E-government and digital transformation in Libyan local authorities

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Abstract

This article reports on e-government in local authorities in Libya, and discusses the issues involved in digital transformation. The study builds upon existing models and frameworks to establish a Technology-Organisation-Process (TOP) maturity model for assessing e-government status in three case studies in Libya, which reveal major problems in adopting e-government in Libya. The current technology deployment remains basic, with inadequate information systems and networks, out of date personal computers and office software, and unreliable access to the internet. Organisational capabilities, skill levels, lack of funding, management support and process inefficiencies are other factors hampering progress in the adoption of e-government. A step-change to digital government that employs emergent technologies such as artificial intelligence, big data, analytics and cloud computing is currently out of reach. The TOP maturity model provides a framework for assessing e-government readiness in a developing world environment and gives a multi-dimensional perspective on local authority capabilities.

Key Words: Digital transformation; e-government; TOP maturity model; technology deployment; qualitative case studies; organisational capabilities; process efficiencies; Libyan local authorities.

1. Introduction

The deployment of new digital technologies, allied to the availability of the internet, has had a profound impact on the global economy, and in the context of Africa, national governments are assessing the potential of digital transformation to drive economic growth and reduce inequalities (Department of International Relations and Cooperation, 2019). One area where digital technologies may be of benefit is e-government, which is generally seen as the use by government agencies of information technologies (such as wide area networks, the internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. The concept of digital government (as opposed to e-government) has come to the fore, which the World Bank (2020) see as "a fundamental shift in the way governments around the world are embracing their mission". This involves governments in "leveraging the power of information technologies in transformative ways" (para. 1). The World Bank (2020) sees this as contributing to its "twin goals of ending extreme poverty and boosting shared prosperity" (para. 16).

In 2010, the Libyan Government mandated the Ministry of Communications and Informatics to develop an e-government strategy to modernize government services. This initiative, known as "E-Libya", aimed at putting information technology at the centre of government

operations to enhance the services provided to all residents and businesses. Although the e-Libya initiative was viewed as a major in an attempt to convert to an information-based society, the project was suspended in 2015 due to the unstable political situation. Late in 2017, the government started to resurrect the initiative by starting negotiations with PricewaterhouseCoopers to commence and provide a comprehensive e-government plan, but progress has been hampered by the continuing civil war and social unrest. In 2020, Libya was ranked 162 out of 193 in the world in the United Nations latest bi-annual world ranking of e-government services (United Nations, 2020), behind, in the Arab world, the UAE, Bahrain, Saudi Arabia, Kuwait and Oman (Zaptia, 2020).

Through their policies, programmes and services, local governments can have a significant impact on citizens, businesses, and other stakeholders on a daily basis. Local governments render services in defined geographical areas, where central government cannot attend in detail to all the requirements of society at local level. In Libya, local authorities were governed through "popular committees" during the rule of Muammar Gaddafi from 1977 to 2011, but in 2012, the Interim National Transitional Council approved a new law (law no.59) which set out the role and duties of local authorities. It re-defined the powers given to governors and mayors, and determined the amount of financial resources allocated to provinces and municipalities. The local authorities, whose members are now directly elected, fall under the direction of the Ministry of Local Authorities (MLA).

This article examines e-governance in three local authorities in Libya, through the TOP (Technology-Organisation-Process) maturity model, which was piloted in Libya in 2017 (Forti and Wynn, 2017), and has since been refined and applied to two further local authorities. It addresses two research questions: first, what is the status of e-government at local authority level in Libya? Second, what are the key issues involved in transitioning from e-government to digital government in Libyan local authorities? Following this introduction, relevant literature and models are reviewed in section 2, and the research methodology is discussed in section 3. The TOP model is then set out in section 4, and section 5 summarises the main findings from the three case studies. Section 6 discusses these findings in the context of the two research questions. Finally, section 7 draws some conclusions regarding the contribution of the research project and future work.

2. Related literature

E-government can be seen as a response to the need to improve local, regional and national government operations (Jadi and Jie, 2017). In the 1990s, the emergence of network-based information technology (IT) represented a turning point for government agencies, which now had the opportunity to exploit information technology to achieve their goals. The term "e-government" was coined and since then it has been re-defined and developed as technologies have advanced. Heeks (2006) saw e-government as a combination of the key characteristics of a technological department and public administration, encompassing and enhancing customer service (the front office), and organisational structure (the back office). More generally, e-government was seen by Otubu (2009) as the process whereby the use of information and communication technology (ICT) is employed by the government in the delivery of services to members of the public, and in the internal running and linkages among different governmental agencies. Public sector organisations in both developed and developing countries have realised the importance of making their services more effective, efficient and accessible by revolutionising governments' interactions with their stakeholders (Rammea and Grobbelaar, 2017). E-government has become an explicit component of public sector reform, as an instrument to increase efficiency, strengthen competitiveness and speed institutional modernisation.

In the last decade, there has been increasing pressure and demand from citizens to provide government services online, as technologies have matured and the risks of their adopting has declined. There is also international pressure to participate in the "e-Economy" and be part of the global economic network (Hatsu and Ngassam, 2017). This pressure has encouraged policy and decision makers, including those in poor and less developed countries, to facilitate the move to e-government. Unfortunately, this transformation has often been associated with complexity and difficulty due to the multiple dimensions and perspectives involved (Veenstra, Klievink and Janssen, 2011). It is evident that effective e-government must deal with a range of political, economic, cultural, technological and organizational factors. The complexity of e-government as a socio-technical system (Hafizi, Miskon and Rahman, 2014) impedes change in many developing countries, such as Libya. It is clear that e-government offers great opportunities to enhance efficiency and increase productivity, but it also raises many challenges.

This has been brought into even sharper focus with the wide range of new "disruptive" technologies that are now available. This process of "digitalisation" is central to the concept

of digital government, which goes beyond what has hitherto been termed e-government. The move to digital government has a clearer technology focus, and can be seen as "a synergistic process", in which "the organizations that are most successful are the ones that 'ride the wave' of technology, and use a well-defined strategy that receives buy-in from the end users and shows clear, and ongoing, benefits" (DX, 2020, para.13). The World Bank (2020, para.1) see the possibilities of the deployment of these new technologies as ranging "from setting measurable administrative goals to improving public service delivery, from making data-driven decisions to enacting evidence-based policies, from ensuring greater accountability and transparency within government to building greater public trust". The World Bank (2020, paras. 16/17) claim, "a well-suited digital infrastructure can improve the functions of governments at various scales – national, regional and local. Data will be central in enabling digital development, for instance making use of contextual data indicators can allow governments to gain a more acute understanding of local issues and accurately gauge public concerns".

