Towards a Conceptual Model for e-Business Deployment in Libyan Universities

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TOWARDS A CONCEPTUAL MODEL FOR E-BUSINESS DEPLOYMENT IN LIBYAN UNIVERSITIES (A CASE STUDY OF MISURATA UNIVERSITY)

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ABSTRACT

There is a lack of literature on technology utilization in Libyan universities and this paper attempts to make a worthwhile contribution to this literature. The paper explores e-business deployment in Libyan universities, with an initial focus on the university of Misurata, situated in the north of the country between the country's two main cities of Tripoli and Benghazi. It examines the current and potential uses of e-business, and assesses the barriers to wider use of e-business systems and technologies. Existing models to measure e-business deployment are applied and assessed, and a new model is developed to better gauge the current situation at process level in these universities. The model will be further applied at other Libyan universities and will act as a yardstick for comparing and progressing the operational implementation of e-business in these organisations.

Keywords: *E-business, E-business models, Libyan universities, technology strategy, SCALE model, process change, case study*

INTRODUCTION

With the rapid advancement of information and communications technologies (ICT) in the new millennium, electronic business (e-business) has become a significant element of organisational strategy to achieve competitive advantage (Yang and Lee, 2012). Previous studies have viewed e-business in different ways. Wu et al. (2009), for example, see e-business as an entity, an organization which conducts its day-to-day business functions using the internet, websites, enterprise information portals and/or other electronic network technologies. Anitesh et al. (2005), on the other hand, view e-business as a process that involves the total digitization of value chains within an organisation. This research assumes the wider definition of e-business as a process, as defined by Chaffey (2002, p. 13) as "all electronically mediated information exchanges, both within an organisation and with external stakeholders, supporting the range of business processes". The term therefore is taken to include the

use of all information systems and related technologies, irrespective of whether they use the internet or are accessed via web technologies.

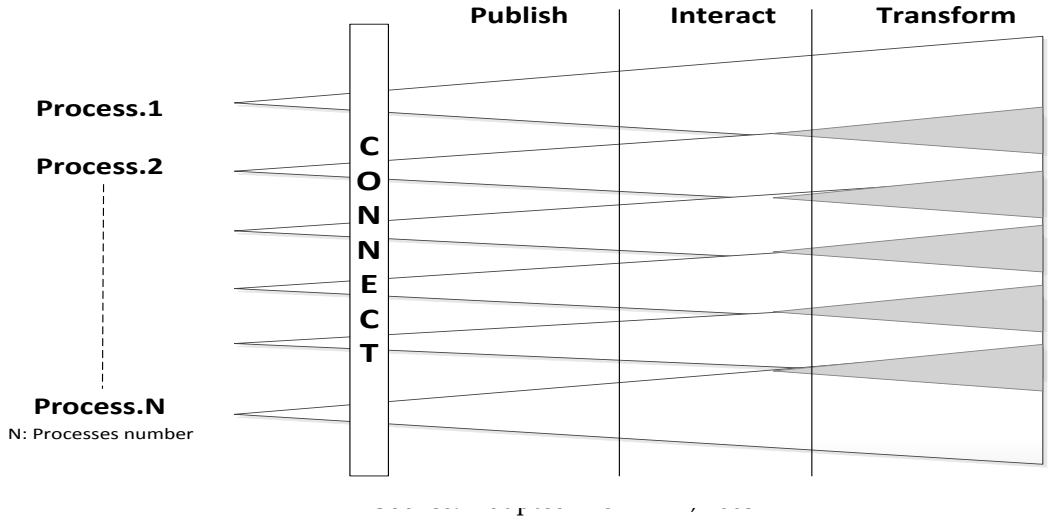
Previous studies have researched e-business deployment in large organisations, including some universities. Espinoza and Gonzalez (2012), for example, concluded that universities in Chile have become dependent on ICTs for managing their operations and providing services. In a recent study, ITU (2012) reported that Libya has recently undertaken administrative reform, especially in universities, supported by a strategic plan for developing e-business infrastructure, thus making e-business applications in the higher education sector a key component of its overall development plans. The Libyan Ministry of Higher Education (LMOHE) fund and manage eleven public universities, with a common management, financing and regulation system which aims to improve the universities' management and services (LMOHE, 2012). Kumar and Arteimi (2009) have observed that Libyan institutions still face significant challenges in bringing about a more effective use of e-business in their daily administration processes; these include a lack of e-business infrastructure, a lack of qualified personnel and an institutional resistance to change. Similarly, Al-Mobaideen's (2009) study of technology adoption in Jordanian universities found a number of factors were inhibiting technology deployment, including strategy, infrastructure and networks, funding and sustainability, and organisational culture.

