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A New Model for E-Government in Local Level Administrations in Libya

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Abstract

The measurement of e-Government has traditionally focused on assessing website functions and their use, whereas relatively little attention has been given to other aspects of local authority operations, particularly back-office processes. This study provides a maturity stage model for analysing e-Government capability based on Technology, Organisational and Process (TOP) dimensions. For each of these three dimensions, a number of key change factors are identified and assessed to allow a positioning of the organisation in the stage model; and this is applied at individual process level within the organisation, as well as for the organisation as a whole. This paper reports on the initial use of the model in the Sabratha local authority in Libya. This pilot study illustrates the potential of the model in assessing e-Government readiness and identifying opportunities for investment and change. It highlights the need for process improvement to accompany technology deployment, and the key role of organisational factors in bringing about the necessary change for the move to e-Government.

Keywords: e-Government, Maturity models, Organisational behaviour, Human capacity, ICT infrastructure, Libyan local authorities.

1. Introduction

The adoption of e-Government is more than a technology issue, as it is influenced by many other factors (Heeks, 2006; Ebrahim et al., 2004). For instance, 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 et al., 2008; Andersen and Henriksen, 2007). A number of maturity models have been developed to assess organisations in terms of e-Government at national level (United Nation, 2014; Heeks, 2006). The United Nations model "is not designed to capture e-Government development in an absolute sense; rather, it aims to give a performance rating of national governments" (United Nation, 2014). Janssen (2014) suggests that the existing e-Government maturity models, including the United Nations model, often assess the level of e-Government from the outside, i.e. 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. In this context, research in the UK that has assessed e-business capability at process level within organisations (Wynn et al., 2013) is of relevance. This aspect is not evidenced in any of the existing models, and the proposed new model will thus analyse e-Government at individual process level to provide a more in-depth assessment of overall local authority capabilities.

2. Related Literature

Individual scholars, 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. Ebrahim and Irani (2005) suggest that a staged approach will create momentum that can subsequently be monitored and reviewed, allowing government agencies to steadily attract more citizens to use e-services, until it becomes

standard practice and secure, with citizens and businesses trusting to operate via e-Government portals for personal, service and business transactions. There are a range of models and frameworks that suggest a number of key factors, providing a better understanding and visualisation of e-Government adoption. However, the challenge of identifying the critical factors and their optimal combination remains an issue for both researchers and practitioners (Edington and Shin, 2006).

Even though many studies have sought to identify the factors that contribute to e-Government adoption (Moon, 2002), "there is a gap when it comes to integrating these factors into a holistic model" (Edington and Shin, 2006). An effective e-Government model, with higher levels of diffusion and adoption, requires an enabling context. This highlights a key issue: a comprehensive understanding of the real context of the state or organisation in which the initiative is taking place is required, if that initiative is to succeed (Bwalya and Healy, 2010). In the general area of technology adoption in developing countries, much of the literature has focused on IT adoption in the public sector, and how this helped to enhance its efficiency and effectiveness (Moon, 2002). 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.

3. Conceptual Framework

3.1. Overview

Building on themes and elements evident in existing literature (Heeks, 2003; Chen et al., 2007; Ebrahim and Irani, 2005; Layne and Lee, 2001; United Nations, 2014; Department of Trade and Industry, 2003; Janssen, 2014), a conceptual framework has been developed to assess the e-Government readiness of local authorities at individual process level and overall. The model identifies three *dimensions* of change that influence the adoption of e-Government - Technology, Organisational and Process dimensions. Each dimension comprises a number of *factors* that determine the readiness of the authority as regards each dimension of change; and these are assessed at individual process level within the local authority. 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.