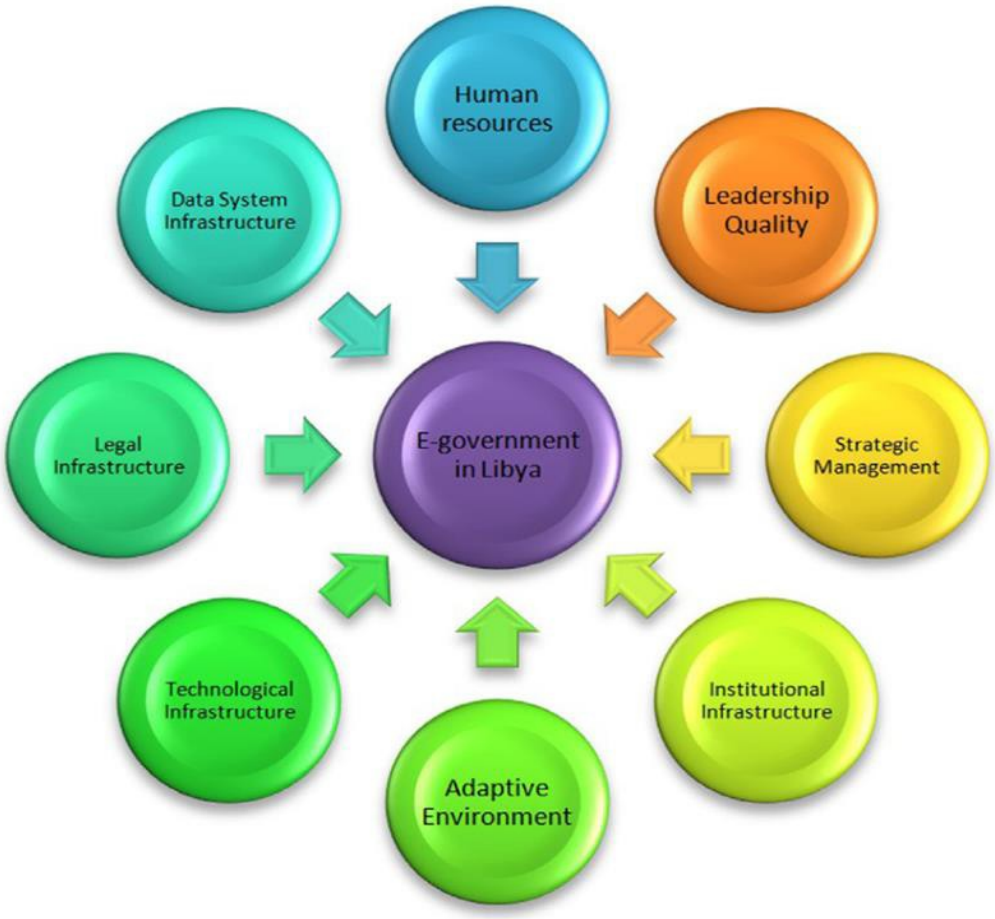

Figure 1. Infrastructure needed for quality e-government in Libya (Busoud and Živković, 2016, p. 514)

Several frameworks and models have been devised to assess and analyse technology adoption in government. The adoption of e-government, however, is more than a technology issue, as it is influenced by many other factors (Ebrahim, Irani and Alshawi, 2004). Organizational structure and human capabilities are important factors which are related to the nature of the government in a particular country, and its overall role and responsibilities in society (Gupta, Dasgupta and Gupta, 2008; Andersen and Henriksen, 2007). In the context of Libya, Busoud and Živković (2016) suggest a wide range of factors that impact on e-government (Figure 1).

A number of maturity models have been developed, some of which try to assess this broader range of dimensions in e-government. For example, Valdes *et al.* (2011) structured their model around three main elements: leverage domains, key domain areas and critical variables, which together "enable public agencies to consider the necessary aspects to join e-Government initiatives". Four leverage domains were defined ("e-Government Strategy", "IT Governance", "Process Management", and "Organization and People"), with 17 key domain areas, and 55 critical variables.

The United Nations model (United Nation, 2014) "aims to give a performance rating of national governments". Janssen *et al.* (2014), however, suggests that the existing e-government maturity models, including the United Nations model, often assess the level of e-government from the outside, by observing the availability of front-end services, and pay scant attention to back-office systems and processes, which provide the foundation for e-government as a whole. This may be a logical focus when taking the citizens' point of view, or from the view of other stakeholders who are not directly involved in improving the overall provision of e-government; but it provides only a partial view of e-government systems and processes.

Another shortcoming of existing models is that they do not assess governmental organisations at individual process level. Other researchers and international institutions (Altameem, 2007; Warkentin *et al.*, 2002) have developed models to assess e-government infrastructure. These suggest that implementing a robust e-government infrastructure needs a staged approach, where an authority transitions from an immature to a mature stage, at which point electronic access to fully integrated public services is made available.

In addition to the technology factor, some argue that e-government needs to focus on the different attitudes and values evident in different local government environments, allied to contrasting social, organisational and cultural factors (Kim, 2007). Andersen and Henriksen

(2006) further suggest that e-government stages and models have been used to measure the level of e-services in many countries, but that they have not taken much cognisance of key operational metrics, notably in back office processing capabilities, particularly in developing countries. In addition, Bwalya and Healy (2010) argue that, to be effective, an effective e-government model must be based on a comprehensive understanding of the real context of the state or organisation in which the initiative is taking place is required.

This line of thinking is reiterated in some of the literature on digital transformation. Bock (2019), notes that simply digitizing services through technology alone does not yield the transformation of an organization, but rather a balanced interplay of technology, people, channels, and a clear strategy is usually required in what he terms a "digital ecosystem" (para.7). Digital transformation is thus viewed as the deployment of a wide range of technologies and systems to significantly improve business processes and operations. Similarly, the DX consultancy, (DX, 2020, para.4) note that the three areas that organisations "must address in order to best measure the state of their Digital Transformation" are strategy, culture and technology. Nevertheless, other researchers (Obwegeser *et al*., 2020, para.3) conclude, "the reality for many organizations is that digital transformation consists of an ungainly confederacy of digital initiatives revolving around new technologies, a few Skunk Works projects, and random acts of digital enablement".