The research discussed in this paper attempt to support the universities in developing more efficient ways of managing core organisational processes and associated information flows, and explores the cultural and operational implications of using e-business technologies and related processes. It is designed to contribute to knowledge in the context of university operations and management, investigating how e-business deployment can contribute to universities' overall performance. It also suggests a new model for assessing the effectiveness of e-business within Libyan universities.

THEORETICAL FRAMEWORK

Over the past decade a number of e-business models have been developed and designed in Western countries, where the technological and organisational environment is still significantly different to that in a developing country such as Libya. This study will examine if and how a number of these models may be used or adapted in the Libyan university context. The UK Department of Trade and Industry (DTI) e-business adoption model identifies five simple stages in developing e-business capability, providing an evolutionary viewpoint on how organisations might develop their online strategies (DTI, 2003). Another model, the Connect-Publish-Interact-Transform (CPIT) model, analyses e-business adoption at individual process level, allowing a more in-depth assessment of the impact of e-business on organisational operations (Wynn, Turner and Lau, 2013). In this model, 'Connect' indicates the basic

use of ICT applications such as e-mails for messaging, and internet tools for information gathering. 'Publish' refers to the publishing of electronic information, generally via an organisation's website. 'Interact' indicates some interaction between customers, employees or business partners with the host organization via their website, which could be, for example, the placement of an order by a customer or end consumer. In a university context, this could be a dynamic website that provides accessibility and flexibility for submitting application forms and orders online, or an integrated system agreed with partners and stakeholders to interact with the organization via the website. Note here, that in the context of the original CPIT model, a narrow definition of e-business is assumed, centering on the use of the internet and websites. Finally, 'Transform' refers to the deployment of advanced e-business systems that allow the organisation's processes to be automated, coalesced and transformed.



Zuboff's concepts of automate-informate-transformate are another means of evaluating e-business capabilities at the individual process level. In this context, e-business is viewed in line with its wider definition, almost akin to ICT deployment. 'Automate' implies the simple use of technology such as computer systems to support a process; 'informate' requires that information systems are being used to create management and operational information to advance process improvement; and 'transformate' means that the deployment of e-business has had a significant impact leading to a degree of transformation in the organisational process. This framework has been used to assess information systems in Libyan banks (Sharkasi and Wynn, 2011), and in Libyan oil companies (Akeel, Wynn and Zhang, 2013).

The Design - Actuality Gap model developed by Heeks (2002) identifies four main elements of change that are key to transitioning an organisation from local actuality - where the organisation is now – to its future state or design (Figure 2). While Heeks' model can be applied to any business transformation, in this paper it is used to provide a perspective on the deployment of e-business. The model provides a view of the possible transition from the current level of e-business deployment to the targeted 'design' stage. The transition is based on meeting certain criteria and standards in four interrelated elements of

change – people, information, technology and processes. Regarding process change, which is a central focus of this research, Harmon (2009) has argued that process redesign should not only look at the top level process functions, but should also examine how the lower level activities are managed day-to-day, looking at how activities are planned, communicated, organised, monitored and controlled. Another body of literature looks at how processes gain in maturity and sophistication as an organisation grows. The Capability Maturity Model (CMM) defines five levels of process maturity that an organisation goes through as it grows, initially starting without process disciplines, to a developed organisation where all processes are measured, managed and reliably performed (Harmon, 2009). This concept has been adapted for use in major systems projects that can be aligned with the adoption and progression, within an organisation, of Business Process Management (BPM) maturity models (Van Looy, De Backer and Poels, 2014).