3.2. Technology dimension

This dimension focuses on technologies that should be in place before e-Government services can be offered reliably and effectively to the public (Figure 1). These technology factors support the operation and integration of information systems and applications in business processes across the organisation, and provide the necessary standards and protocols regarding network and communication infrastructure (Basu, 2004). IBM (2001) concluded that to have a successful e-Government strategy, the public sector must create an IT infrastructure that is optimised to support new applications that are necessary for e-Government (Gil-Garcia and Pardo, 2005). 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, such as those proposed by Ebrahim and Irani (2005), Chen et al., (2007) and Heeks (2006), identify the factors that hinder the adoption of e-Government. These include network communications, hardware and software applications, security and privacy, and IT standards (see Table 1). These factors underpin the effective use of office functions and automation of the work in the core organisational processes. Ebrahim and Irani (2010) argue that the effective provision of these factors will improve the functioning and interaction between processes and provide a strong foundation for the building of an e-Government portal.

3.3. Organisational Capability Dimension

Fountain (2001) states that "information technology and organisational/institutional arrangements are connected reciprocally. Both function in this framework as dependent and independent factors". Scholars have started to focus more on organisational issues and address the relationship between information technology and human activity, organizational culture and change management. Recognition and management of these factors is a prerequisite to achieve a successful change programme. According to Moon (2002), these are critical factors in organisational technology adoption.

Several studies (Al-Shehry, 2008; Schein, 2010) show that a high number of e-Government initiatives, in different types of public agencies, fail or do not achieve their goals. The failure of e-Government adoption 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;

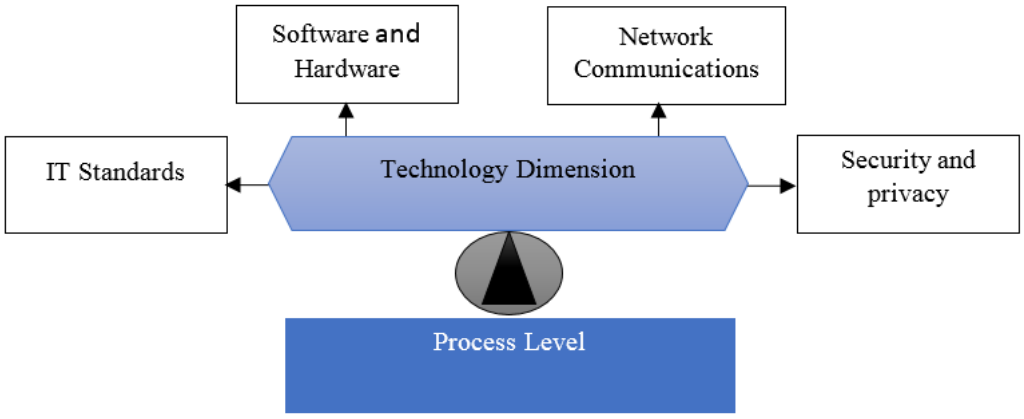

Figure 1 Technology Dimension Factors

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. Building on Heeks' (2006) assertion that having successful e-Government adoption require organisational capacity, four main factors relating to organisational change have been identified (Figure 2).