Recent research on e-government in Libya has included studies of security aspects (Murah and Ali, 2018), future plans (Busoud and Živković, 2016), as well as the initial development of the TOP maturity model (Forti and Wynn, 2017; Forti, 2020). However, there has been no research that attempts to address the current situation regarding e-government in Libya in the context of digital transformation.

3. Research methodology

This research is based on a qualitative, inductive, approach using questionnaires and semi-structured interviews as the main method of data collection in three case studies of Libyan local authorities. The philosophical position is based on the ontology of subjectivism, while the epistemological position is interpretivism. Bryman and Bell (2011) have contested that a case study approach can be productively combined with an inductive qualitative research method, allowing detailed and intensive research activity. The case study is also appropriate for a combination of qualitative methods (Saunders, Lewis and Thornhill, 2009). The

approach aims to provide opportunity to gain a rich understanding of the research context, which enables answers to the research questions to be formulated (Yin, 2013). This is qualitative, inductive, exploratory research based on detailed case studies.

Questionnaires and semi-structured interviews were used for data collection and eighteen senior and middle-level government employees and officials from the three local authorities were interviewed. Semi-structured interviews offer flexibility, as they help to collect more detailed information from the respondents by allowing the researchers to create a rapport with the interviewees, immerse themselves in their day-to-day reality and interpret their perceptions and assumptions. Yin (2013) suggests that the utilisation of multiple sources of evidence is one way of increasing the construct validity of case studies. A structured questionnaire was filled in by five respondents in each of the three cases studied, and follow-up interviews were conducted with the questionnaire respondents. A further three personnel from the Ministry of Local Authorities (MLA), the central government authority responsible for overall direction of the country's local authorities were also held. Interview transcripts, documentary evidence and observation have been combined in order to obtain a broader view. The use of multiple sources of evidence (especially tape-recorded interviews) allowed the researchers to establish a range of technical and behavioural issues.

The three case study local authorities are:

Misurata local authority (MLA): Misurata is the third largest city in Libya. It has a population of over 500,000 people and is located on the Mediterranean Sea, 200 kilometers east of Tripoli, Libya's capital city. The authority is responsible for managing the city's services and facilities, its social and administrative affairs, and organizing procedures for licenses and permits for business and individuals. The authority issues licenses of local business development and activities encompassing hotels, markets and factories. The interviewees in this case study were the deputy manager of human resources, the statistics and information officer in the finance function, the information officer in the community services office and two IT staff.

Sabratha local authority (SLA): Sabratha is located in the north west of Libya, 70 kilometers east of Tripoli, on a point of rocky land projecting into the Mediterranean Sea. The city was the westernmost of the ancient "three cities" of Roman Tripolis, and the population numbers over 150,000. The authority provides a range of different services to its stakeholders

(citizens, businesses, governments), including water supply, sewage collection and disposal, refuse removal, electricity and gas supply, health services, roads and storm water drainage, street lighting, parks and recreation, taxation, licenses, and schools. The interviewees from the authority included the director of procurement, deputy manager of human resources, director of financial management and accounting, deputy manager of statistics and information technology and the deputy manager of legal affairs.

Rujban local authority (RLA): Rujban is a small city, which lies on the Nafusa mountain chain more than 150 kilometers south-west of Tripoli, and is inhabited by 18,000 people. The authority has less financial and administrative powers than the other two authorities do, but their responsibilities include planning and administering a number of core services for its stakeholders. Staff are located in a variety of buildings across Rujban city. Interviewees in this case study included the deputy manager of community and services, director of procurement, the director of financial management and accounting, the statistics and information technology officer and an IT software and support analyst.

4. Development of the Technology-Organisation-Process (TOP) model

The TOP model was developed to assess the e-government readiness of local authorities at individual process level and builds on themes and concepts evident in existing literature (Chen *et al*., 2006; Ebrahim and Irani, 2005; United Nations, 2014; Janssen *et al*., 2014). The model recognises three dimensions of change – technology deployment, organisational capabilities and process efficiency, with each dimension comprising a number of factors and sub-factors that are assessed at individual process level within the local authority (Figure 2). This allows the identification of stages of maturity as regards e-government adoption, providing an evaluation of what is needed to progress from one stage to the next in the model. A brief overview of each dimension is given below.

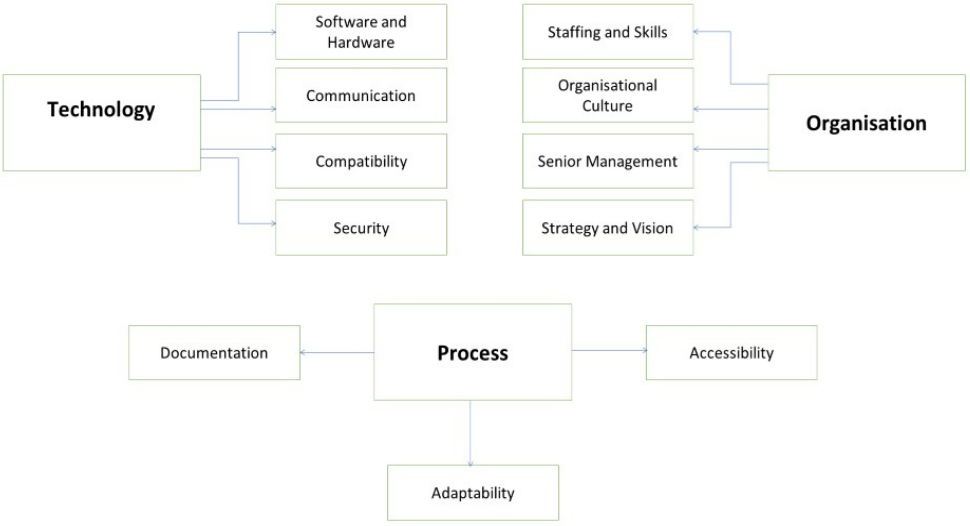

Figure 2. The main dimensions and factors of the TOP model

Technology deployment dimension

This dimension focuses on technologies that should be in place before e-government services can be offered reliably and effectively to the public. There are four technology factors, which support the operation and integration of information systems and applications in processes across the organisation, and provide the necessary standards and protocols regarding network and communication infrastructure. ICT infrastructure is an essential part of e-Government implementation and diffusion. It enables government agencies to cooperate, interact and share work, facilitating daily tasks and using the technology to save employees' time and effort (Alshehri and Drew, 2010). A number of different models identify network communications, hardware and software applications, security and privacy, and IT standards as critical factors that underpin the effective development of e-government capabilities.