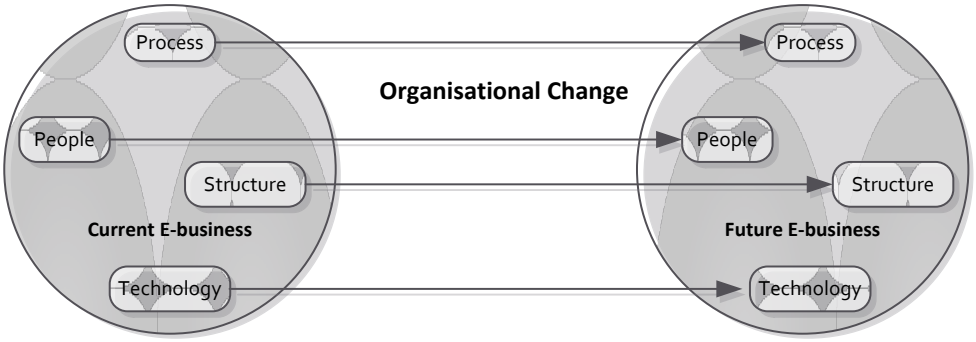


Figure 2. *Design -Actuality Gap Model*

Source: Adapted from Heeks, 2002

Within this theoretical framework, this paper addresses the following research questions:

RQ1. What is the level of e-business deployment in Libyan universities (using Misurata university as an initial case study)?

RQ2. What are the key issues that impede the wider deployment of e-business applications and related information systems?

RQ3. What is the most appropriate model or framework for assessing and comparing e-business deployment in the universities of Libya?

RESEARCH METHODOLOGY

Saunders et al. (2009) defined research strategy as the general plan of how the researcher will go about answering the research questions and they also noted that a case study strategy can incorporate multiple cases, thereby increasing confidence in the resulting data and research findings. This research project adopts a multiple case study approach - if two or more universities exhibit the same concept or

model, replication could be applied and analytic generalisations could be informative to other similar institutions; however, this paper reports on findings from the first case study researched as part of this wider project. Other relevant studies have adopted similar approaches. For example, Prananto et al. (2003) studied eight case study companies to see how the companies treated their e-business initiatives at different stages of maturity, while Al-Mobaideen (2009) examined ICT deployment in Jordanian universities using a qualitative multiple-case study approach (four Jordanian universities were investigated). Sharkasi and Wynn (2011) used a multiple case study approach in their research into the deployment and evaluation of accounting information systems in Libyan commercial banks. Given the nature of the research questions, the research adopts a qualitative methodology which will use multiple cases (Yin, 2009), and an inductive approach, allowing generalisations to be made from the case study findings. The time horizon is cross-sectional as data are collected only once. For data collection, the study uses multiple-sources of evidence; these include a structured questionnaire, open qualitative semi-structured interviews with many different organisational actors, document analysis, workshops, and observation.

The researchers are centrally involved in the phenomena being studied, and in the process of data collection and analysis in order to answer the research questions. The philosophical perspective is thus based on the ontology of subjectivism, and the epistemological position is interpretivism. The study population is the eleven Libyan public universities. In the completed study, up to six Libyan universities will be the subject of detailed case study investigation. At each university a range of investigative activities are being undertaken to gather and analyse the data and information. These activities include ascertaining overall strategy, mapping of organisational processes and sub-processes, assessing information requirements, systems architecture assessment, and overall review of e-business functions and capabilities at process level. This research also explores the cultural and operational implications of using e-business systems and technologies to support and manage core processes and provide better services.

