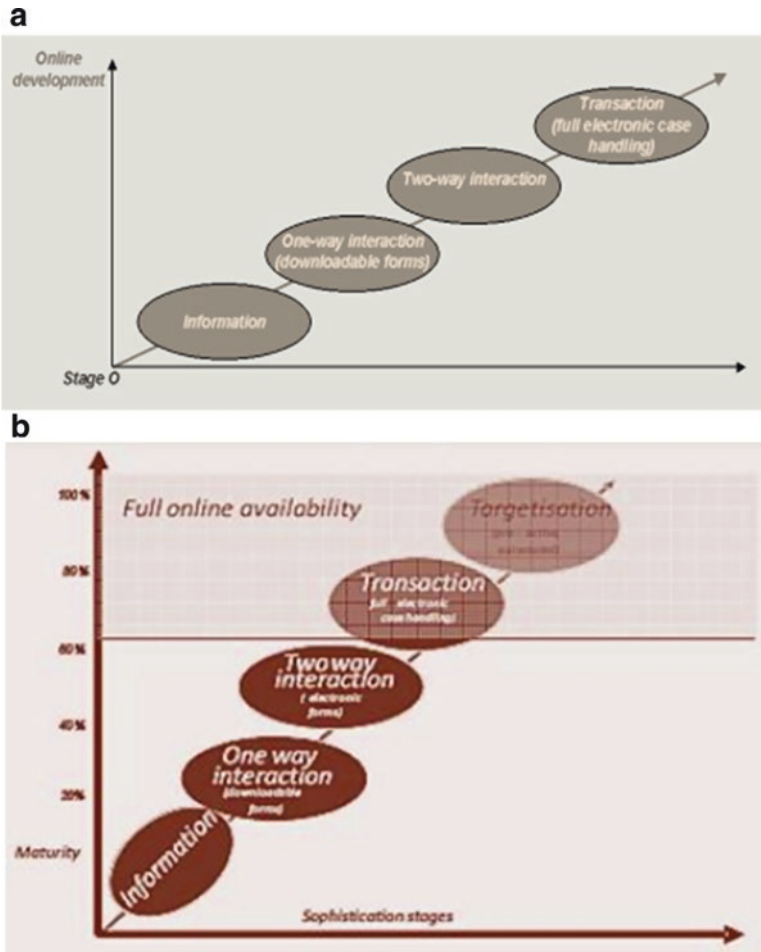
Fig. 5 (a) The original four-stage UN model, 2002 (Ronaghan 2002). (b) The updated version of the UN model, 2012 (UNDESA 2012)

observations in the Asia-Pacific. The maturity levels are: Setting up an email system and internal network e.g. feature e-mail systems to improve information sharing, coordination and feedback; Enabling inter-organisational and public access to information e.g. information is department centric, shared between organisations and can be accessed by the public over the Internet; Two-way communication such as basic eServices and citizens can make suggestions using emails or ask questions in forums and receive answers. Exchange of value e.g. eService features applications such as tax assessments and license renewals. At this stage, the citizen can make secure payments online; Digital democracy incl. focus is on empowering the civil society (e.g. increasing awareness of government corruption) and allowing citizens to vote and express their opinions and feedback, and; Joined-up government incl. vertical and horizontal integration allowing for citizens to execute services without knowing which government agency is responsible for.

*Chandler and Emanuel (2002)* in 2002 proposed a four-stage model. It is a scientific model, with an indicative approach to eGovernment maturity. The maturity levels are: Information i.e. online information about government services and policies; Interaction such as basic level of interaction between governments and citizens such as email systems; Transaction i.e. features eServices, and; Integration e.g. features integrated services across various departments and agencies.

*European Union (2012)* has since 2002 used a eGovernment benchmark model similar to the UN. The focus is on supply, technology and integration and initially included five-stages of maturity. The European Commission publishes its eGovernment benchmark yearly, but has since 2010 started including additional biannual focus areas, and has moved from benchmarking services to life-events, user engagement, access to personalized data and user-rating – through mystery shoppers and surveys. The model is “international” in character and takes an abductive-deductive approach to eGovernment maturity. The model is developed with inspiration from the SAFAD model (Statskontoret 2000) and experiences in the EU+ member states. The model forms the basis of the EU’s annual eGovernment Benchmarks and Surveys. A pre-condition stage looking at PC and Internet accessibility as well as digital literacy compliments its five stages (see Fig. 6): Emerging presence i.e. basic websites with static information; Enhanced presence e.g. emerging portals (i.e. a degree of vertical and horizontal integration), interactivity, and customer services (i.e. eServices); Interactive, that is two-way interactivity (i.e. eServices and communication), searchable intranet; Transactional i.e. eServices, and; Seamless such as fully networked government (i.e. horizontal and vertical integration).

*Hodgkinson (2002)*, in 2002, present a two phased, five-stage model, focusing learning cycles and an s-shaped curve for learning (see Fig. 7). The model focus the rate of technology diffusion in government, service impact and technical aspects such as interoperability before data exchange and vertical and horizontal integration is possible. It is inspired by diffusion of innovation (DOI) and innovation diffusion theory (IDT), technology acceptance (TAM) and IS management models. The stages are: Government online i.e. initiation of idea generation, analysis and pilot implementation and contagion such as wider adoption of technology and benefits of ICT, business needs, decentralization of strategy and resources; eGovernment i.e.



**Fig. 6** (a) The original four-stage EU model, 2002. (b) The updated five-stage EU model, 2009 (EC 2012)

control (i.e. re-focus on cost, efficiency and quality, re-centralisation of some strategies and control), interoperability, and data management.

Moon's (2002) 2002 five-stage model by M.J. Moon focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It is very similar to the 2001 model proposed by Hiller and Belanger (2001). It is a scientific model, with an abductive approach to eGovernment maturity. It was developed based on observations and data from 2000 US municipality websites. The maturity levels are: Web presence i.e. technological leap-frogging, websites with static information); Interaction such as simple interaction, e-mail and downloadable forms; Transaction i.e. eServices; Transformation/integration such as back office automation and digitization of processes with aspects of vertical and horizontal integration, and; Participation for transparency and release of data.



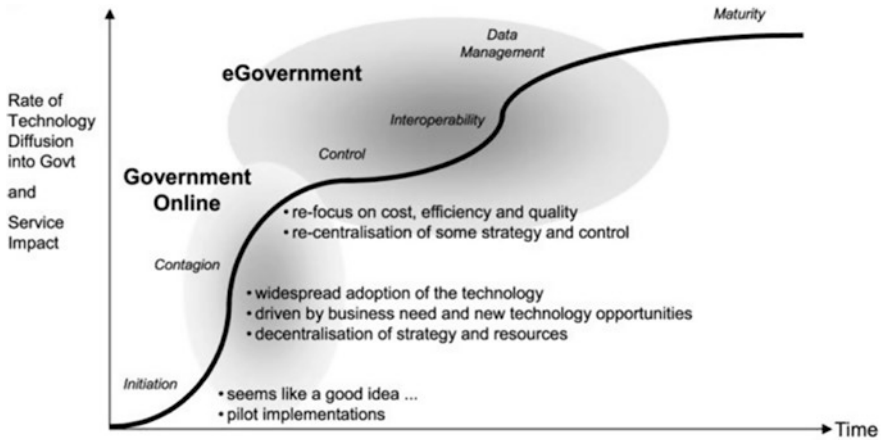


Fig. 7 Hodgkinson’s five-stage maturity model and learning curve (Hodgkinson 2002)

Netchaeva’s (2002) 2002 five-stage model for eGovernment and eDemocracy does not name the individual maturity levels. It is a scientific model, with an inductive approach to eGovernment maturity, and focus on the following aspects: Scattered information e.g. websites with department information; e-mails and FAQ; Other online services such as features forums and opinion surveys; eGovernment portal incl. eServices such as license renewals and payment of fines, portals and one-stop-shops, and; Possible democracy e.g. citizens can vote, contribute in online discussions and make comments on policy and legislation proposals.

UKNAO – UK National Audit Office (NAO 2002) in 2002 presented a report to the House of Commons, in which a five-state maturity model was introduced. The model is “national” in character and takes an abductive-deductive approach to eGovernment maturity. The model is developed based on experiences in UK. The maturity levels are: Basic site with limited information available online, mainly information about authorities; Electronic publishing incl. increasing number of website and more content; ePublishing e.g. use of personalization options and customizable search tools, some forms can be submitted online and others can be downloaded and increasing use of e-mails and the timely responses, alerts about new content is an offered; Transactional incl. secure eService transactions, and; Joined-up eGovernance: featuring one-stop-shops and joined-up governments through vertical and horizontal integration.

World Bank (Toasaki 2003; InfoDev, C.f.D.a.T. 2002) published a three-stage model in 2002. The model is “international” in character and takes a deductive approach to eGovernment maturity. The model is developed as part of the World Bank’s Center for Democracy and Technology eGovernment handbook for developing countries. The maturity levels are (see Fig. 8): Publish online information such as rules, regulations, documents and forms; Interact, with users providing feedback and submit comments on legislative or policy proposals, and; Transact, i.e. secure eService transactions.