Organisational capability dimension

As Fountain (2001) noted, “information technology and organisational/institutional arrangements are connected reciprocally. Both function in this framework as dependent and independent factors”, and it is generally recognised that a number of organisational issues

relating to human activity, organizational culture and change management are critical in successful technology adoption. Several studies (Al-Shehry, 2008; Schein, 2010) show that a number of e-government initiatives, in different types of public agencies, fail or do not achieve their goals. Reasons for such failure can be linked to a variety of factors, including a lack of executive and top managers' commitment and support, employees' resistance to change, lack of skills and training programmes, lack of awareness and conceptual understanding, old and inflexible management systems, and a lack of funds and absence of an e-government strategy. According to the United Nations (2014), the percentage of illiteracy in developing countries is often high and the percentage of ICT illiteracy is even worse. Four main factors relating to organisational change have been identified (Figure 2).

No	Factors	Description
1.	**Software and Hardware**	Evidence of software and hardware equipment that is providing professional and powerful computing. This encompasses desktop computers and servers that run and host applications and provide access to government data and services which supports and integrate the operations of information systems and applications across local administrations.
2.	**Network Communications**	A group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource sharing among a wide range of users within or outside the organisation. This includes access to the internet.
3.	**Security and privacy**	A set of strategies and operational procedures for managing the processes, tools and policies necessary to prevent, detect, document and counter threats to digital and non-digital information
4.	**IT Standards**	Established standards and controls that allow the local authority to run application programs from different vendors, and to interact with other computers across local or wide-area networks regardless of their physical architecture and operating systems
5.	**Staffing and Skills**	The ability of local authority staff - and the organisation as a whole - to learn, develop and adapt to change.
6.	**Organisational Culture**	The type of culture set by senior management in the local authority, and in particular the attitude towards acceptance of new technology, notably that relating to e-Government initiatives.
7.	**Strategy and Vision**	Evidence of a clear strategy and vision that provides a roadmap for a transition to e-government objectives. Constitutes an overall frame of reference for all decisions and plans in all departments within the local authority.
8.	**Senior Management**	The leadership, support and commitment from management, particularly as regards e-Government plans and investment.
9.	**Documentation and Standardization**	Evidence of clear documentation of processes and procedures, and guidance for computer and systems operation, which provide a standard way of operating. Must reflect changes brought in by new circumstances and technologies.
10.	**Adaptability**	The ability of the processes to respond and adapt to changed circumstances within e-government context.
11.	**Accessibility**	A measure of how easy it is (or otherwise) for key stakeholders to access the process (via website, phone, personal, kiosk, etc.)

Table I. The eleven factors used to assess e-government maturity

Process efficiency dimension

Process management is a systematic approach to making an organization's workflow more effective, more efficient and more capable of adapting to an ever-changing environment. The

goal of process management is to reduce human error and miscommunication and focus stakeholders on the requirements of their roles. Effective process management combines electronic document management services with workflow technology to automate key business processes. The continuous refinement and improvement of processes build layers of efficiency and agility within the organisation, resulting in a more productive and more profitable infrastructure. Since the 1990s, private organisations have achieved major business process change and recorded many associated successful initiatives in the information system arena. Veenstra *et al.* (2011) argue that change programmes in e-government are likely to be inadequate without business process efficiency gains. Three main factors associated with the process dimension are shown in Figure 2.

Capability	Definitions
Chaotic	The process is non-technical and completely relies on manual work
Basic	There is only very basic ICT Infrastructure, and the process is still largely based on manual operations. Some personal computers are used, running desktop software (typically MS Office), and some printers are available. There may be some use of information systems to support individual tasks, but data exchange is primarily paper or telephone-based. There is no IT support.
Controlled	There is limited networking between departmental computers and printers. Data exchange happens only within the department, based on the local area network. There is access to the internet, but it is slow and unreliable. Some software packages or bespoke information systems are used, but there is vulnerability in security and privacy, and there is only limited IT support provided.
Standardized	The technology infrastructure enabling the information to be exchanged within and between departments in the local government is in place. Information systems are used to support departmental activities. Software security is installed, polices are in place and there is adequate IT support.
Optimized	The infrastructure enabling integration between systems in different departments allows data to be exchanged between departments and across local authorities, enabling local government to deliver technology-supported services to its employees and citizens. IT standards are in place across local authorities. There is professional IT support.

Table II. Qualitative model definitions of the technology deployment dimension

Overall, eleven primary factors were identified for the model (Table I), with each factor having a number of sub-factors. These were assessed in each of the three authorities, with each of the three dimensions being assessed separately at process level. The stages in the resultant 5-stage model are denoted as follows: Chaotic, Basic, Controlled, Standardized and

Optimized. These notations are derived from the maturity model developed by the Software Engineering Institute to assess the maturity of software (Software Engineering Institute, 2006). After reviewing other maturity model stage definitions, these appear to be a good initial fit for the model and the overall research objectives. As an example, a brief summary of the five stages in the technology dimension, applied to individual process areas in the local authorities, is given in Table II below.

5. Findings

This section presents an overview of the findings from the three case studies at process level. In an initial stage of research the main processes in each of the local authorities were identified – these were broadly similar but there were slight variances between the local authorities, reflecting different authority responsibilities. Process definitions are based on the explanations of the people involved in performing the process. In all, across the three authorities, there are 15 processes, each with findings relating to the three dimensions in the TOP model. Here an overview is given of the findings in each authority with some illustrative examples at process level.

5.1 Misurata Local Authority (MLA)

Six main processes were identified in MLA (Figure 3). Overall, the TOP analysis presents a mixed picture, with some of the internal processes (financial management, human resource management) being reasonably advanced in terms of organisational capabilities, and others (properties management and ICT management) using technology effectively to support their job functions, even if it is out of date, and not able to support modern day e-government services. A major issue is the lack of process documentation and consistency across all process areas.

Figure 3. Misurata local authority: TOP maturity model

In the *financial management* (FM) process, technology deployment is basic with transaction processing and reporting being undertaken in accounts management and payroll areas on standalone personal computers. The staffing and skill levels are relatively advanced and the performance is adequate, with training being provided by senior management on a regular basis. The staff computing skill levels range from basic to advanced computers and staff also portray good interpersonal and communication skills, a teamwork mentality and good adaptability, which can reduce resistance to change when new technologies are introduced. The overall process is based on a hierarchical structure, which is centralised, with the most important decisions being taken by senior management and officials in the local authority's main office. E-government vision and strategies are not detailed and lack a strategic framework. There is some evidence of process documentation via MS Word and MS Excel for accounts management, payroll and debt advisory functions. These documents act as

authorised communication guides that most of the employees and managers can reference to see how a process or activity should be performed.