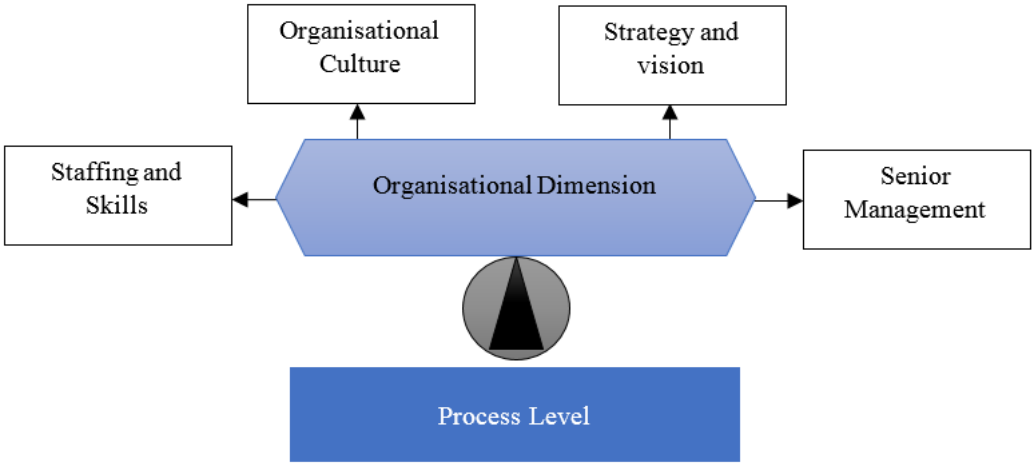

Figure 2 Organisation Dimension Factors

3.4. 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 (Rouse, 2014). 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 (CMMC, 2016). Scholl (2005) argues that researchers have documented many experiences in business process efficiency in private organisations, but very little is known about it in the public sector. However, some argue that the documented methods and insights may apply equally in public organisations (Scholl, 2005). Since the 1990s, private organisations have achieved major business process change and recorded many associated successful initiatives in the information system arena (Thong et al., 2000). Veenstra et al. (2011)

argue that change programmes in e-Government are likely to be inadequate without business process efficiency gains. The main factors associated with the process dimension are shown in Figure 3.

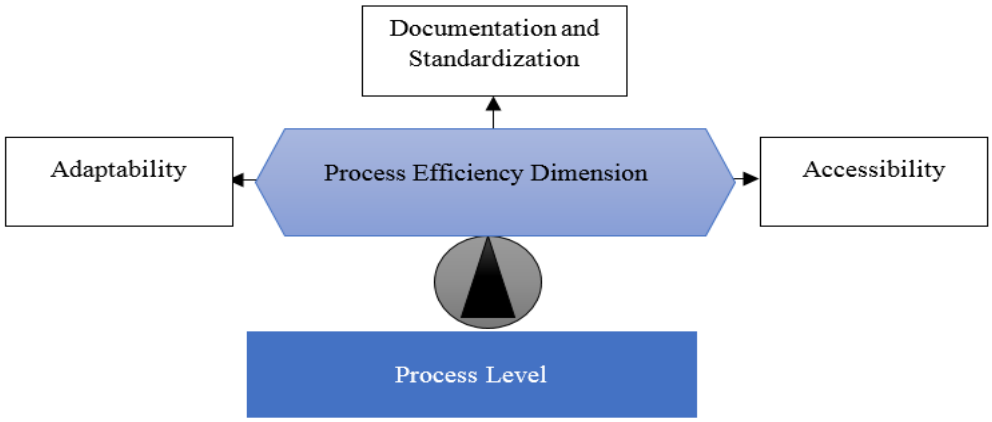

Figure 3 Process Dimension Factors

3.5. Summary

The proposed framework is multidimensional and is composed of: technology, organisational capacity, and process efficiency *dimensions* and its associated *factors* (Table 1), aimed at assessing the readiness, prior to e-Government deployment, of the Libyan local government authorities. 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 (SEI) to gauge the maturity of software (SEI, 2006). After reviewing other maturity model stage definitions, these appear to be a good initial fit for the model, which may be amended as the research progresses.

4. Methodology

The philosophical foundation of this study is based on the ontology of subjectivism, while the epistemological position will be interpretivism (Denzin and Lincoln, 1998). A qualitative approach is adopted based on a case study strategy using questionnaires and semi-structured interviews as the main method of data collection. As Strauss and Corbin (1990) pointed out, a qualitative approach can explore and understand any phenomenon that is, at the time of writing, little known, as well as gaining more in-depth information, which might be difficult to gain using quantitative methods. The case study approach is well established as a research approach in the study of local government operations and decision-making in a number of contexts (Wynn and Taylor, 1981). E-Government is a relatively new area in Libya, and there is not much empirical information to explain it. According to Ebrahim et al. (2004), e-Government adoption requires exploratory methods to identify and assess the range of issues impacting upon it. This is qualitative, inductive, exploratory research based on a detailed case studies. The Libyan Ministry of Local Authorities (MLA) has been used as the main organisation for case study research, providing three case studies, one of which (Sabratha local authority) is reported on here. The MLA is a public sector organisation that makes policies and governs 101 local authorities across Libya. A questionnaire and semi-structured interview approach is being used for data collection and twelve senior and middle-level government employees and officials responsible from Sabratha local authority are being interviewed. The main advantage of using a questionnaire is to gain a holistic view at individual process level. The 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, 2009). However, in this paper, the findings concerning Sabratha local authority are based solely on the questionnaires from respondents, but not from the interviews which are currently being conducted.