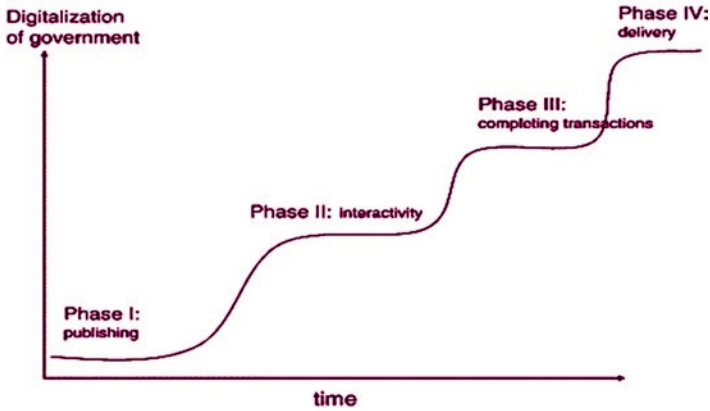
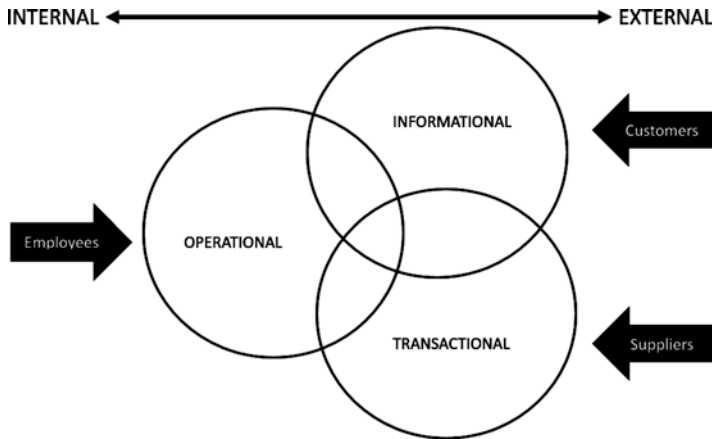


Fig. 8 World Bank four-stage maturity model (Toasaki 2003)

*Accenture* (Rohleder and Jupp 2003) in 2003 published a five-stage model. The model is developed by a consultancy and takes a deductive approach to eGovernment maturity. The model has been applied to Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Portugal, Singapore, South Africa, Spain, the UK and USA. Based on the model Accenture publish an annual eGovernment Ranking of selected countries. The model consisting of the following maturity levels: Online presence with information published online; Basic capability i.e. security and certification is developed and the online presence is broadened; Service availability with eServices increasingly available on portal(s) and features of cross agency cooperation and services increasingly designed to meet customer needs; Mature delivery with eServices clustered with clear ownership and authority – CIO (Chief Information Officer) or central agency the involvement of customer in the process of eGovernment and the services are marketed; Service transformation i.e. improved customer service delivery is the objective and multi-channel integration is common.

*Koh and Prybutok* (2003) in 2003 presented a three-element model (see Fig. 9). The model is scientific and takes an inductive approach to eGovernment maturity. The model focus on internal and external factors and three stakeholder groups i.e. employees in public authorities, suppliers (i.e. IT vendors or IT departments) and customers (i.e. citizens and businesses). Visualised as circles of there are overlaps between the three elements thus providing a degree of granularity with a degree of inspiration from the IS management and computer science literature. The elements are: Informational i.e. online information; Transactional i.e. online transactions, and; Operational i.e. operational, vertical and horizontal integration.

*Reddick's* (2004) 2004, two-stage model, is one of the most simple maturity models identified. It is a scientific model, with an abductive approach to eGovernment maturity. The model is developed based on observations in the USA, The



**Fig. 9** Koh and Prybutok’s three-stage and users of internet maturity model (Koh and Prybutok 2003)

maturity levels are: Cataloguing online information about the government and its activities, and; Transactions incl. eServices and one-stop-shops.

Waseda (Obi 2014, 2012, 2015) first published the Waseda model and its annual benchmarks for selected countries in 2004. The model is “international” in character and takes an abductive-deductive approach to eGovernment maturity. The model is used for an annual eGovernment ranking list for an increasing number of countries. The model differs somewhat from other stage models as it does not define distinct levels of maturity. It covers managerial and organisational aspects also seen in CMM/CMMI models and the IS management literature. The focus is on qualitative and quantitative indicators including: Network preparedness and infrastructure; Management optimization and efficiency; Online presence of information, services, national portals and websites; Governance incl. cooperation and promotion; eParticipation and digital inclusion; Open government, and; Cyber security. The indicators can be grouped into four-stages, that is: Networked preparedness and infrastructure; Online services; Management optimization, and; eParticipation.

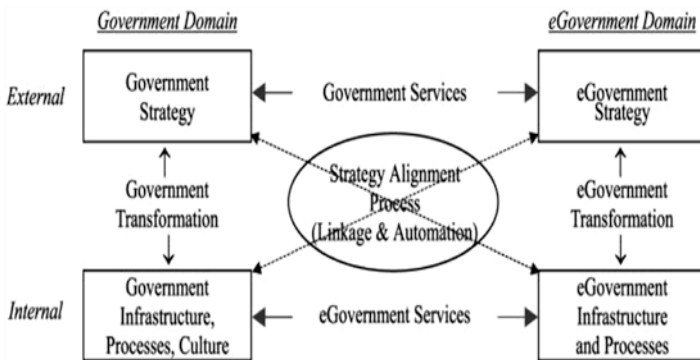
West (2004) first published the four-stages model in 2004. It is a scientific model, with an abductive-deductive approach to eGovernment maturity. The model is developed based on observations and data from 1813 and 1680 US municipality websites model in 2000 and 2001. The West Index on US municipalities and a number of countries is based on the model. The maturity levels are: Bill-board i.e. websites as billboards mainly used for posting information; Partial-service-delivery with the ability to search for data via search engines with some eServices available; Portals containing all information and eServices (i.e. a one-stop-shop), and; Interactive democracy incl. ortals offers personal and proactive online service, utilise push technology and feedback forms.

Windley’s (2002) 2002, four-stage model. It is a scientific model, which takes a deductive approach to eGovernment maturity. It is developed based on observations

from the US [Utah.gov](http://Utah.gov) site and consists of the following maturity levels: Simple website with static pages with downloadable forms; Online government featuring interaction mechanisms such as e-mails, online forms, help and FAQs; Integrated government incl. end-to-end eService transactions, but also emerging internal integration as information is shared between departments, and; Transformed government: Customer centric eServices organized according to user needs and segmented according to population groups and life events. Vertical and horizontal integration is also a feature.

*Davison et al. (2005)* in 2005 presents a four-element model combining the insights of the strategy and maturity alignment models from the IS management and computer science literature (see Fig. 10). The model focus on internal and external factors in both the government (i.e. the public sector in general) and eGovernment domain (i.e. ICT within the public sector). Rather than looking at the supply-side issues related to digitization of service delivery and ICT enabled reform Davison et al. focus on the key elements enabling the successful use of ICT. The models cover eGovernment services (i.e. information and transaction), processes (i.e. vertical and horizontal integration) and transformation within the four elements of: Government strategy with choices pertaining to positioning of government and business strategies; Government infrastructure and processes incl. choices pertaining to internal arrangements and configurations supporting authorities chosen position including public sector culture; eGovernment strategy incl. choices pertaining to IT scope, systemic capabilities and IT governance, and; eGovernment infrastructure and processes e.g. internal arrangements and configurations determining data, applications and technology infrastructure used to deliver eGovernment services.

*Siau and Long's (2005)* 2005 five-stage maturity models focus on supply, technology and organisational integration and some aspects of participation in a democratic sense. It is a scientific model, with an inductive approach to eGovernment maturity. It differs from the Moon (2002), Hiller and Belanger (2001) models by including engagement and political decision making to the fifth stage in the form of