The *community services* (CS) department is the largest in the authority, providing water, electricity, waste disposal, housing and taxation services which directly affect the stakeholders, particularly its citizens and businesses. However, computers and software packages are out of date, and staff skills and capabilities are inadequate, hampering work performance levels. Few employees have even basic computer skills, and interpersonal skills, such as communication skills, teamwork, problem solving, planning and organizing or self-management are similarly limited. There was evidence of resistance to change to embrace new technology, and a general lack of commitment to work. Many staff will refuse to adopt e-government change because of fear of losing their positions. There is a lack of task documentation, with inefficient process performance and increased the probability of mistakes.

Within the *human resource management* (HRM) process, both hardware and software are available to acceptable levels, but technologies are outdated and inadequate to adopt e-government systems. It was evident from the interviews that the employees possessed reasonable employability skill, but functional skills were too low and there was a lack of available training courses. Organisational culture was reasonable among the employees; this was evidenced by the fact that employees were committed to their work and tasks were mostly completed within set timescales. However, there was lack of support and funding from senior management for required changes and technology upgrades. Awareness of e-government benefits among the management and employees was low. Processes were unstructured and undocumented, resulting in inconsistencies, with multiple employees doing the same task in different ways. The overall approach to management was disorganised.

5.2 The Sabratha Local Authority (SLA)

There were five process areas identified for analysis at SLA (Figure 4). Basic technology, at least, was in evidence in all process areas, with the exception of legal affairs management (LFM), where only two inadequate computers were in operation, built around the old and relatively slow Celeron processor, which were thus not used for day-to-day activities, and which were not linked to the network. Process efficiency and organisational capabilities were low, ranging from chaotic to basic in all processes.

Desk Tops	Lap Tops	Multi-function devices	Networks	Other devices
24	5	4 All in One Printers	LAN Network	1 Photocopier 1 Fax Machine
Software	**Description and Characteristics**		**Weaknesses**	
Purchasing System	The purchasing system manages the entire acquisition process, from requisition, to purchase order, to product receipt, to payment. It uses an SQL Database and Visual basic Platform		The system is isolated and works only on six computers. Manual work is required before data entry into the system. This in-house developed system runs under the Windows form application, which does not support .Net Framework.	
Warehouse Management System (WMS)	Stores integrated, often historical, and aggregated information extracted from multiple departments. It is used to avoid product overstocking and outages, and for organizing inventory data that before was generally stored in hard-copy form or in spreadsheets. It uses an SQL database and Visual Studio Platform.		The system is isolated and works only on four computers, and manual work is needed before data entry into the system. This in-house developed system runs under the Windows form application, which does not support .Net Framework.	
Website	Simple information dissemination		One-way communication. The website makes information available, but there is no capability for the user to search, enter data or access authority systems or databases.	

Table III. Technology deployment in the procurement management process at Sabratha local authority

The *financial management* process has a more robust technology platform than most other areas, including computers with i7 processor and laser printers. However, the software was outdated, with Windows XP and MS Office 2000 still used. A client/server network with fifteen computers was connected to the server, but the internet was often disconnected and unreliable. The FM process is supported by an accounts management and payroll system, used by eight personnel for preparing invoices for citizens and businesses and recording of its employees' earnings. The system was developed by third party programmers based on the Borland Delphi platform. There is local network connectivity and centralized control, which helps in administering the system and ensures that all files are stored at the same place, allowing effective system backups. However, although basic security software was installed on the server, it has limited security features and there was also a lack of awareness of security risks among employees, and security policies were not applied to reduce security breaches. In addition, there was no disaster recovery plan in place. MS Word and Excel are used to produce reports and online services are used occasionally to display and update information on the local authority's website. The staffing and skill levels are basic and the performance is adequate, due to the training provided by senior management on a regular basis. The management is based on a hierarchical structure, which is centralised with the most important decisions being taken by senior management and the local authority's main office (the mayor's office). E-government vision and strategies are not detailed and are lacking a strategic framework.