FINDINGS

E-business deployment at Misurata University

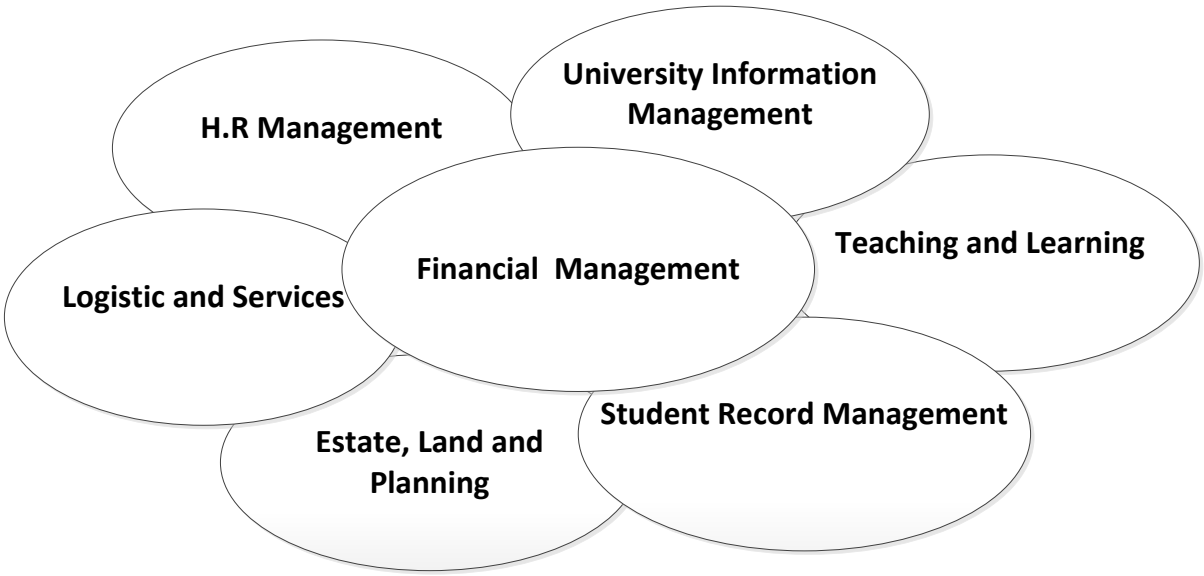


Figure 3. *Main Processes at Misurata University*

Initial process mapping suggests there are seven main processes operating at the Libyan universities (Figure 3). Process definitions are based on the explanation of the people involved in performing the process and outcomes were agreed with them. Each process contains a number of sub-processes which reflect the activities and information flows within that process. This acts as a framework for allocating current e-business applications and assessing their capabilities in supporting processes and sub-processes.

At Misurata University, the human resource management process was the first to use e-business technology. An in-house designed system - built by third party locally based programmers in Visual Basic and Delphi, with an SQL Database - was introduced in 2006 to record, store and report personnel data on university employees and staff. Reports are provided monthly, quarterly, bi-annually, and annually. The system is used by five employees to administer vacations, staff changes, and retain the classified details of Libyan and foreign university staff. However, it is a stand-alone system which is digitally isolated from the university's networks and other systems. Data is gathered manually and prepared by using software packages (e.g. MS Word or Excel spreadsheets) before entry into the in-house system. There remains a high degree of manual and semi-manual processes and a lack of information sharing.