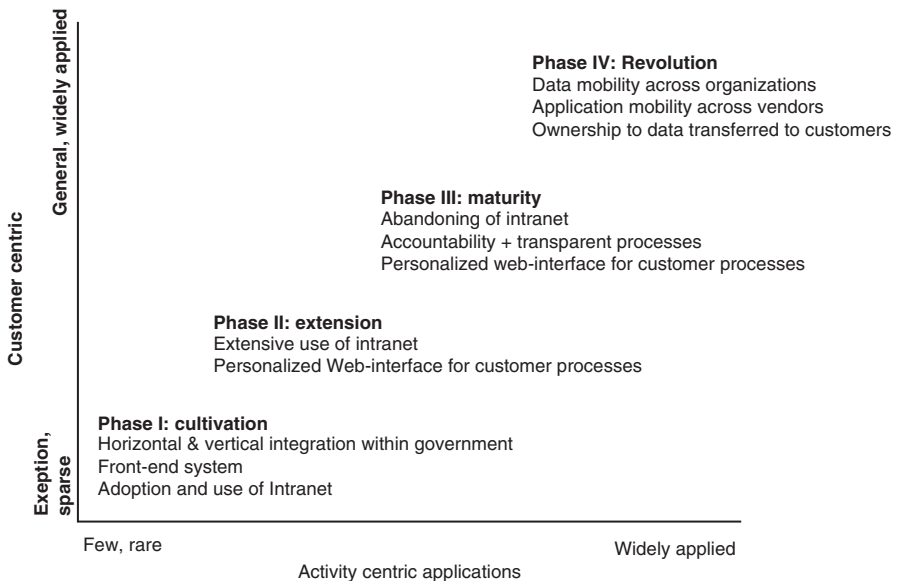


**Fig. 10** Davison's et al. four stage strategy and maturity model (Davison et al. 2005)

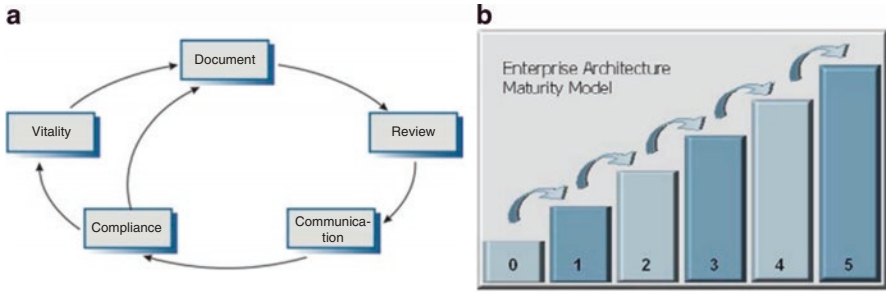
a “eDemocracy stage”. The maturity levels are: Web presence incl. technological leap-frogging, websites with static information); Interaction e.g. simple interaction, e-mail and downloadable forms; Transaction i.e. eServices; Transformation/integration such as back office automation and digitization of processes and aspects of vertical and horizontal integration, and; eDemocracy incl. engagement, political decision making, transparency, release of data.

*Persson and Goldkuhl (2005)* in 2005 evaluates a number of existing models and propose a two-stage model from a computer science perspective. The maturity levels are: Integration of services with a focus on public services, directed services, concentrated services and portals, and; Integration in services incl. elements such as the integration of services and agencies, transparency in processes of independent processes, database access in information gathering, information or decision provision requirements and joint information services.

*Andersen and Henriksen’s (2006)* 2006 Public Sector Process Rebuilding Model (PPR) builds on Layne and Lee four-stage maturity model (Layne and Lee 2001). It is a scientific model, with an abductive-deductive approach to eGovernment maturity. It is developed based on observations and data from 110 central government sites in Denmark. The PPR model focus on supply, organizational integration, processes and differs from other models by emphasising user-centricity rather than technological aspects. Four-stages of maturity, of which the first two stages comprise the four-stages proposed in the Layne and Lee model (see Fig. 11): Cultivation e.g. websites with static information, downloadable forms, vertical and horizontal integration; Extension such as eServices, basic personalization and life-events and a focus on data ownership; Maturity of eServices, none-Internet interphases,



**Fig. 11** Andersen and Henriksen PPR model (Andersen and Henriksen 2006)



**Fig. 12** (a) eGOV-MM's three dimension and interrelated elements (NASCIO, N.A.o.S.C.I.O. 2006). (b) eGOV-MM's domain level and key domain areas (NASCIO, N.A.o.S.C.I.O. 2006)

increased personalization, user-centricity and outcome based organisations with economics of scale being sought, data ownership more fluid, mobility of data and open data based infrastructure; Revolution i.e. seamless organizational structures, fully personal and outcome based service delivery, with data ownership and focus fully transferred to the end-user.

*National Association of State Chief Information Officers' (NASCIO)* (NASCIO, N.A.o.S.C.I.O. 2006) 2006 Enterprise Architecture Maturity Model and toolkit, is not a eGovernment maturity model par say, but it exemplifies a lot of the IS management CMM/CMMI model thinking which has inspired many future models. The model and toolkit is national in nature, takes an inductive-deductive approach to eGovernment, and is developed in corporation with CIO's in the USA. The aim of the model is to introduce a cyclic process and approach to IT development in single organisations. Based on documentation, review, compliance, communication, and vitality elements framework and procedures must be reviewed and updated to properly reflect environmental changes (see Fig. 12). The model has six-levels of maturity and each consist of a number of eight categories of factors. The stages are: Level 0 No programme; Level 1 Informal program; Level 2 Repeatable program; Level 3 Well-defined program; Level 4 Managed program, and; Level 5 Continuously improving vital program. The categories are: Administration i.e. governance roles and responsibilities; Planning incl. EA program road map and implementation plan; Framework e.g. processes and templates used for EA; Blueprint i.e. a collection of the actual standards and specifications; Communication such as education and distribution of EA and Blueprint detail; Compliance ensuring adherence to published standards, processes and other EA elements, and the processes to document and track variances from those standards; Integration of touch-points of management processes to the EA, and; Involvement and support of the EA Program throughout the organisation.

*Cisco* (2007), the IT and consultancy firm, in 2007 published a three-stages. It is a scientific model, with an abductive approach to eGovernment maturity. The maturity levels are: Information interaction featuring departmental websites, legislative posting, public notices, online forms, webcasting and personalized portals; Transaction efficiency i.e. eServices and portals including electronic payments like

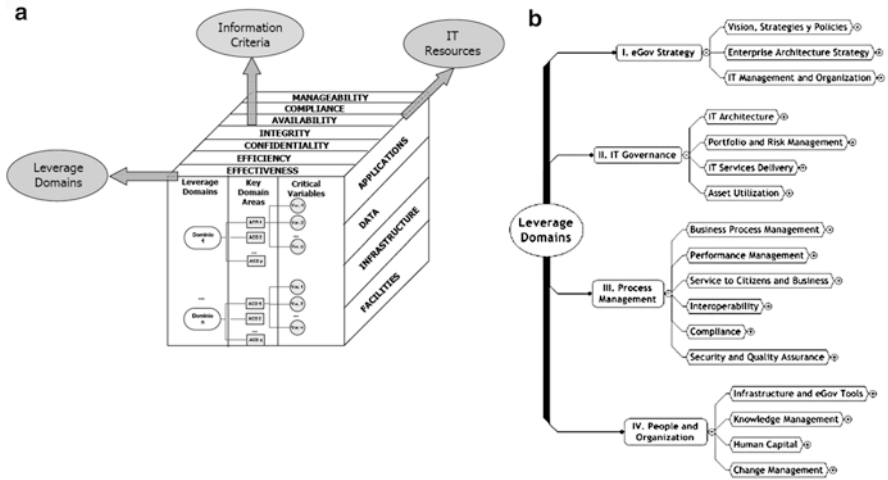
online taxes and eProcurement, and; Transformation citizen centric, i.e. consolidated and shared administrative services at this stage are across various government jurisdictions.

*Almazan and Gil-Garcia's* (Almazan and Gil-Garcia 2008; Luna et al. 2013) six-stage model published in 2008 (presence, information, interaction, transaction, integration and participation). It was updated in 2013 by merging the initial two stages information based stages (i.e. presence and information) and adjusting the remaining four stages. The 2013 model consists of five-stages and 172 indicators, which aim to highlight the performance and efficiency of portals by including supply and actual use in relation to the online population – thus, indirectly including pre-conditions (Luna et al. 2013). It is a scientific model, with an abductive approach to eGovernment maturity. It has been developed based on observations and data from 32 Mexican state portals and includes ranking (in 2013). The 2013 levels of maturity are: Information Online information, static or updated; Interaction e.g. downloadable forms, communicate with the government via e-mail and forums; Transaction such as secure eService transactions and payment options via portals; Integration incl. one-stop-shops/portals, vertical and horizontal integration, and; Political participation offering users voting and participation in opinion polls, surveys and public forums.

*Chan et al.* (2008) in 2008 proposed a model focusing on supply, technology and organizational integration. It adds none-governmental stakeholders to the mix. It is a scientific model, with an abductive approach to eGovernment maturity. The model is developed based on observations and data from regional government in China. The five-stages of maturity are: Publish websites with static information; Interact i.e. downloadable forms; Transact through eServices; Integrate through vertical and horizontal integration of service providing agencies, and; Tri-party integration i.e. integration of public, private and stakeholder organisations.

*Iribarren et al.* (2008) proposed an IT focused eGovernment Maturity Model (eGov-MM) based on four domain levels, in 2008. It is a multi-dimensional model and assessment tool in the form of a capability maturity framework to ensure continued measurement and control. It is a national model developed for the Chilean government and borrows from experiences in the UK, US, Australia, Canada, Sweden, South Korea and others. It distinguish between maturity and capabilities and is inspired by the IS management's US CMMI and EA models (NASCIO, N.A.o.S.C.I.O. 2006), ISO/IEC 15504 in Europe and supports Wimmers holistic view (Traumüller and Wimmer 2003; Iribarren et al. 2008). The domain levels on effectiveness, efficiency, confidentiality, integrity, availability, compliance, manageability on one axis and IT resources like applications, data, infrastructure and facilities on the other (see Fig. 13). The four domain levels are: eStrategy; IT governance; Process management; People and organisation capabilities.

*Shahkooh et al.* (2008) in 2008 proposed a five-stage model. It is a scientific model, which takes an abductive approach to eGovernment maturity, proposing the following maturity levels: Online presence i.e. online information; Interaction with citizens interacting with governments through e-mail to officials and downloading forms; Transaction through secure eService transactions like payments and tax fill-



**Fig. 13** (a) eGOV-MM’s three dimension and interrelated elements (Iribarren et al. 2008). (b) eGOV-MM’s domain level and key domain areas (Iribarren et al. 2008)

ing; Fully integrated and transformed eGovernment with services organized as a single point of contact such as portals, and; Digital democracy featuring online voting, public forums and opinion surveys.