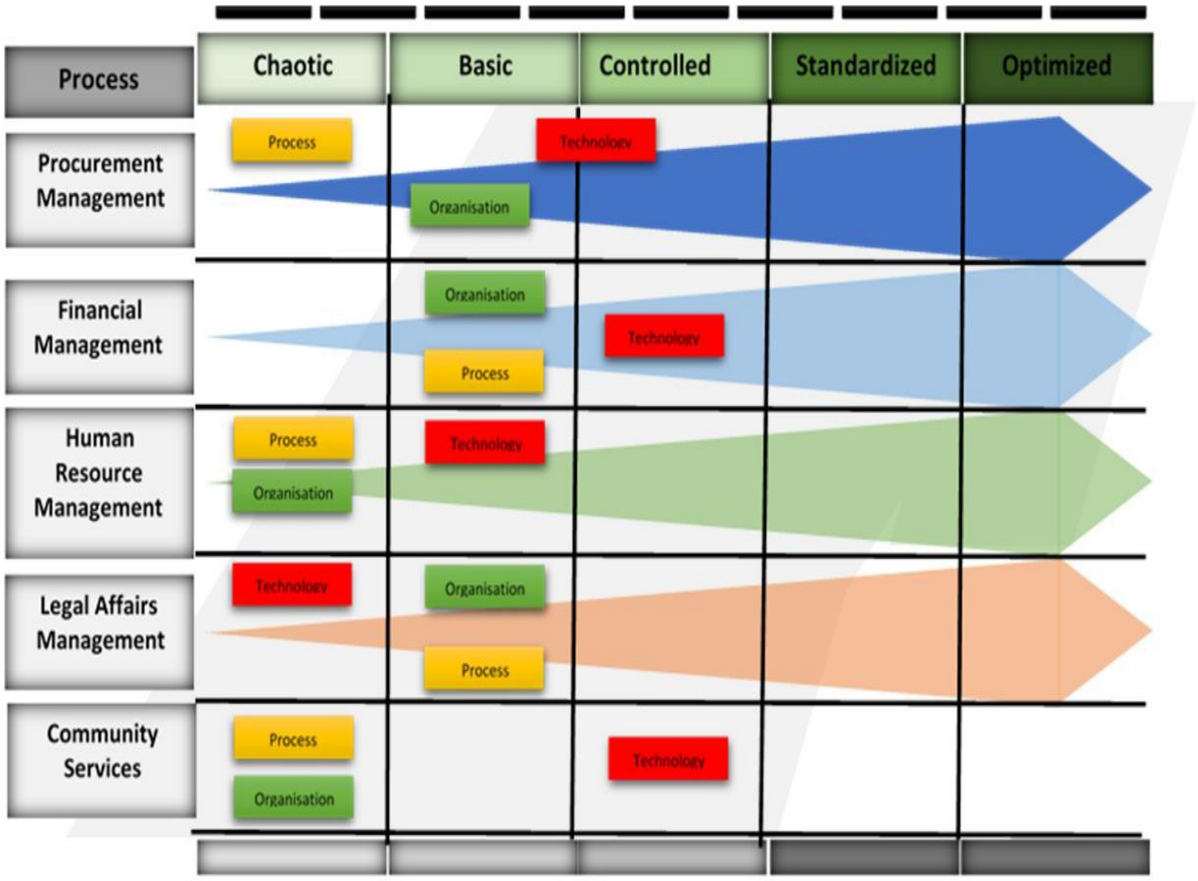

Figure 4. Sabratha local authority: TOP maturity model

The *procurement management* (PM) process is responsible for the purchase and storage of all supplies, services and construction in support of the local authority's activities. In-house systems, which were built by the authority's IT department, are used, based on Visual Studio and an SQL database (Table III). A purchasing system, which was first introduced into the department in 2010, is used to record and store the daily purchasing activities of the local authority and produce reports - monthly, quarterly, bi-annually, and annually. Warehousing is supported by the second in-house system, which was developed and introduced in 2008, and is used to control the movement, storage and accounting of materials. The systems run on six different computers, there is a peer-to-peer local network in the department, and the data is gathered from other processes manually and prepared by using office software packages (MS Word or Excel spreadsheets) before entry into the in-house system. There is a traditional hierarchical management structure in place, which no longer produces optimum efficiencies in the new information era. Skill levels amongst staff appear to be generally adequate; the department used to provide staff training and courses but stopped five years ago due to lack of funds. There is not a general resistance to change among the staff to use technology; many

of the employees have adequate knowledge of basic computer skills, despite the fact that manual/handwritten work is still in evidence. There was a lack of documentation for tasks, which always increases the probability of mistakes, lowers productivity levels and does not assure continuity of process and quality when employees leave or are on vacation.

5.3 Rujban Local Authority (RLA)

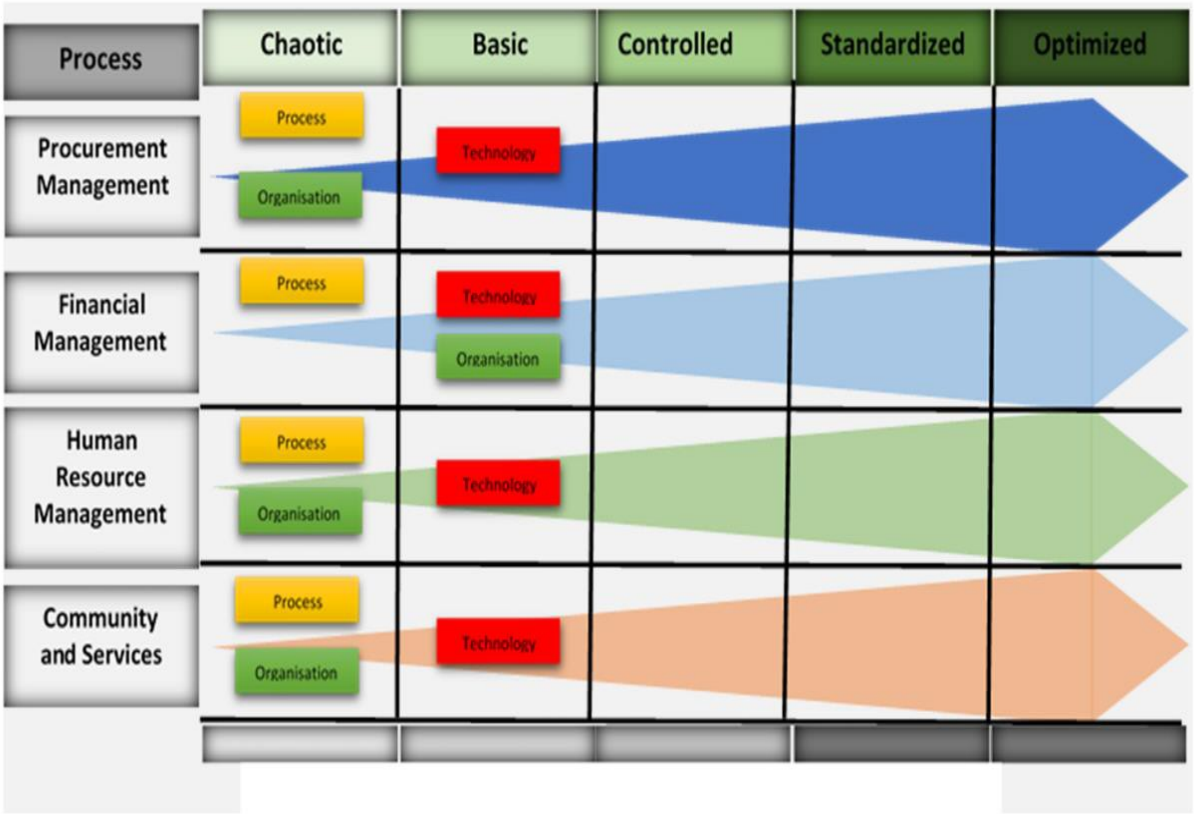

Figure 5. Rujban local authority: TOP maturity model

Four main processes were identified and investigated at RLA (Figure 5). Overall, the authority is behind the other two cases, with process efficiencies and organisational capabilities remaining at the chaotic stage in three of the four process areas. Only in financial management were organisational capabilities more advanced. Technology deployment is standard across the organisation, but remains at the basic level.

The *community services management* (CSM) process employs twenty-one staff, and utilizes an in-house system to record civilian details. PCs and software were available, but generally out of date using old non-supported versions. There was peer-to-peer network, with one printer connected to it, but the internet was normally unavailable. Basic security software

was installed on the computers, but no security polices applied, nor were disaster recovery procedures in place. The Windows operating system was installed on PCs, but out of date (Windows 2000), and incompatible databases were employed in different processes across the authority. Skills and capabilities were inadequate, with no training courses provided or planned. There was lack of commitment to work and resistance to change among the employees and favoritism was an issue as many employees complained that they had been ignored and never been promoted. There was a perceived lack of senior management support, poor funding and no reward system; awareness of the potential benefits of e-government was minimal and there was no detailed future plan to adopt e-government. In terms of process efficiency, there was no documentation, and a consequent lack of standardisation in task execution.