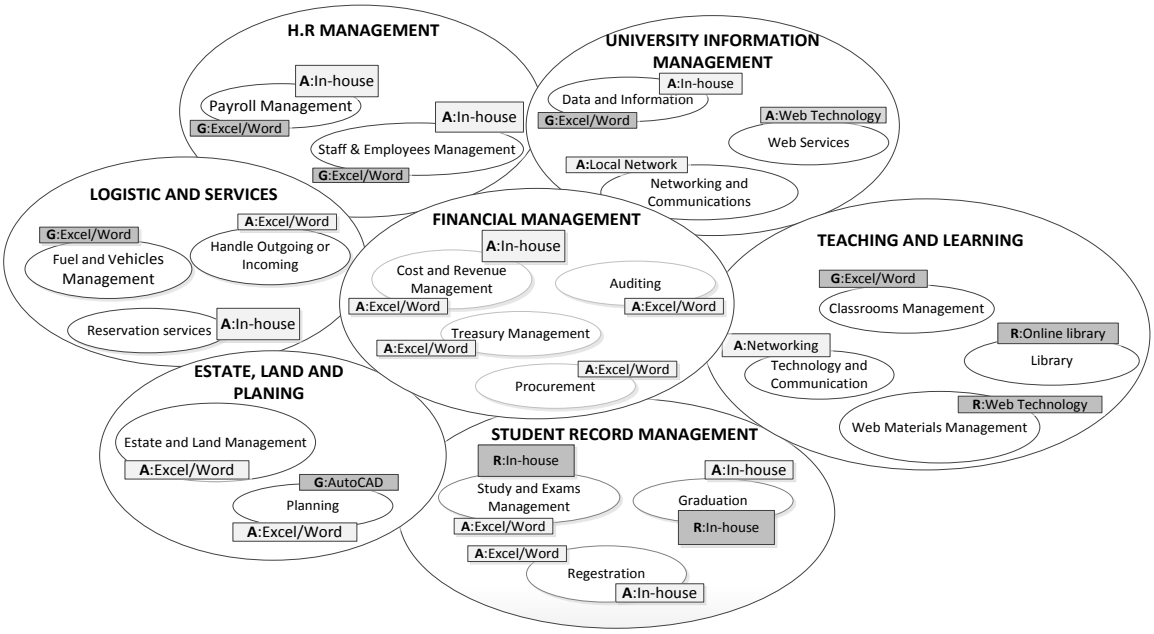


Figure 4. *Systems Profiling by Process and Sub-process at Misurata University*

G (Green): indicates a system that is sound and does not need replacing.

A (Amber): indicates a system that may need replacement.

R (Red): indicates a system is defective and needs replacing

Similarly, within the student records management process, the university has developed and used an in-house system for the management of basic student records for the last twelve years. This system was again developed locally by third party programmers using Visual Basic and Delphi. There are three main systems functions or modules: student registration, study and exam recording, and graduation records. Students' data are still manually gathered before entry into these systems. There is a basic local network connectivity which supports data entry, editing and records update from several internal interface portals (Figure 5). In the engineering college there is now an elementary web portal which supports web-based applications, providing student access to read and update certain designated details related to their academic modules. However, even with these e-business systems, there still no electronic ID student card to identify students as members of the university community. Many of the staff, employees and managers still do not have sufficient knowledge of the practicalities of using of e-business systems in the university's daily work; so there are still real difficulties in the use of e-business in the student record management process. For example, in Misurata University, eight colleges follow an academic year system and three other colleges still follow a semester system. As a result, it is problematic for staff in student records to consolidate the processes required to complete their work, which leads to a complexity of design and implementation of these systems.

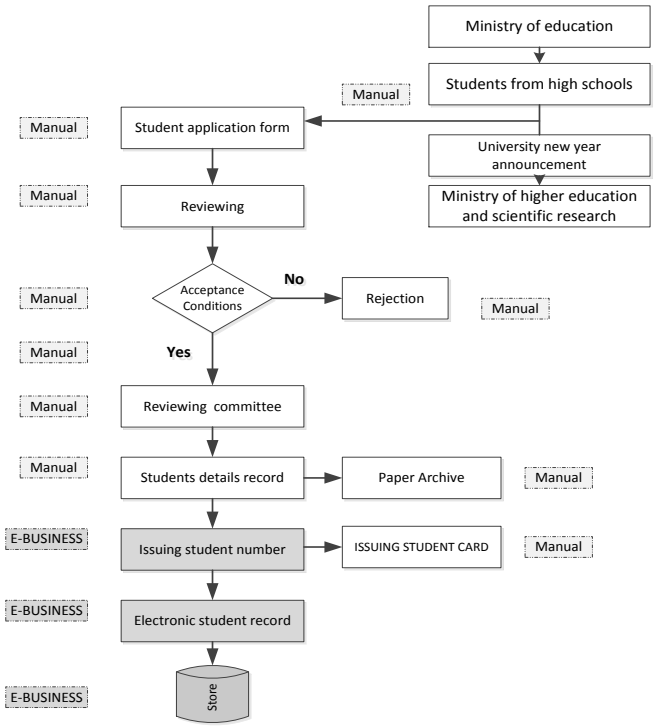


Figure 5. *New student registration flowchart*

The financial management process exhibits the most advanced use of e-business technologies in the university. Again, bespoke in-house systems are used in conjunction with MS WORD and Excel. Four in-house systems have been developed locally using Visual Basic and Delphi programming languages, covering a range of functions - employees and staff salaries, student scholarship and grants, the national ID records, and budget reconciliation for financial year end reporting. However, with the exception of the salary system, the use of paper based forms remains for recording data prior to entry into these systems; and these systems are isolated from other university systems and there is no access remotely via a web-portal nor are they linked through a local internal network. Nevertheless, in the financial management process, more than any other, the University relies heavily on current e-business systems, and some of these systems could be acceptable in the mid-term, especially if they could be accessed more widely through the upgrade of the supporting technology.