5. Initial Findings from the Sabratha case study

Initial process mapping suggests there are four main processes operating in the Sabratha local authority (Figure 4). Process definitions are based on the explanations of the people involved in performing the process; each process contains several sub-processes which reflect the activities and information flows within that process.

Because of space limitations, inventory of equipment and systems is shown just for one process area, but an overview is given for the others.

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 1 Factors: general scope and meaning

5.1. Technology Dimension

5.1.1. Procurement Management

There are two sub-processes in the procurement management process – purchasing and warehousing. These sub-processes use technology equipment and in-house systems which were built by the programmers from the authority's IT department, using Visual Studio and an SQL database (Table 2). The purchasing sub-process uses the purchasing system which was first introduced into the department in 2010 to record and store the daily purchasing activities of the local authority and produce reports - monthly, quarterly, bi-annually, and annually. The warehousing sub-process uses the second in-house system, which was developed and introduced in 2008, and is used to control the movement, storage and accounting of materials. Both systems are used to store data generated in other process areas of the local authority. The systems run on six different computers, and 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.

5.1.2. Financial Management

The financial management process has two main automated sub-processes that use an integrated system, providing accounts management and payroll functionality. The systems functions support the local authority in daily tasks, including preparing invoices for citizens and businesses, and involves the local authority's recording of its employees' earnings including gross wages, salaries, bonuses, commissions, etc., that have been earned by its employees. The system was developed by third party programmers based on the Borland Delphi platform. There is local network connectivity (a client/server network) and centralized control which helps in administering

the system and ensures that all files are stored at the same place, allowing effective system backups. There are eight users and the network supports data entry, editing and records updates from several internal interfaces. MS Word and Excel are used in conjunction to facilitate the work and produce reports. The finance department uses online services occasionally to display and update information on the local authority's website.

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 2 Technology deployment in the procurement management process

5.1.3. Human Resource Management

The human resource management process encompasses two sub-processes: personnel records and vehicle management, both of which use bespoke systems – the human resource information system (HRIS) and the vehicle management system (VMS). These systems were developed by a third party company to match the department's requirements and thus avoid many of the compromises that have to be made with 'off-the-shelf' software. The HRIS is used in conjunction with MS Word and Excel, and covers a range of functions including employee engagement, recruitment, and training, and provides a means of acquiring, storing, analysing and reporting employees' performances. However, even with the automated functions that the system provides, the use of paper-based forms remains for recording data prior to entry into the system. The systems are isolated from other departments in the local authority and there is no access remotely via a web-portal.

The VMS (also called 'Vehicle Tracker') is used to follow-up transport contracts, periodic vehicle maintenance and produce reports on the vehicles' condition. Paper-based forms remain for recording data prior to entry into the system using MS Word and Excel. Network connectivity is available in the department (a client/server network) to support remote access, which enables employees within the department to access data on the server.

5.1.4. Community and Services Management

The senior management in the local authority views information technology as a critical and essential investment priority for Community and Services Management. The department is the largest in the authority, and provides services (water, electricity, waste disposal, taxation housing) which directly affect the stakeholders, particularly its citizens and businesses. There are 40 employees who work in the department with twelve main responsibilities, of which only three are automated. In 2010 the department, with the cooperation of IT management, introduced three bespoke in-house systems (housing system, billing system, civil status management system). The systems were developed in Visual Studio with an SQL database. The implementation of these systems represented a major step forward for the Sabaratha local authority. There is no access via a web-portal for data entry into these systems, but they are available on line to display information only. There remain some semi-manual processes in the department; for example, housing and civil status records are collected manually and then stored in Excel spreadsheets prior to entry into the appropriate systems by staff. These systems are little more than adequate in supporting these functions, which serve the majority of citizens and businesses in the area. Nevertheless, senior management are seeking to enhance and upgrade the systems in the future to make them accessible, particularly to citizens. Despite their limited functionality, the systems are relatively user-friendly and accessible for internal staff via the client/server network.