In the *human resource management* (HRM) process, an in-house developed system provides data entry, tracking, and reporting functions for the personnel, payroll, and some accounting functions within the authority. However, the use of paper-based forms remains for recording data before entry into the system using MS Word and MS Excel. A client/server network facilitates sharing of access to data located on the server and printers were connected to the network. However, there was no network access to other areas of the authority and the internet was unreliable. There was also outdated security software installed with basic features, and no security policies were applied, nor was a disaster recovery plan in place. In terms of organisational capabilities, functional and employability skills were weak, and no training courses were planned to improve employees' skills and quality of work. There was also resistance to change when new technologies were introduced, and there were no plans to adopt IT projects encompassing a move to e-government. The HRM process was generally lacking organisation, with many activities unstructured and undocumented, with a resultant lack standardization and consistency.

6. Discussion

The findings are discussed in this section in the context of the two research questions (RQs) set out in section 1.

RQ1: What is the status of e-government at local authority level in Libya?

Technology deployment within the three local authorities was at the basic or intermediate level in most process areas. Some business information systems were used, notably in the finance and procurement processes, often being bespoke systems developed in-house or by third parties. Personal computers or laptops were used by some employees on which MS Word and MS Excel were run. Some computers were networked to departmental servers, but no authority had an effective cross-authority network, and databases were often incompatible, making data exchange problematic. Computers were generally old models and desktop software and operating systems were old versions and/or out of maintenance. Security software was in evidence, but security and backup procedures were weak or non-existent. Access to the internet was not always available, and although all three authorities had a web portal, they provide only very basic information.

Organisational capabilities varied from process to process and between the three authorities, but generally lagged behind the level of technology deployment. Staff capabilities were limited within most process areas, employees showing inadequate functional and employability skills, resistance to change and weak awareness of the benefits of e-government. Funding was also issue, and there were no detailed or planned strategies at process level or authority levels to adopt e-government. Employees also feared that e-government might lead to organisational change that may result in redesigning or losing job roles. Favoritism, and a culture where information is considered an asset not to be shared, were other problems evident in the three authorities. There was no evidence of a reward system based on merit.

Processes were chaotic or at a basic level in all three authorities and this hampered the effective use of the available technology. Documentation was poor or non-existent, hampering standardisation and access from other parts of the authority, or from citizens and other outside agencies. Process improvement in such circumstances is difficult. There was a general lack of strategy to improve processes and organisational capabilities. The process efficiency dimension was generally weaker than the technology and/or the organizational dimension in all three authorities.

RQ2: What are the key issues involved in transitioning from e-government to digital government?

The case studies provide the context for digital transformation in local authorities in Libya. Henriette, Feki, and Boughzala (2015, p.431) suggest this involves a profound transformation of "organisational activities, processes, competencies and models to fully leverage the changes and opportunities of a mix of digital technologies". Clearly, with local authorities struggling to embrace the potential of e-government, a further step-change to deploy and benefit from the new technologies is a major challenge. The TOP model analysis indicated major shortcomings in the three authorities' capabilities to adopt e-government technologies, practices and processes, which can be seen as a strategic gap between the current reality and what is possible (Figure 6). Below, we suggest what needs to be done to instigate this change and move further towards digital government.

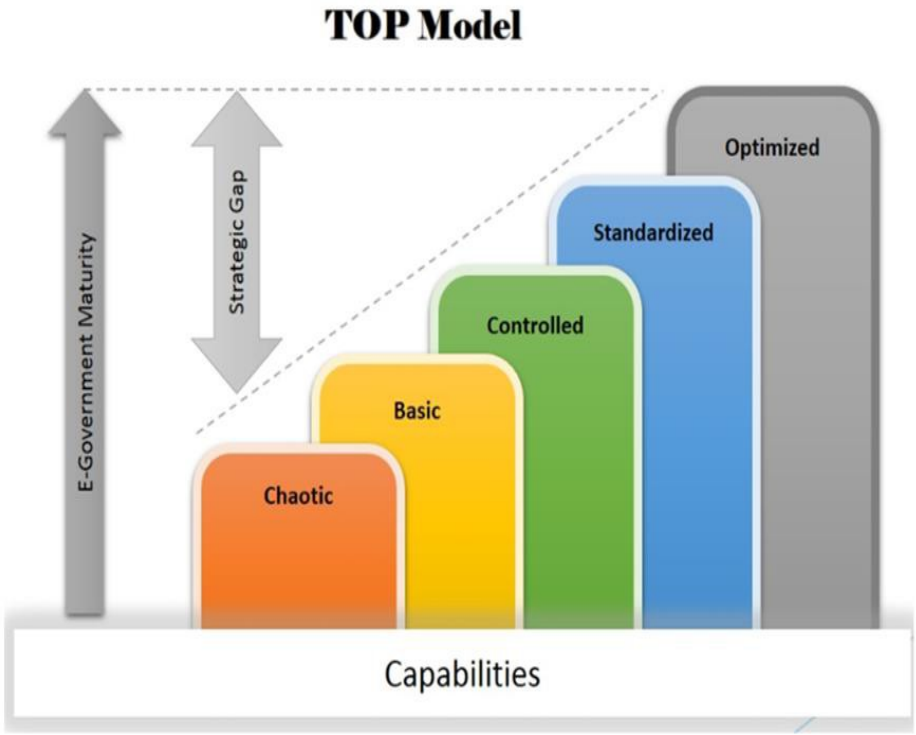

Figure 6. Local authority e-government strategic gap

Technology deployment:

Set technology standards and minimum requirements for technology infrastructure

The MLA should provide minimum specifications for commonly used IT equipment, as a measure of ensuring standardization and the necessary upgrade of equipment used across its local authorities. This should include personal computers, servers, and desktop software.

For e-government to be successfully implemented in local authorities, it is imperative that *communication infrastructure be developed* across the country. A coherent strategy is needed for ensuring connectivity within and between the country's local authorities. Many still suffer from low penetration of the fixed line telecom infrastructure and low teledensity all over the regions, which in turn impacts on the on the availability of the internet.