The university's estate, land and planning management process encompasses the management and supervision of the university campuses, buildings, lands and investments. As illustrated in Figure 4, there are two sub-processes. There are some e-business applications available such as MS WORD, Excel, and AutoCAD, which are used for printing or the preparation of quantity tables and simple map design. According to the manager of this process, only 10% of users have the ability to use information

technology applications and devices. The university's estate inventory is still performed manually. University buildings and land distribution are in dispersed geographical locations which makes it difficult to collect accurate data.

With regard to the information management process, it is currently limited to gathering and aggregating the university's data and information by and large manually from the university's printers and other hard copy sources. There is some evidence of the use of e-business applications such as MS WORD, Excel and PowerPoint, which are used for electronic data preparation and saved onto hard drives, and there is also some use of the web development software CMS, available as an open source product. There is now a team of five staff working on these tasks and supporting the university networks and hardware. However, these employees' qualifications and capability levels are relatively low, which restricts their ability to deal with complex problems in information systems. The university's current systems were all developed outside the university, except the employee and staff records system, which was developed in-house by the IT department. The university website is rudimentary and does not have accurate data or provide reliable communication, and there is no integration with (or between) the university's internal systems.

Within the teaching and learning process, which includes both undergraduate and postgraduate study, the Engineering College and Information Technology College both provide teaching and research in computing and IT. In these colleges, there is some evidence of e-business deployment in the classroom, with computers being used for projection of lecture material (in MS WORD or PowerPoint) via data projectors. However, the teaching and learning processes and activities in the rest of the university exhibit very little use of e-business technologies, with no use of the internet in the classroom. There are no online course materials or lectures that can be accessed 24 hours a day, 7 days a week. An e-business strategy needs to be developed for teaching and learning to usher in computer-based and on-line learning services and the sharing of resources. There is a basic library website, but access to learning resources is still mainly reliant on printed books and other materials in local university libraries.

ANALYSIS

Towards a new conceptual model for e-business deployment in Libyan universities

We will now assess if and how some of the existing models and concepts can be used in the context of e-business in Libyan universities. Zuboff's model of automate-informate-transformate can be applied at the individual process level, and this shows Misurata University to arguably have most of its processes at the 'informate' stage, based in the main on the use of in-house systems allied to spreadsheets and word-processing packages (Figure 6). The estates planning and logistics management processes lag

behind with some automation but still a significant dependence on manual processes. Only the financial management process could be said to be at the 'transformate' stage, but this is questionable and relative to a very low level of computerization a decade ago.

Process	Automate	Informate	Transformate
Teaching and learning	MS. Access database and MS. Word, Excel spreadsheets are used for timetabling of lectures.	Basic information sharing use web-sites, and low level use of email communications ★	
Human resources management	In-house system developed in Delphi and VB/SQL from a third party vendor is used to support payroll & personnel management.	Electronic information available, and reports on staff absence, sickness, holidays, leave, etc. and pay/salary details. ★	
Financial management	Third party systems using VB/SQL, Delphi coding, MS. Access databases & Excel spreadsheets are used to manage both financial and management accounting activities.	System generated summary reports for payroll and salaries; it's available for managers and operators.	In 2014 Visa cards have become available to use for payment and purchase within the University. Possibilities of networking in-house systems with other relative ★ systems inside the university.
Student records management	Use of three in-house systems designed by VB/Delphi. Basic level of a network link, and use of MS. Word and Excel for electronic data management**.**	Basic reports from in-house systems are available. Elementary website with a general information catalogue available to current and prospective students. ★	
University information management	In-house system locally designed in MS. Access. Use of MS. Excel and MS Word for electronic data management **.** Server available, but not in use.	Basic level of electronic information available. ★	
Estate/ land and planning management	Basic use of MS. Office applications, and AutoCAD. ★		
Logistics & services management	Basic use of MS. Office applications		

Figure 6. *e-business deployment at process level in Misurata University (based on Zuboff's automate-informate-transformate)*

The DTI's CPIT model was designed in the years when e-business was closely linked to internet use, but it can still be of value by adapting it to accommodate the wider definition of e-business assumed in this research. It means that some of the stages need re-defining, notably 'publish' which now includes

display of information via standard information systems as well as on websites or via a web front-end or portal. The application of the CPIT model to Misurata university is shown in Figure 7, indicating that all processes, with the exception of estates planning and management, are at the publish stage at least, with financial management, student records management and human resources management being further advanced.