5.2. Organisational Dimension

The organisational dimension focusses on aspects relating to people capabilities, culture and organisation (Figure 2). In this section, a general description of all processes in terms of the organisational factors is presented.

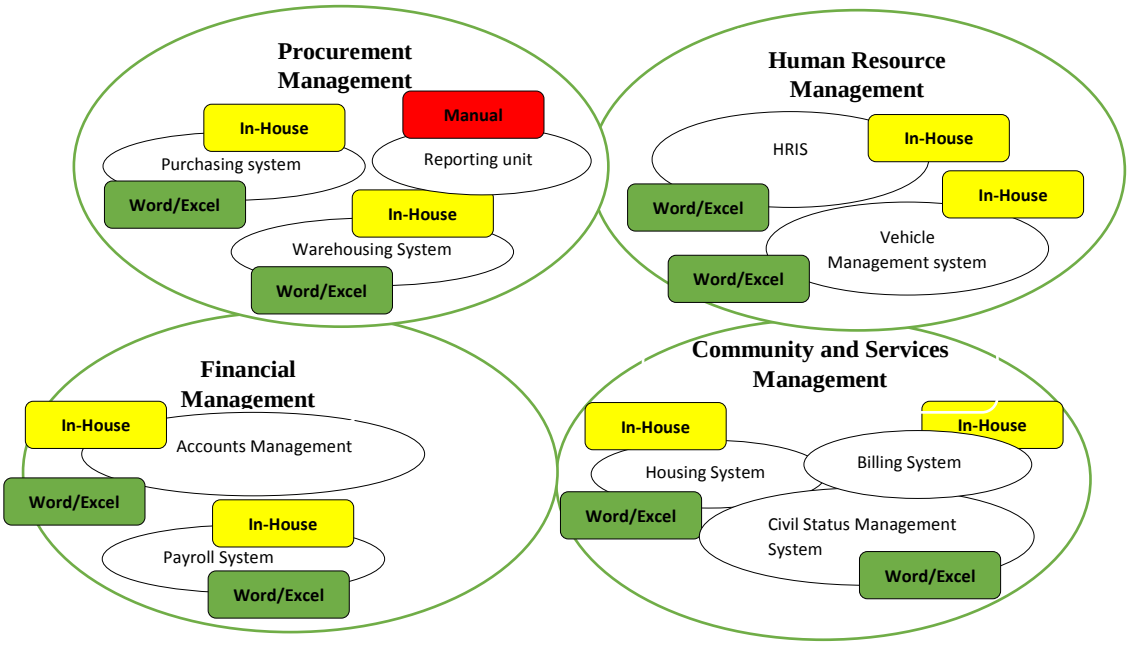

Figure 4 Existing systems mapped to process activities at Sabratha local authority

G (Green): indicates a system that does not need replacing.
A (Yellow): indicates a system that may need replacing.
R (Red): indicates a system that is defective and needs replacing

5.2.1. Procurement Management

The procurement management process is responsible for the purchase of supplies, services and construction in support of the local authority's activities: invitation to bidding for contracts, requests for proposal, requests for quotations and issuing of contracts, as well as providing information about inventory and stock. The department runs competitive bidding processes in accordance with MLA regulations and laws. The local authority relies heavily on businesses and, in some cases, citizens or other government agencies to meet its procurement requirements. The department is required to lead, manage and develop the highest possible standards of excellence in all its activities.

The department employs thirty employees, who undertake and monitor the work. The department follows a traditional hierarchical structure with rule-based management which no longer produces optimum efficiencies in the new information era. Skill levels amongst staff appear to be generally sufficient; the department used to provide staff training and courses but stopped in the last three years 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.