*Kim and Grant (2010)* in 2010 published a five-stage model. It is a scientific model, with an inductive approach to eGovernment maturity with the following maturity levels: Web presence featuring simple and limited information online; Interaction focus on search engines and downloadable forms; Transaction incl. online transactions with the possibility of electronic payments; Integration i.e. horizontal and vertical integration and performance measurements using statistical techniques, and; Continuous improvement featuring political activities and a focus on continuous improvements and performance.

*Kalambokis et al. (2011)* focus on data in their 2011 Open Government Data (OGD) Stage Model. Like Andersen and Henriksen (2006) focus on value creation in light of organisational and technical complexity (see Fig. 14). Other sources includes Deloitte and Touche (2001), EU (2012), Layne and Lee (2001), Siau and Long (2005) and West (2004). It is a scientific model, with an inductive approach to eGovernment maturity and open data use – and indirectly on eServices. The maturity levels presented are: Aggregation of government data; Integration of government data; Integration of government data and non-government formal data; Integration of government data with non-government formal and social data.

*Shareef et al. (2011)* in 2011 present the eGovernment Adoption Model (GAM) (see Fig. 15) focus on five overarching categories, 11 sub-categories and 73 factors which influences citizens adoption of eGovernment. It focus on attitudes, digital literacy, assurance, adherence and adaptability to use. It is a scientific model with an inductive approach to eGovernment. It is based technology adoption model (TAM), diffusion of innovation (DOI) and planned behavior theory (TPB). Previous models have been considered, and empirical work has been carried out in Canada. The five



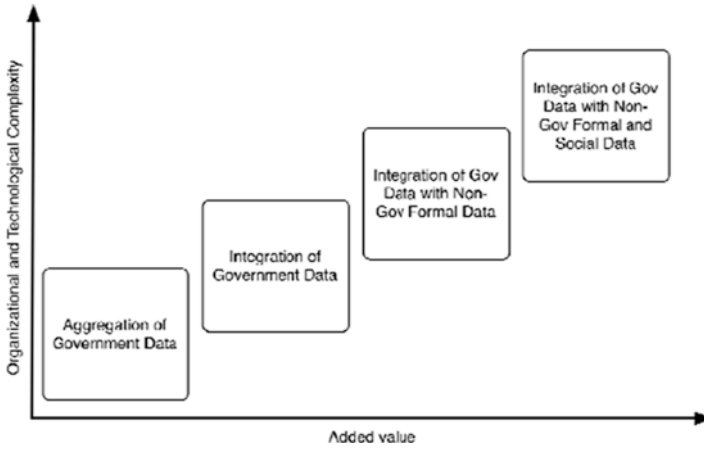


Fig. 14 OGD Maturity Model (Kalampokis et al. 2011)

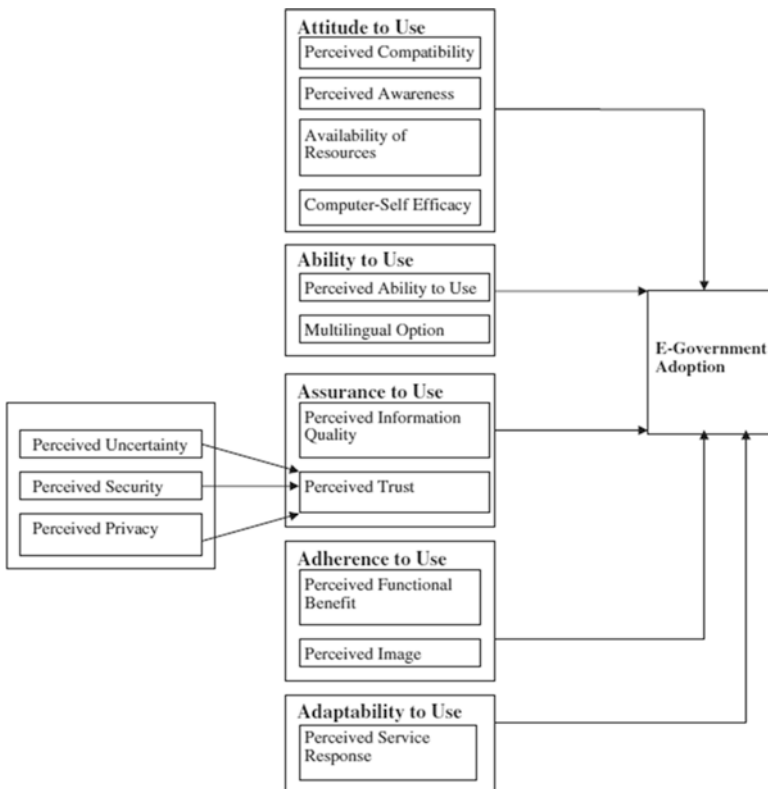


Fig. 15 GAM dimensions (Shareef et al. 2011)

categories of factors influencing citizen take-up of eGovernment solutions at various stages of maturity are: Attitude to use i.e. received compatibility, perceived awareness, availability of resources, computer-self efficacy; Ability to use i.e. perceived ability to use, multilingual option; Assurance to use that is the perceived information quality and trust; Adherence to use i.e. perceived functional benefits, perceived image, and; Adaptability to use that is the perceived service response.

*Alhomod and Shafi (2012)* in 2012 propose a redefined four-stage model, based on their evaluation of 25 existing models. It is a scientific model, with an abductive approach to eGovernment maturity. The maturity levels are: Presence on the web with portals merely providing information; Interaction between the citizen and the government i.e. downloadable and e-mail forms made available for use; Complete transaction over the web that is secure eService transactions and two-way communication, and; Integration of services i.e. horizontal and vertical integration between authorities to share information and data.

*Lee and Kwak (2012)* in 2012 suggest a five-stage model with a focus on engagement and data exchange. It is a scientific model, which takes an abductive approach to eGovernment maturity. The model is developed based on observations and data from the US health sector and propose the following maturity levels: Initial conditions not to be confused with “pre-conditions” (e.g. UN, EC and Waseda models) the focus is on one-way static interaction from authorities to citizens; Data transparency with limited use of Web2.0 and social media. Objective is to get public feedback on the usefulness and data quality; Open participation with increasing use of Web 2.0 and social media tools to increase transparency and engagement, and includes eVoting and ePetitioning; Open collaboration incl. interagency collaboration by sharing data and public input and public contests are organised and data is analyzed for obtaining new insights and improving decision-making; Ubiquitous engagement with data easily accessible via mobile devices and data being vertically and horizontally integrated and data analytics is used for decision making processes for authorities continuous improvement of performance.

*Dias and Gomes (2014)* in their 2014 evaluation of local eGovernment maturity in Portugal propose an adjusted model based on Layne and Lee (2001) and the EU benchmarking models (EC 2012). It is a scientific model, which takes an inductive approach to eGovernment maturity. The model is developed based on observations and data from 239 local authorities in Portugal in 1999, 2007, 2010 and 2013. The proposed model consists of three parallel dimensions each consisting of four stages: Information incl. generic information (i.e. presence), downloadable forms (i.e. interaction), search functionality (i.e. interaction) and parameterize search (i.e. interaction); Service incl. information (i.e. one-way), authentication of user (i.e. two-way), eService transaction (i.e. two-way) and authentication and eService transaction (i.e. transaction); Participation e.g. features (i.e. two-way), authentication and features (i.e. two-way), participative process (i.e. transaction) and advanced participative process (i.e. transaction).

*Janowski's (2015)* four-stage Digital Government Evaluation Model from 2015, is a scientific model, which takes an inductive approach to eGovernment maturity. It has many of the same features as earlier models but attempt to provide it as a practical tool. It is developed based on observations in developed and emerging

STAGE	APPLICATION CONTEXT	CHARACTERIZATION		
		Internal government transformation	Transformation affects external relationships	Transformation is context-specific
Digitization	Technology in government	no	no	no
Transformation	Technology impacting government organization	yes	no	no
Engagement	Technology impacting government stakeholders	yes	yes	no
Contextualization	Technology impacting sectors and communities	yes	yes	yes

Fig. 16 Digital Government Evolution Model (Janowski 2015)

economies around the world. Rather than mere levels of maturity it propose four-stages of complexity depending on three binary variables: (1) whether digitisation adds to internal work and structures of government without affecting them; (2) transforms internal processes and structures; whether the transformation is internal with, or without affecting the end-users; (3) whether the transformation is depending on a particular application context. The four levels of maturity are (see Fig. 16): Digitisation or technology in government (i.e. presence); Transformation being eGovernment (i.e. transaction and transformation); Engagement or eGovernance (i.e. eParticipation/eDemocracy), and; Contextualisation i.e. policy-driven eGovernance.

Heeks' (2015) Manchester eGovernment Maturity Model from 2015, adapt the Layne and Lee (2001) be less linear in its process, differentiate between the front- and back-office and less "US-centric". It is a scientific model, which takes an inductive approach to eGovernment maturity. The model is developed based on observations in developed and emerging economies around the world. The result is two parallel dimensions consisting of three and four elements respectively, thus forming a matrix (see Fig. 17). The stages are: Sophistication of digitised interaction (i.e. front-office) incl. informed/one-way interaction, interact/two-way interaction and transaction/complete service; Extent of process change (i.e. back-office) incl. digitisation (simple automation), improvement (process integration), redesign (e.g. proactive transaction) and transformation (fundamental change e.g. process elimination).