Process	Connect	Publish	Interact	Transform
Teaching and learning	Some computers available, existence of basic LAN. Use of MS. Word, Excel, and Access applications	Use of some Data-Show and smart boards for teaching purposes. ★		
Financial management	Existence of some computers and other hardware accessories uses for the preparation of certain electronic information. Use of MS. Word, Excel, and Access. Existence of reliable electricity network.	Computer generated hard copy reports available for key aspects of financial management from bespoke systems and office productivity tools.	Existence of basic LAN and four in-house systems (National number system, payroll system, a student's salary system, final account closure system). Level of user interaction is limited based on user authority and confidentiality of information. ★	*There has been significant change in technology deployment over the past decade and further significant change is feasible in the short to mid-term.*
Students record management	Office productivity tools are used, mainly in standalone mode.	Elementary information on university courses is published on university website. and there is a basic LAN but bespoke systems remain standalone.	In-house systems (registration, study& exams, and graduation systems) provide access to database information (read/write), and use of MS Excel and Access.. ★	
University information management	MS Access, Excel, Word are used for information collection and storage.	Reports are made available electronically via email. Servers available but no multi-user systems at present. ★		
State/ land and planning management	Use of AutoCAD software, MS. Word and Excel ★			
Logistics & services management	MS Word, Excel available for basic applications.	Some data is published electronically via Excel spreadsheets. ★		
Human resources management	Office productivity tools are available on a range of computers.	Personnel information is available electronically within	In-house systems. (e.g. Personnel records system) are used interactively, but no LAN available. ★	

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		the HR function.		

Figure 7. *e-business deployment at process level in Misurata University (using the CPIT model)*

Nevertheless e-business deployment remains basic by western standards, with the university still struggling to install the required technology infrastructure, such as networks and internet connection. As a result, the in-house systems are isolated and online access to key information is limited to a few users.

The assessment at process level afforded by the application of the Zuboff and CPIT models is useful, but requires modification of the underlying concepts in both cases. Zuboff's original conception of automate-informate-transformate dates from the 1980s, when information technology was of a different era and the impact of technology on people was emphasised. Similarly, the concepts underlying the CPIT model reflect an understanding of e-business that is different to the broader definitions generally accepted today. A model better geared to the broader definition of e-business that also reflects the slower take-up of information technology in developing world countries like Libya is more appropriate.

The SCALE model has five stages. ***Start*** indicates a clear organizational structure, with clearly defined roles and procedures, and a general awareness of the availability of ICTs for day to day running of an organization, with possibly one or two individuals using standalone technologies (e.g. a laptop or mobile phone/iPad). At the ***Connect*** stage, there is an electricity network widely available and some internet connectivity allowing access to websites and inter-organization email exchange, a partial in-house data communications network facilitating multi-point access, and a few standalone users of basic office systems (e.g. a word processor or spreadsheet). At the ***Access*** stage, there is a wider take-up of office systems and use of some information systems for recording, processing and reporting information in key process functions. These systems are often built in-house by end-users or via third party programmers. The first servers appear allowing access to systems and applications from the organisation's network. Once most processes are at this stage, a central IT/IS department normally is put in place to manage the infrastructure and systems. The organization will normally have a website at this stage, which includes information on products and services, although there is probably no ability to take transactions via the website. ***Leverage*** indicates an established level of e-business systems deployment in most process areas, with some basic cross-organisational standards being introduced for IT/IS products and services, and procedures for things like backup and upgrades are defined. There is a degree of process change at this stage, as new systems require and allow process improvements. Website content becomes more advanced, being used by internal staff as an intranet and transactions are taken via the website where appropriate to the type of organization. ***Enterprise*** level is attained when systems are in place in all main process areas, either using a range of integrated packages or in-

house developments, or possibly an ERP integrated package. At this stage the end-user community includes information specialists. Processes are improved and streamlined and are reliant on a range of multi-user systems or modules accessing centrally held databases. The majority of corporate systems are accessible via the intranet or web portal, for both internal and external users, customers and business partners.