5.2.2. Financial Management

The financial management process (FMP) manages and controls all financial functions of the local authority. The FMP is also responsible for the management of the local authority's cash flow and ensuring there are enough funds available to meet the day-to-day payments, as well as the day-to-day transactional accounting for the authority's business. This includes the tracking of all transactions and the management of local authority reporting. The FMP comprises two main sub-processes (accounts management and payroll). The staffing and skill levels are relatively advanced and the performance is adequate, due to the training provided by senior management on a regular basis. The staff have basic and advanced computers skills and 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 FMP 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 within the FMP is not detailed and is lacking a strategic framework.

5.2.3. Human Resource Management

The human resource management process plans comprises 20 employees to develop and administers policies and programmes designed to make expeditious use of the local authority's human resources. There is an in-house system (HRIS) for personnel records which is used by four employees who have sufficient-to-advanced computer skills. The other sixteen employees display poor computer skills. The vehicle management sub-process employs twelve employees but staffing and skills are demonstrably inadequate. The in-house vehicle tracker system is only used by two employees. However, even these employees' qualifications and capability levels are relatively low, which restricts their ability to deal with complex problems in information systems; and this remains a barrier when changing to e-Government-based management.

There is no detailed strategy or vision to adopt new e-Government initiatives. Seminars and workshops were held twice in the past three years and were led by the MLA and Ministry of Communication and Informatics. They focussed on how to benefit from e-Government, but the programme was stopped due to a lack of funds. The process is based on a hierarchical structure, and the decision-making is centralised around the senior management of the local authority (the mayor) and the HR senior managers and, on some occasions, with the involvement of MLA personnel.

5.2.4. Community and Services Management

The community and service management process encompasses the largest of the authority's departments and displays the greatest use of technology. There are forty employees responsible for twelve operational responsibilities as noted above, and technology skill levels are relatively high. Nevertheless, some resistance to change was in evidence and training has not been carried out for the last two years due to lack of funds. There is no detailed strategy to adopt e-Government and the awareness of e-Government services is low. The process is based on a traditional hierarchical management structure.

5.3. Process Efficiency Dimension

5.3.1. Procurement Management

Within the three main sub-processes, there is some operational ambiguity regarding who is supposed to carry out specific tasks if a key employee is absent or has left the organisation. There is no standardisation or formalisation of the rules, policies, and operating procedures. There is clearly a lack of documentation, like a training manual, to help new employees with the tasks that need to be performed. The accessibility to the process remains mainly through face-to-face contact or via phones but not online.

5.3.2. Financial Management

There is some evidence of process documentation by using MS Word and MS Excel for accounts management, payroll and debt advisory functions. This acts as an authorised communication guide that most of the employees and managers can reference to see how a process or activity within the business should be performed. Finance enquiries can be channelled online via e-mails to the local authority's website, which could provide the basis for future e-Government services within this process area.

5.3.3. Human Resource Management

There are many repeatable processes to get work done, but these processes are not documented. There is also a lack of standardisation to unify the procedures that use different practices to do the same process. There are also a number of human errors causing breakdowns in the workflow and which have an impact on processing cash flow. For example, most employees have a separate and distinct method of accomplishing any given task. In terms of reachability, although there is a basic website for the local authority, this process can only be accessed by personal contact or via phones.

5.3.4. Community and Services Management

Most of the process is partially documented and standardised. For example, the business procedures for taxation, licenses issue, bills issues and birth registration use a communication guide that all employees and

managers can reference to see how the process should be performed. There are a range of different services provided to outside stakeholders, but these services are still provided in person or via phones. There is no online or e-Government service except for basic information on the authority's website.

6. Conclusion

There are some encouraging signs of change at Sabratha local authority. Basic information technology is deployed in most process areas which could provide the platform for the progression of e-Government. Network infrastructure is readily available within the authority, which will widen the access to the systems and data. In-house information systems are in place in some key process areas. Online, there is a web portal, but it provides only very basic services whereby display information is available. It is increasingly recognised by staff that a new web-portal is needed and that this would afford the local authority an opportunity to move forward.
From evidence gathered to date, it is clear that the organisational dimension has a key influence on the implementation success of technology, including e-Government services initiatives. It is also clear that a flexible vision and strategy is needed to meet the evolving needs of citizens, businesses and other governmental agencies, as well as support from the Ministry of Local Authorities and Sabratha local authority's senior management. Resistance to change emerged as a key issue that can affect e-Government initiatives in the local authority. The level of skills, both functional and employability, is varying between different process areas. This needs to be recognised and planned for as a part of new strategies for e-Government initiation. Figure 5 shows the initial assessment for the processes within the maturity model.