### Stage Models by Origin and Type

The literature review has identified 42 different stage-models. Looking closer at their description, in section "Stage Models Identified and Described", their origin can be traced to either national authorities such as national auditors, or international

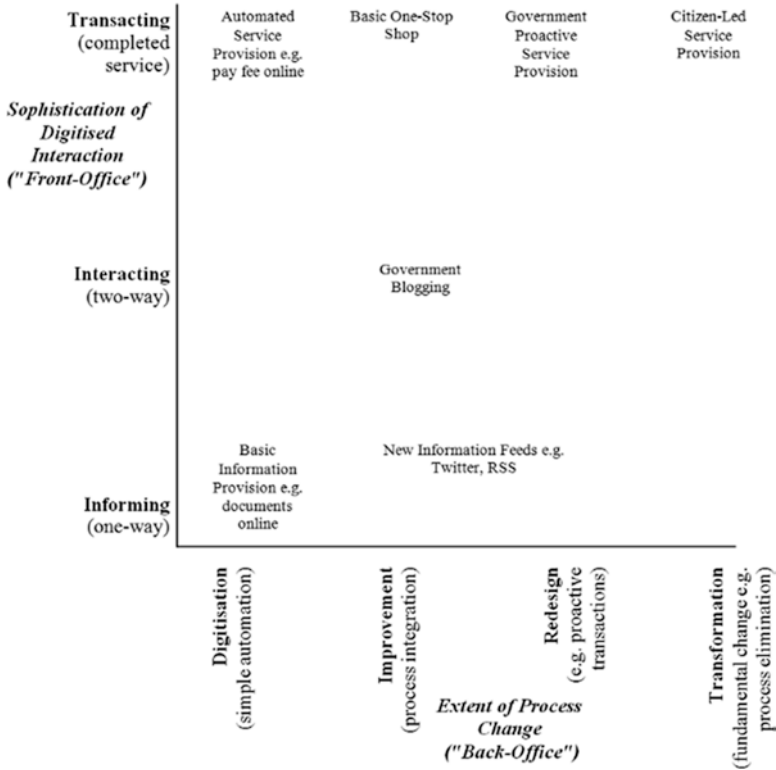


Fig. 17 Manchester eGovernment Maturity Model Metaphores (Heeks 2015)

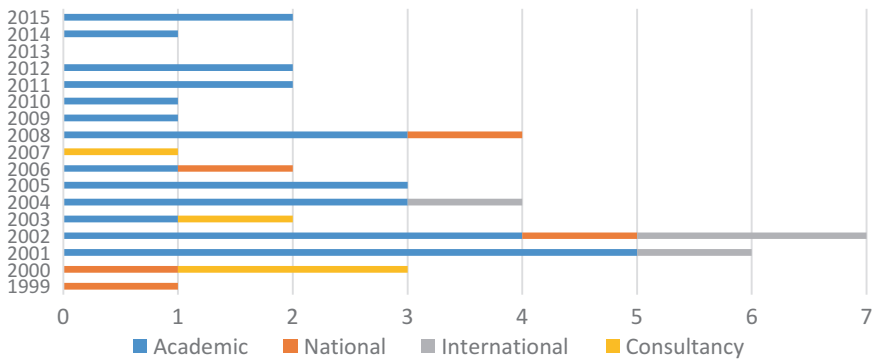
organisations like the EU or UN, consultancy firms like Deloitte and CISCO or academia. Table 1 present the number of models identified for each of these four categories.

The first model was published by the Australian National Auditing Office in 1999 (ANAO 1999). The latest models are published by Heeks and Janowski in 2015 (Heeks 2015; Janowski 2015). Using the year of publication, the timeline (see Fig. 18) highlight a number of developments.

The first models to emerge are from national authorities, international organizations and consultancies. National models from Australian ANAO (ANAO 1999) to the UK equivalent were published in 1999–2001. International organisations followed with the UN (UNDESA 2014) in 2001 and the EU (EC 2012) and World Bank in 2002 (Toasaki 2003; Alhomod and Shafi 2012). The Deloitte (Deloitte and Touche 2001) through to the Accenture model (Rohleder and Jupp 2003) were published in 2000–2003. The first scientific models were published by (in alphabetical order) in 2001 by Hiller and Belanger (2001), Howard (2001), Layne and Lee (2001) and Silcock (2001), followed by Wescott (2001), Chandler and Emanuel (2002), Moon (2002) and Netchaeva (2002) in 2002. The most recent models includes Dias and Gomas (2014) in 2014 and Janowski (2015) and Heeks (2015) in 2015.

**Table 1** Stage models by origin (incl. names of model)

Type of model	Number of models	Name of model
National	5	ANAO (1999), SAFAD (2000), UKNAO (2002), NASCIO (2006), Iribarren et al. (2008).
International	3	UN (2014, 2008, 2010, 2012), EU (EC 2014; European Commission and D.R.a.I. 2013), WB (Toasaki 2003).
Consultant	4	Deloitte (Deloitte and Touche 2001), Gartner (Baum and Di Maio 2000), Accenture (Rohleder and Jupp 2003), Cisco (Cisco 2007).
Scientific	30	Hiller and Belanger (2001), Howard (2001), Layne and Lee (2001), Silcock (2001), Wescott (2001), Chandler and Emanuel (2002), Hogdginson (2002), Moon (2002), Netchaeva (2002), Koh and Prybutok (2003), Reddick (2004), Waseda (Obi 2012, 2014, 2015), West (2004), Windley (2002), Davison et al. (2005) Persson and Goldkuhl (2005), Siau and Long (2005), Andersen and Henriksen (2006), Chan et al. (2008), Shahkooh et al. (2008), Almazan and Gil-Garcia (2008),Luna et al. (2013), Kleivink and Janssen (2009), Kim and Grant (2010), Kalampokis et al.(2011), Shareef et al. (2011), Alhomod and Shafi (2012), Lee and Kwak (2012), Dias and Gomes (2014), Heeks (2015), Janowski (2015).



**Fig. 18** Stage-models published over time

What is also clear from the literature review is that stage models were of particular interest in 2000–2004 when 23 of the 42 identified models were published (i.e. 54.8%) – including all models originating in international organisations and consultancies.

As presented in Table 2, 22 (i.e. 52.4%) of the identified models are based on practical experiences and case studies with 15 (i.e. 35.7%) being based largely on observations of ICT use in a single country and at a single level of government (e.g. local, regional, or central) public administration. Seven (i.e. 16.7%) models are based on the experiences in multiple countries, i.e. Accenture, UN, EU, Iribarren et al., Janokowski, Wescott and West. Three models (i.e. 7.1%), Windley, Chan et al. and Almazan et al., are based on regional observations in a single

**Table 2** Stage-models based on practical experiences and case studies

Model	Type	Experiences/case study
ANAO	National	Australian experience.
SAFAD	National	Swedish experience and ANAO model.
UKNAO	National	UK experiences.
NASCIO	National	USA States.
Iribarren et al.	National	Chilean experience plus experiences of 22 countries. Annual ranking of Australia, Canada, South Korea, Sweden, UK, USA and others.
Accenture	Consultant	Observations in 22 countries. Annual ranking of Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, Norway, Portugal, Singapore, South Africa, Spain, the UK and USA.
UN	International	Observations in 193 countries.
EU	International	Observations in 28 EU plus associated member states. Based on SAFAD model. Annual ranking of the countries.
Layne and Lee	Scientific	Observations in the US.
Moon	Scientific	Case study of 2000 US municipalities.
Reddick	Scientific	Observations in US municipalities.
Wescott	Scientific	Observations in Asian-Pacific countries.
Waseda	International	Observations in multiple countries.
West	Scientific	Case studies of from 1813 and 1680 US municipalities in 2000 and 2001 plus observations in multiple countries e.g. in 2006.
Windley	Scientific	Case study of US <a href="http://Utah.gov">Utah.gov</a> .
Andersen and Henriksen	Scientific	Case study of 110 Danish stage sites and Layne and Lee model.
Shareef et al.	Scientific	Case study in Canada.
Chan et al.	Scientific	Case study of selected Chinese regional portals.
Almazan et al.	Scientific	Case study of 32 Mexican state portals.
Dias and Gomes	Scientific	Case studies of 239 Portuguese municipalities in 1999, 2007, 2010 and 2013.
Lee and Kwak	Scientific	Observations in US health sector.
Janowski	Scientific	Observations in multiple developing countries.

country, whereas Moon, Reddick and Dias & Gomes (i.e. 7.1%) are based on case studies in municipalities.

The most cited model is hard to assess as the original source of national, international and consultant models are often not cited or referenced appropriately in the literature, is neither publically available, not included in scientific databases, nor available on sites such as research gate and Google scholar. Using Google scholar (accessed on 15 April 2016) the most frequently cited models are all scientific: Layne and Lee’s 2001 model (Layne and Lee 2001) with 2031 citations, Moon’s 2002 model (Moon 2002) with 1550 citations, Hiller and Belanger’s 2001 model (Hiller and Belanger 2001) cited 952, and Andersen and Henriksen’s 2006 model

(Andersen and Henriksen 2006) model being cited 453 times. The most cited model not published by academics are Gartner's (Baum and Di Maio 2000) 2000 model with 302 citations.