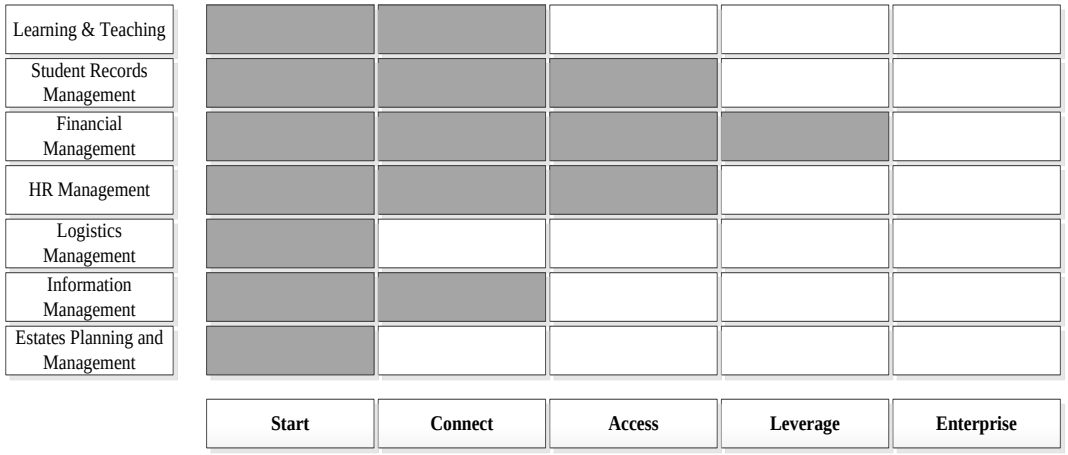

Figure 8. *E-business deployment assessment at the process level in Misurata University using SCALE model*

The application of the SCALE model at Misurata university is shown in Figure 8, with only the financial management process being at Leverage stage. The model allows greater differentiation of the other processes, with human resource management and student records management at the Access stage, and all others at the Start or Connect stages. This model can be used to help identify the hurdles that have to be jumped in each process area to facilitate advancement up the SCALE model. While there is evidence of awareness at senior management level of the importance of e-business systems, Misurata University faces a range of barriers to e-business deployment, which affect most process areas to some degree: (1) the lack of a clear business plan for the university that encompasses technology strategy, objectives and investment; (2) lack of consistent and standard administrative processes and procedures; (3) lack of basic network and internet connectivity; (4) lack of e-business skills and knowledge; (5) lack of training and development programs regarding e-business systems and technologies; (6) cultural resistance to change and a laissez-faire management attitude. In line with Heeks' model, these barriers are strongly linked to all four of his key elements, but particularly, process, technology and people issues.

CONCLUDING REMARKS

There are some encouraging signs of change at Misurata University. Development of web-portal services is in progress in the student records management and teaching and learning processes, which

will widen access to existing systems as the basic network infrastructure is upgraded and extended. It is increasingly recognized by staff that new e-business systems are needed and that this affords the university an opportunity to move forward. What is now needed is a clear e-business strategy, aligned with the overall university business plan, with parallel programmes to upgrade skills and knowledge in the key process areas of the university. This must encompass the small IT department which needs to play a key role in the planning and delivery of new systems and technologies. This group already have some skills in web-site development and this is likely to be an important capability as attempts are made to provide a user friendly front-end to the range of systems currently in place, as a short to mid-term solution.

The use of the SCALE model has helped identify where progress has been made and where opportunities exist at individual process level, and this will now be further developed and applied in Misurata and a number of other Libyan universities. The results of this research will be fed into the future business planning and operational delivery of new e-business systems in the universities of Libya, linked to the Libyan government initiative to develop e-business infrastructure across its university campuses.

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