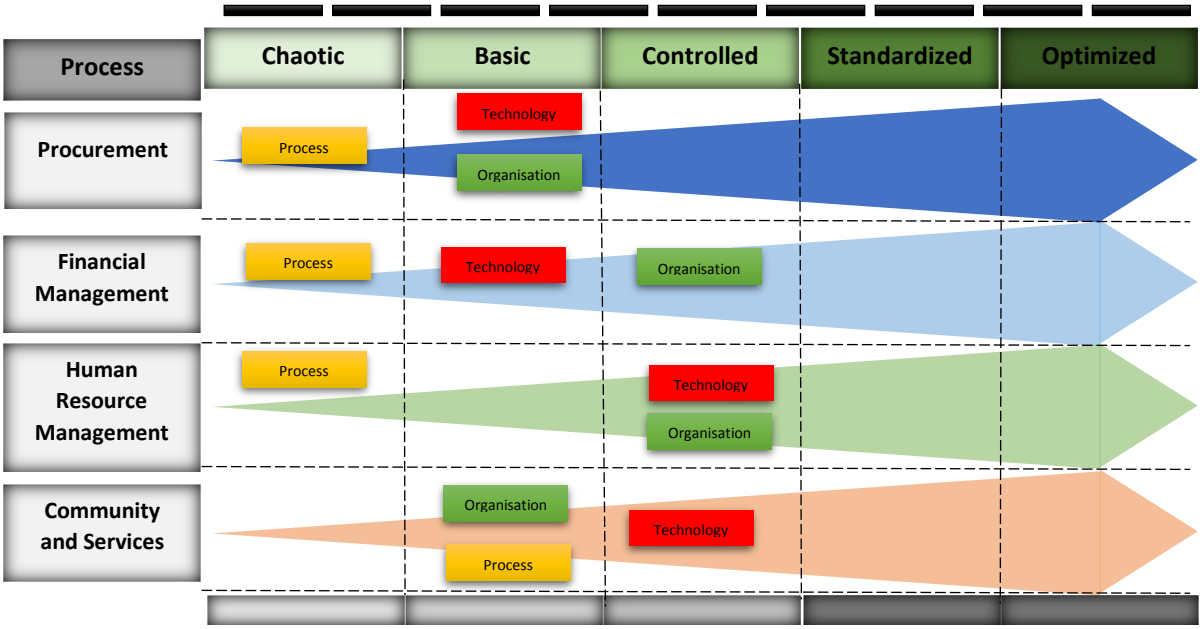

Figure 5 The maturity model: Initial assessment of Sabratha local authority

One notable conclusion from this initial analysis is that the process efficiency dimension seems to be lagging behind and is not aligned to the technology and organisational dimensions. Effective process management can help organisations scale up and improve efficiency for new and existing employees. However, most of Sabratha local authority is disorganised and daily tasks are neither adequately documented nor standardised, despite the fact that some of these tasks have already been automated. It is also worth noting that external access to these processes is mainly via the phone or personal contacts, and the web-portal is only a one-way service to present information at present.
Although this analysis is at an early stage, the potential of the three dimensional maturity model for developing appropriate strategies and plans for a transition to e-Government is evident. At Sabratha, processes as a whole are not particularly well advanced, although the Financial and HR management processes have a reasonable basis from which to move forward, in terms of technology deployment and organisational capability. But it is clear that process maturity is generally weak across the local authority and this area needs appropriate focus and investment to allow the authority to transition to an e-Government in a planned and effective manner. In light of this pilot study at Sabratha, the model will now be further developed. In particular, the change factors

will be refined and described to allow a positioning of an organisation at an appropriate stage – at individual process level - within the model, which will be applied to other local authorities in Libya.

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