### *Maturity Levels in Stage-Models*

Analysing the 42 models, 11 different stages are identified: From pre-conditions to transformation (or morphing) and eDemocracy. As illustrated in Fig. 19 (at the end of the chapter), the models and their respective complexity and maturity levels (or stages) varies from simple models such as Reddick's (2004) two-stage model presenting information online and transactional eServices, and the World Bank's (Toasaki 2003) three-stage model, which adds user-engagement to Reddick's version. More complex models includes Dias and Gomes' three-dimensional, 12-stage model (Dias and Gomes 2014), Waseda's four-stages with seven cross cutting themes (Obi 2015), Iribarren et al. with five-stages and 172 indicators, or the UN model with its four-stages and over 200 indicators for its eGovernment Readiness Index (UNDESA 2008). It is particularly interested that models like Dias and Gomes, Heeks and Waseda borrow heavily from the CMM / CMMI models with their multi-dimensional approach.

Two clusters of development are identified in literature (and visualized in Fig. 19). The first cluster appear in the period 1999–2004 and consists of 23 models (i.e. 54.8%). Three of five models published by national authorities, all three international organisations and the four consultancy models are from this period. All models (except Waseda) in this cluster includes maturity stages for publication of static information online, transactional services (i.e. eServices), aspects of back-office integration and a degree of public sector reform. Only the UN, EU and Waseda address pre-conditions such as the availability of internet access, digital literacy and internet use. Similarly, only Gartner, Silcock and Accenture included ICT enabled transformation (or morphing) of public administration. Hiller and Belanger, Wescott, Moon and Netchaeva by contract, address user engagement, participation and decision making (i.e. eParticipation and eDemocracy) to some degree.

A second cluster of emerge from 2005 (but over a longer period) and consist of 19 models (i.e. 45.2%). Three trends emerge within the second cluster. First, all build on the ideas from the 1999–2004 cluster, and includes the presentation of static information online (except Iribarren et al. and Kleivink and Janssen), eServices transactions (except Iribarren et al. and Kleivink amd Janssen), back-office integration and a degree of ICT enabled public sector reform. Second, public sector reform becomes more prominent and is included in 14 models (i.e. 14/19, compared to 4/23). Lastly, eParticipation and eDemocracy is also included in more models. In addition to the 12 models (i.e. 12/19, compared to 7/23) addressing user engagement and decision making published from 2005, the period also see the UN and EU extending their models in order to address these aspects (EC 2012; UNDESA 2012).

**Fig. 19** (a) Identified stage models mapped in accordance with their different maturity levels. (b) Identified stage models mapped in accordance with their different maturity levels



Item No.	Item Description	Item Category	Item Status	Item Location	Item Date	Item Value	Item Unit	Item Qty	Item Price	Item Total	Item Remarks
1	...	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...	...
10	...	...	...	...	...	...	...	...	...	...	...
11	...	...	...	...	...	...	...	...	...	...	...
12	...	...	...	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...	...	...	...
14	...	...	...	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...	...	...	...
16	...	...	...	...	...	...	...	...	...	...	...
17	...	...	...	...	...	...	...	...	...	...	...
18	...	...	...	...	...	...	...	...	...	...	...
19	...	...	...	...	...	...	...	...	...	...	...
20	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...
22	...	...	...	...	...	...	...	...	...	...	...
23	...	...	...	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	...	...	...
27	...	...	...	...	...	...	...	...	...	...	...
28	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...
30	...	...	...	...	...	...	...	...	...	...	...
31	...	...	...	...	...	...	...	...	...	...	...
32	...	...	...	...	...	...	...	...	...	...	...
33	...	...	...	...	...	...	...	...	...	...	...
34	...	...	...	...	...	...	...	...	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...
36	...	...	...	...	...	...	...	...	...	...	...
37	...	...	...	...	...	...	...	...	...	...	...
38	...	...	...	...	...	...	...	...	...	...	...
39	...	...	...	...	...	...	...	...	...	...	...
40	...	...	...	...	...	...	...	...	...	...	...
41	...	...	...	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...	...	...	...
43	...	...	...	...	...	...	...	...	...	...	...
44	...	...	...	...	...	...	...	...	...	...	...
45	...	...	...	...	...	...	...	...	...	...	...
46	...	...	...	...	...	...	...	...	...	...	...
47	...	...	...	...	...	...	...	...	...	...	...
48	...	...	...	...	...	...	...	...	...	...	...
49	...	...	...	...	...	...	...	...	...	...	...
50	...	...	...	...	...	...	...	...	...	...	...

Fig. 19 (continued)

The vast majority of the 42 models use different semantics and metaphors, similarly many models and individual stages overlap (Meyerhoff Nielsen 2016a; b; Alhomod and Shafi 2012; Lee 2010). This means that some general categories exist. In fact, commonalities between national, international and consultancy models, are also shared with many of the scientific models, and is visualized in Fig. 19 (Lee 2010).

### *Overarching Characteristics and Meta Stages*

As the various models are based on different perspectives and use different definition and metaphors, they can be difficult to understand and summarise. To alleviate this difficulty, the 11 meta stages presented in Fig. 19 are distilled further using Lee’s qualitative meta-synthesis framework (Lee 2010).

Using a detailed qualitative meta-synthesis procedure Lee use 12 stage-models to develop a new semantic framework consisting of five general metaphors namely: Presenting, Assimilating, Reforming, Morphing, eGovernance. The Lee’s five metaphors are defined and described in Table 3 below.

**Table 3** Metaphors: their definitions, related stages, and themes (Lee 2010)

Metaphors	Description	Stages/concepts	
		Citizens and services	Operation and technology
Presenting	Presenting information in the information space	Information	
Assimilation	Assimilates (or replicates) processes and service in the information space with the ones in the real world	Interaction	Integration
Reforming	Reform the processes and services in the real world to match the information space requirements, fitting for efficiency	Transaction	Streamlining
Morphing	Change the shape and scope of processes and services in the information space as well as the ones in the real world, fitting for effectiveness	Participation	Transforming
eGovernance	Processes and services in both worlds are synchronously managed, reflecting citizen-involved changes with reconfigurable processes and services	Involvement	Process management

From the analysis of the 42 models, identified in the literature review, it becomes clear that the 11 overarching stages identified represents six specific meta stage characteristics. With respect to Lee's framework, an initial 'pre-condition' stage is missing. A pre-condition stage is therefore added to Lee's framework for the purpose of this article (bringing the number of stages to six) (Meyerhoff Nielsen 2016a).

The 42 models and their respective overarching stages are, in Fig. 20, mapped in accordance with the six meta characteristic described in Table 3. The models are presented chronological and in alphabetical order within said year.

## Review of Existing Stage Models

The stage and meta characteristic mapping in Fig. 20 highlight a number of interesting aspects. Table 4 below summaries the number of models, which address each of the six meta stages. The main differences in the models unearth relates to ICT enabled morphing (i.e. transformation) of public administrations and eParticipation and eDemocracy (i.e. user engagement and decision-making).

### *Preconditions*

Models, like the UN (UNDESA 2014), EU (EC 2012), Waseda (Obi 2015) and Iribarren et al. (Iribarren et al. 2008) which include preconditions generally focus on the availability of key enabling factors such as digital literacy, Internet availability and use, electronic identifiers (eID), availability of a basket of electronic services, accessing public sector information, downloadable forms and transactional eServices in aggregated terms. The aim is to enrich analysis and monitor the availability of key enablers. Unfortunately, none of the models addresses the actual use of key enablers like eID's.

While Lee's framework include management and governance issues in the final maturity level (Lee 2010), it may be argued – in line with the IT governance literature (Brown and Magill 1994; Brown and Grant 2005) (see section "Background"), recommendations by the OECD (OECD 2014) and authors like Iribarren, NASCIO and Janowski (Iribarren et al. 2008; NASCIO, N.A.o.S.C.I.O. 2006; Janowski 2015) – that governance structures and cross-governmental cooperation are preconditions for successful ICT implementation and take-up. For instance, is the eGovernment Strategy legally binding for one or all levels of government, what mechanisms govern decision-making, legal changes and coordination processes, benefit realization etc. While most would agree on the objective of IT governance, the Waseda, NASCIO, Iribarren et al., Shareef et al. and Janowski models are the only one, which address it directly (e.g. governance, cooperation and promotion structures, management optimization, policy driven eGovernment) (Iribarren et al. 2008; Meyerhoff Nielsen 2016a; Obi 2015; NASCIO, N.A.o.S.C.I.O. 2006; Shareef et al. 2011; Janowski 2015; Lee 2010).