There is the opportunity for the MLA to *establish common information systems* for the main functions in local authorities. Processes are similar across all authorities. Finance and HR functions, for example, could be processed using common systems; and in time, these could be made available online via the internet. *Standards and technologies for web-site development,* to provide a standard web interface for citizens and other stakeholders, should be agreed and implemented.

Local authorities hold large amounts of sensitive database. Appropriate *security measures and technologies need to be introduced*. These include public key infrastructure (a set of rules, policies, and procedures needed to create, manage, distribute, use, store, and revoke digital certificates and manage public-key encryption), reliable firewalls, and data encryption techniques. The use of local authority *data centres with disaster recovery procedures and technologies* should be assessed.

Partnerships with local and national technology and service companies should be explored, to participate in the implementation of a suitably funded national e-government strategy. The private sector can be a source of cost-sharing, technology provision and project management expertise.

Organisational capability:

Local authorities should recognise the importance of functional and employability skills and *provide appropriate training*. In addition to technical skills, IT staff need training on the evaluation, procurement and management of technologies.

Lack of awareness of the basic functioning and potential benefits of e-government can be addressed through training, workshops, conferences and seminars. This should encompass *exposure to successful e-government strategies and projects* in other countries, which share similar cultural backgrounds, such as Bahrain and the Emirates.

Attitude and adaptability to change is an important prerequisite for e-government implementation. Change management skills are required to guide the process of transformation. The use of consultants to provide employees with confidence about the outcomes of a transition to of e-government should be considered.

Local authority vision, goals, objectives, priorities and strategies need to be re-examined and aligned with a re-formulated national e-Libya initiative. *A coordinated roadmap for transition* to digital government at national and local level is required. Seniors management in the local authorities need to provide leadership and build political support within other government bodies, making the case for change and the required resources, publicly taking ownership of the project on a sustained basis.

Process efficiency:
Task and process documentation can reduce the current operational inconsistencies and process errors. Software tools are available to support this. Process documentation is part of collective organisational knowledge, and can be shared within and between authorities. This would provide a way of standardising processes and eliminating the current chaotic and ineffective environment.

As new technologies are introduced, the options for *process improvement* should be examined. Effective process management can help organisations scale up and improve efficiency for new and existing employees. The interface between the local authority and its citizens also requires focus. External access to authority processes is currently via the phone or personal contact for most people, and web-portals are in the main a one-way service to simply present information at present.

7. Conclusion

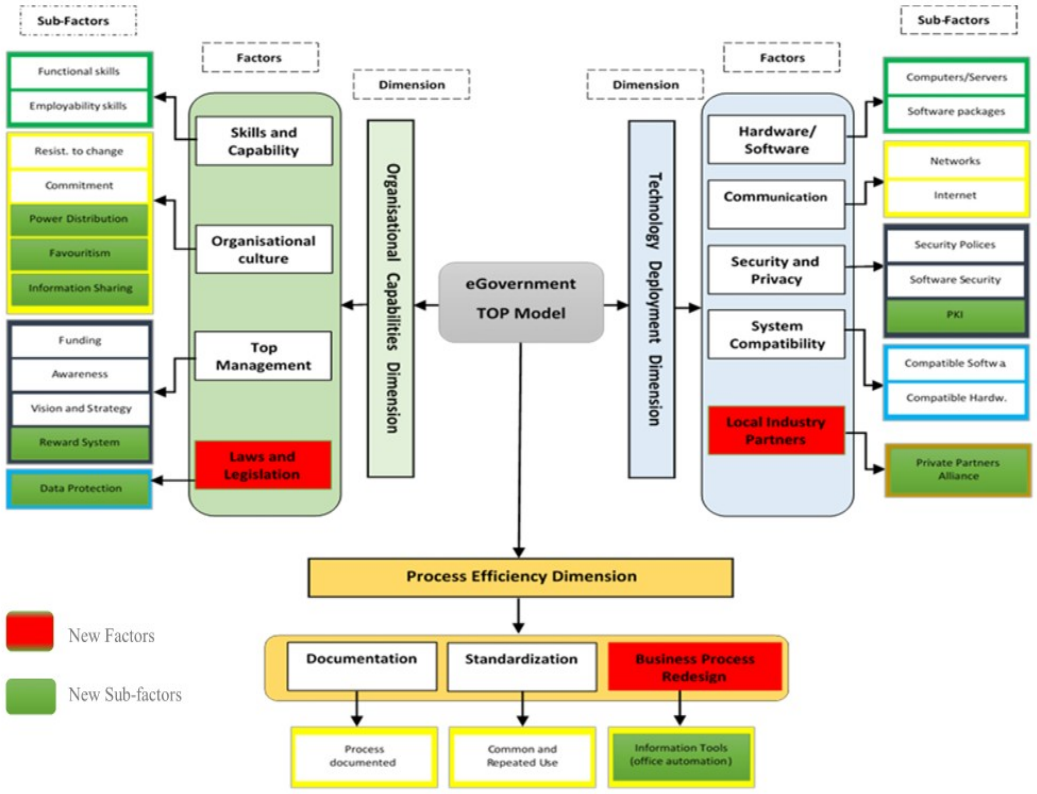

Figure 7. Amendments to the TOP model following application in three case studies

This article has examined the status of e-government in local authorities in Libya with a view to assessing the potential of digital transformation and a move to digital government. Findings suggest that many of the so-called digital technologies are not yet "on the radar" for most local authorities in Libya. It will first be necessary to put in place the fundamental building blocks for such a transition. In technology terms, this will mean providing the basic hardware, software, networks, websites and security measures and standards that most local authorities in the developed world already have. In reality, it is not possible to "jump a technology stage" – to harness the benefits of artificial intelligence, big data, analytics, cloud computing and the like, without having the technology foundations in place first. Equally important are the organisational and process changes discussed above.

However, some of the digital technologies can act as a stimulus for such a transition. The use of mobile computing and social media by Libyan citizens and businesses are perhaps the two technologies that can best act as a catalyst for change in local authorities. As the general

public extend their use and knowledge of these technologies, so the pressure on local authorities to upgrade their e-services will grow.

The TOP maturity model has proved a useful tool for assessment of local authority e-government status in Libya. Only an overview of findings has been presented here, but application of the model highlighted some new factors and sub-factors, which have now been incorporated into the model (Figure 7). Future work could involve amendment of the model to a more advanced technology environment, where the technology dimension would encompass the full range of digital technologies, with appropriate review of the factors and sub-factors in all three dimensions.

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