Name / author of model	Year of publication	# of steps in the model	Pre-conditions (0)	Presenting (1-2+3 / Lee presenting)	Transaction (4+5 / Lee institutional transaction)	Reforming / Use-centric (6+7+8 / Lee Reforming)	Morphing / Personal (9 / Lee Morphing)	eDemocracy (10 / Lee Governance)	Ranking, benchmark, index evaluation
ANAO (Australian National Audit Office)	1999	4		2+3	4+5	6+7			
Deloitte Research	2000	6		2+3	4+5	7+8			
Gartner Group	2000	4		2+3	4+5	6+7+8	9		
SAFAD (Sve Agency for Adm. Dev. / Svanbokontoret)	2000	4		2+3	4+5	6+7+8			
Hiller & Behringer	2001	5		2+3	4+5	6+7+8		10	
Howard	2001	3		2+3	4				
Leyns & Lee	2001	4		2	4+5	6+7+8			
Shoock	2001	6		2	4+5	6+7+8	9		
United Nations	2001-2001	4	0	2+3	4+5	6+7+8		(10)	x
Wescott	2001	6		1+2+3	4+5	6+7+8		10	
Chandler & Emanuel	2002	4		2+3	4	7+8			
EU	2002	5	(0)	2+3	4+5	6	9	(10)	x
Hodgkinson	2002	5	(0)	1+2+3	4+5				
Mason	2002	5		2+3	4+5	6+7+8		10	
Nechera	2002	5		2+3	4+5	6+7+8		10	
UKNAO (UK National Audit Office)	2002	5		2+3	4	6+7+8			
World Bank	2002	3		2+3	4+5	6			
Accenture	2003	5		2	4+5	6+7	9		x
Koh & Pfyfock	2003	3		2+3	4+5+6	7+8			
Redback	2004	2		2+3	4+5	6			
Wazelsa	2004-	4	0	2+3	4	7+8		10	x
West	2004	4		2	4+5	6+7+8		10	x
Wardley	2004	4		2+3	4+5	6+7+8	9		
Davison et al.	2005	4		1+2+3	4+5	6+7+8			
Sun & Leung	2005	5		2+3	4+5	6	9	10	
Perrison & Goldhall	2005	2		1+2+3	4+5	6+7+8	9	10	
Andersen & Hammen	2006	4		(1)+2+3	4+5	6+7+8	(10)		
NASCIO	2006	6	0	1+2+3	4+5	6+7+8	9	10	
Cisco	2007	3		3	4	7+8	9		
Almazan & Gal-Garcia	2008	6		1+2+3	4+5	6+7+8	9	10	x
Chan et al.	2008	5		2+3	4+5	6+7+8	9		
Irham et al.	2008	4					9	10	
Stakhovsk et al.	2008	5		2+3	4+5	6+7+8	9		
Kervik & Janssen	2009	5		2+3	4	6+7+8	9	(10)	
Kim & Grant	2010	5		2+3	4	6+7+8	9	10	
Kalamobis et al.	2011	4		1+2		7+8	9	10	
Shareef et al.	2011	5	0	1+2	3+4+5	8			
Almond et al.	2012	4		2+3	4				
Lee & Kwak	2012	5		2+3			(9)	10	
Dias & Gomes	2014	12 / 3 domains		1+2+3	4+5	6+7+8	9	(10)	x
Hicks	2015	7 / 2 domains		2+3	4+5	6+7+8	9		
Jaworski	2015	4		1+2+3	4+5	6+7+8	9	10	

Fig. 20 Identified stage models mapped in accordance with Lee’s qualitative meta-synthesis framework (Adapted by author to incl. pre-conditions) (Lee 2010)

**Table 4** Metaphores: their definitions, related stages, and themes

Pre-conditions: 6/42 (i.e. 14.3%)	United Nations, EU, Waseda, NASCIO, Iribarren et al., Shareef et al.
Presenting: 39/42 (i.e. 92.9%)	ANAO, Deloitte, Gartner, SAFAD, Hiller and Belanger, Howard, Layne and Lee, Silcock, UN, Wescott, Chandler and Emanuel, EU, Moon, Netchaeva, UKNAO, World Bank, Accenture, Reddick, West, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Almazan and Gil-Garcia, Chan et al., Shahkooh et al., Kim and Grant, Kalambokis et al., Shareef et al., Alhomod et al., Lee and Kwak, Dias and Gomes, Heeks, Janowski (except Waseda, Iribarren et al., Klievink and Janssen).
Assimilation: 38/42 (i.e. 90.5%)	ANAO, Deloitte, Gartner, SAFAD, Hiller and Belanger, Howard, Layne and Lee, Silcock, UN, Wescott, Chandler and Emanuel, EU, Moon, Netchaeva, UKNAO, World Bank, Accenture, Reddick, Waseda, West, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Almazan and Gil-Garcia, Chan et al., Shahkooh et al., Kim and Grant, Shareef et al., Alhomod et al., Lee and Kwak, Dias and Gomes, Heeks, Janowski (except Iribarren et al., Klievink and Janssen, Kalambokis et al., Lee and Kwak).
Reforming: 36/42 (i.e. 85.7%)	ANAO, Deloitte, Gartner, SAFAD, Hiller and Belanger, Layne and Lee, Silcock, Hodginson, UN, Wescott, Chandler and Emanuel, EU, Moon, Netchaeva, UKNAO, World Bank, Accenture, Reddick, Waseda, West, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Almazan and Gil-Garcia, Chan et al., Shahkooh et al., Kleivink & Janssen, Kim and Grant, Kalambokis et al., Shareef et al., Alhomod et al., Heeks, Janowski. (Exempt Howard, Hodginson, Iribarren et al., Shareef et al., Lee and Kwak, Dias and Gomes).
Morphing: 18/42 (i.e. 42.9%)	Gartner, Silcock, Hodginson, Accenture, Windley, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Cisco, Chan et al., Iribarren et al., Kleivink and Janssen, Kim and Grant, Kalambokis et al., Lee and Kwak, Heeks, Janowski.
eDemocracy: 19/42 (i.e. 45.2%)	Hiller and Belanger, UN, Chandler and Emanuel, EU, Moon, Netchaeva, Waseda, West, Siau and Long, Persson and Goldkuhl, Andersen and Henriksen, NASCIO, Almazan and Gil-Garcia, Shahkooh et al., Kim and Grant, Kalambokis et al., Lee and Kwak, Dias and Gomes, Janowski.

### *Presenting Online Information and Services*

Emerging from a national context, the Australian ANAO and SAFAD models (see Fig. 2) (Persson and Goldkuhl 2005) were introduced to categorize, evaluate process and guide government organisations' decisions on what services could and should provide. Layne and Lee's (2001) 2001 maturity model streamlines the development stages online information and transactional services by merging different aspects into two categories (see Fig. 4), that is: Catalogue of static information and downloadable forms on websites and transactional aspects such as online service and forms (i.e. eServices).

Dias and Gomes (2014) adjust the Layne and Lee (2001) and the EU benchmarking models (EC 2012) in their 2014 evaluation of local eGovernment maturity in

Portugal. The proposed model consists of three parallel dimensions each consisting of four stages: (1) Information: Generic information (i.e. presence), downloadable forms (i.e. interaction), search functionality (i.e. interaction), parameterize search (i.e. interaction); (2) Service: Information (i.e. one-way), authentication of user (i.e. two-way), eService transaction (i.e. two-way), authentication and eService transaction (i.e. transaction); (3) Participation: features (i.e. two-way), authentication and features (i.e. two-way), participative process (i.e. transaction), advanced participative process (i.e. transaction).

Iribarren et al. eGOV-MM model (see Fig. 13) (Iribarren et al. 2008) takes a multi-dimensional approach including the front- and backoffice, policy, management and organisational capacities. Criticizing the Layne and Lee's model (2001) for being too linear and too 'US-centric' Heeks' Manchester eGovernment Maturity Model differentiate between the front- and back-office (Heeks 2015). The result is two parallel dimensions which forms a matrix (see Fig. 17). One focus on the sophistication of digitised interaction (i.e. one and two-way interaction plus transaction) and the extent of process change (i.e. simple digitisation and automation, improvement process integration, redesign/reform and transformation) which is similar to Waseda (Obi 2015), IT governance and CMM/CMMI approach by NASCIO, Iribarren and others (Iribarren et al. 2008; NASCIO, N.A.o.S.C.I.O. 2006).

While these adjustments to the presentation and publication of information and eServices have evolved over time, none of the models includes actual use. This is in sharp contrast to research in public administration reform – whether it is a NPM efficiency or a JUG effectiveness approach (Bannister and Connolly 2011; Cordella and Bonina 2012; Bannister 2001; Meyerhoff Nielsen and Mika 2014). This is unfortunate as the value added of a project comes from its use, not its existence.

### ***Vertical and Horizontal Integration (Reforming)***

Layne and Lee's stage model breaks with the initial models, by including vertical and horizontal integration as two distinct, and most advanced, levels of maturity to their model (see Fig. 4) (Layne and Lee 2001). Both Deloitte (Deloitte and Touche 2001) and Gartner (Baum and Di Maio 2000) mirror this development.

Persson and Goldkuhl (2005) in 2005 evaluates a number of existing models and propose a two-stage model with a clear computer science perspective. Based on Layne and Lee (2001), their focus is on the integration of services (i.e. services, directed services, concentrated services and portals) and integration in services including horizontal and vertical integration of organisations, processes, the exchange and re-use of data - with the data focus being similar to OGD Maturity Model by Kalambokis et al. (see Fig. 14) (Kalampokis et al. 2011).

## ***ICT Enabled Reform and Transformation (Reform and Morphing)***

The review in section “**Preconditions**”. (see Table 4, Figs. 19 and 20) identified 36 (i.e. 85.7%) models which includes ICT enabled reform of public administration as a maturity level. Of these only half (i.e. 18 models or 42.9% of all models) address ICT enabled transformation (or morphing).

The Klievink and Janssen (2009) five-stage is of particular interest. The level of customer orientation increases with every stage of the model, as does the level of flexibility and includes: Stovepipes, integrated organisations, nationwide portals, inter-organisational integration and customer-driven, joined-up government. The Klievink and Janssen model clearly reflect joint-up government (i.e. integration) and outcomes based thinking seen in public administration and eGovernment literature.

Kim and Grant (2010) propose continuous improvement as a fifth and final maturity level in their 2010 model. Featuring political activities and a focus on continuous improvements and performance it sees ICT as a tool enabling public sector innovation and reform – on par with the logic behind agile development in the IT sector. Lee and Kwak’s (2012) takes a similar approach in their data based model for collaboration and ubiquitous engagement. Although data and collaboration forms the core of Lee and Kwak’s model, the development stages follow a ‘classical’ stage-model pattern, i.e. publication, assimilation, reform and transformation and does therefore not cover Gov3.0. Janowski’s (Janowski 2015) model focus on complexity of ICT enabled reform and move from a ‘classical’ model focus to a fourth and final contextual stage.

The IT governance and CMM/CMMI models, like Davison, Iribarren et al., NACSIO and Waseda, provides a particular interesting multi-dimensional perspective and inclusion of both human, management and organisational capacities (Iribarren et al. 2008; Davison et al. 2005; Obi 2015; NASCIO, N.A.o.S.C.I.O. 2006).

Considering the level of academic consensus of ICT as an enabler of public sector reform and transformation, the limited attention paid to actual outputs and results is surprising. Similarly, not of the models adequately address the Gov3.0 concept.

Cooperation is indirectly addressed by all the models addressing reform and transformation, but none look at the role governance play to ensure backoffice integration or the outcomes required to move from one stage to another. Here the IT governance and CMM/CMMI models, like Davison, Iribarren et al., NACSIO and Waseda, stands out with their multi-dimensional perspective and the inclusion of both human, management and organisational capacities (Iribarren et al. 2008; Davison et al. 2005; Obi 2015; NASCIO, N.A.o.S.C.I.O. 2006).

### ***Stage Models with a Participative and Democratic Dimension (eGovernance)***

The Hiller and Bélanger (2001) and Deloitte and Touche (2001) – and in 2003 the World Bank (Toasaki 2003) with respect to legislative consultations – are the first to add a dimension of engagement and co-creation (indirectly by none-governmental stakeholders) and aspects of participation in a democratic sense. The focus is non-the-less on supply, technology and organisational integration.

In contract active engagement, participation and democratic decision making are aspects of the most advanced maturity levels proposed by authors like Moon (2002) and Siau and Long (2005) while Chan et al. (2008) adds none-governmental stakeholders to the mix of their five-stage model focusing on supply, technology and organizational integration. Similarly the UN eParticipation index was introduced in 2012 (UNDESA 2012) and EU benchmark has included aspects since 2013 (EC 2012).

Lee and Kwak's (2012) five-stage model focus on engagement and data exchange between authorities (i.e. horizontal and vertical integration), transparency by increasing access to data, user-engagement and participation in decision making (i.e. eParticipation and eDemocracy), and lastly on the total transformation of the way public administration deliver services and make decisions (i.e. ubiquitous engagement).

While increased levels of transparency in the government, political and democratic processes is laudable, the latter two does not necessarily constitute a maturity level in their own right. Especially, when focusing on ICT use to improve the efficiency, effectiveness, quality and value added of public sector service delivery.

### ***Realigning the Stage Model to Focus on Integration, User-Centricity and Outcomes***

While stage models like indexes and benchmarks are helpful in mapping the supply and sophistication levels of eService offerings, they all have a technological focus. The relevance of these different models is therefore limited in terms of governance, cooperation and measuring the successful use of online offerings – and thus the value added. In contrast to other stage models, Andersen and Henriksen (2006) follow an activity- and user-centric approach to personalisation of online services in their Public Sector Process Rebuilding (PPR) model (illustrated in Fig. 11). Andersen and Henriksen extends the Layne and Lee's model (see Fig. 4) (Layne and Lee 2001) by making an online presence, horizontal and vertical integration the foundation of their PPR model (Meyerhoff Nielsen 2015, 2016a; Alhomod and Shafi 2012). Klievink and Janssen also address outcomes but anchor their model in the joint-up government research stream (Klievink and Janssen 2009). The approach is interesting as it also reflects ideas around whole-of-government approaches (Frissen et al. 2007; Huijboom et al. 2009b; Traunmüller and Wimmer 2003; Millard



2010), JUG (Bannister and Connolly 2011; de Bri and Bannister 2010) and personalisation of online service delivery (Meyerhoff Nielsen and Igari 2012; Meyerhoff Nielsen and Robert 2015).

The importance of outcomes is a key topic with the both the public administration reform (Bannister and Connolly 2011; Bannister 2001, 2007; de Bri and Bannister 2010), IT-governance and computer science (Brown and Grant 2005) and eGovernment literature (Cordella and Bonina 2012; Traunmüller and Wimmer 2003; Scholl 2009; Janowski 2015). Seven models are complimented with various benchmarks, indexes and rankings (EC 2012; UNDESA 2014; West 2004; Rohleder and Jupp 2003; Obi 2014; Almazan and Gil-Garcia 2008; Luna et al. 2013; Dias and Gomes 2014) but several researchers have questions the value of their due to their simplicity, their supply and technology focus (Lips 2012; Meyerhoff Nielsen 2015, 2016a; Bannister 2007; Heeks 2006, 2015; Rorissa et al. 2011). Andersen and Henriksen are the first researchers, which have taken an outcomes based approach but do not include take-up, qualitative or quantitative indicators. The Waseda (Obi 2015) model differs somewhat from other stage models as it does not define distinct levels of maturity. The focus is on qualitative and quantitative indicators including network preparedness and infrastructure, management optimisation and efficiency etc. Unfortunately, it does not directly address the actual use of eServices, but rather pre-conditions like internet and mobile subscriptions.

## Conclusion

The review of the 42 stage-models identified, their respective maturity levels and meta characteristics show that aspects of Gov3.0 aspects such as ICT enabled integration, transformation, sharing of data and increased participation a number of weaknesses persists.

First, all models, with the exemption of the PPR (Andersen and Henriksen 2006), Howard (2001) and Klievink and Janssen (2009) models, have a technology and supply orientated, i.e. no focus on outcomes or actual use (Meyerhoff Nielsen 2016a, b; Alhomod and Shafi 2012; Lee 2010). This is unfortunate as the tangible benefits of any ICT solution and eServices in particularly can only be realized through the actual and effective use of supplied eServices by citizens (OECD 2014; UNDESA 2014; Meyerhoff Nielsen 2016a; Meyerhoff Nielsen and Mika 2014; Meyerhoff and Kelly 2011).

Second, most of the models have no real understanding of core government service concepts. For instance individual service elements – that is information, transaction capability, personal data – are not separate maturity levels but rather elements in a given service request and subsequent delivery. Similarly downloadable forms are merely a type of static information and does not warrant a separate maturity level (Meyerhoff Nielsen 2016a, b). This is particular surprising considering that 22 models (i.e. 52.4%) are partially based on observations, experiences and case studies in one or more countries (see Table 2).

Third, decision-making, as illustrated by the eParticipation and eDemocracy stages, should not be considered an eGovernment maturity level. Dias and Gomes (2014) makes this argument indirectly, when defining engagement, petition and voting solutions as types of public services. That is, public services which consist of information, transaction capability and some form of data, e.g. information about an election, and internet voting solution allowing for vote casting, plus data such as unique ID numbers, name and address for authorizing a vote. Thus the eParticipation and eDemocracy stage(s) should be seen as an indication of democratic maturity and degree of transparency in a country not as eGovernment maturity levels (Meyerhoff Nielsen 2014, 2016a; Dias and Gomes 2014).

Fourth, front-office service provision and back-office integration are mixed-up in a number of models. For instance, one-stop-shop portals does not constitute a form of transaction, but is rather an indicator of degree to which authorities cooperate and integration in the provision of services via a portal (Meyerhoff Nielsen 2015, 2016a). Heeks attempt to address this by proposing a two dimensional matrix model distinguishing between the front- and the back-office (Heeks 2015). Unfortunately, Heeks does not account for governance or take-up.

Fifth, none of the identified models addresses governance directly. Some, like the Davison et al. (2005), Iribarren et al. (2008), Janowski (2015), Kalambokis et al. (2011), Shareef et al. (2011) and Waseda (Obi 2015) models, highlight management and coordination issues such as the existence of chief information officers. Cooperation on the other hand is indirectly addresses in most models. This is manifested in terms of vertical and horizontal integration, and the existence of one-stop-shops, the sharing of information and data between different authorities and levels of government – even private and third party stakeholders (Lee and Kwak 2012; Chen and Mingins 2011).

Sixth, as illustrated by Figs. 19 and 20 most models merely restructure or adjust existing ones. Key exemptions are the IT governance models like NASCIO (NASCIO, N.A.o.S.C.I.O. 2006) and Iribarren et al. (2008), Andersen and Henriksen's PPR model (Andersen and Henriksen 2006), Hodgkinson's focus on learning curves (Hodgkinson 2002), Davison's four elements (Davison et al. 2005), Shareef's (Shareef et al. 2011) dimensions, Waseda's approach (Obi 2015) and Janowski's (2015) approach, all of which builds on existing models while attempting to address outcomes and governance issues.

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