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A multivariate analysis of the determinants for adoption and use of the Document Workflow Management System in Botswana's public sector

Abstract

Governments in Africa are spending significant funds in their drive towards putting public business processes and services online. Although this drive has different names such as electronic government (e-government), open government, open data, etc., the motivation is hinged upon achieving overall efficiency and effectiveness in public services and is based on Freedom of Information (FoI). In Botswana's public services, diverse interventions are being put into place to facilitate business automation and electronic records management. The then Ministry of Trade and Industry (MTI), now Ministry of Investment, Trade and Industry (MITI) has joined the drive by implementing the Document Workflow Management System (DWMS) as an e-records management system. This study probes the determinant factors influencing meaningful adoption and usage of DWMS for effective records and information management within MITI. Multivariate analysis is employed to understand which factors have the highest variance in adoption and use of DWMS. The study utilises the adapted Unified Theory of Acceptance and Use of Technology (UTAUT) as the conceptual framework in its design. Quantitative data was collected from a population of 61 officers from which 53 (86.9%) were returned and included in the analysis. Effort expectancy, behavioural intention, social influences and facilitating conditions were the key determinants for adoption and use accounting for 55% of variance. The study identifies to what degree each of the potent factors contribute to adoption and use of DWMS at MITI. The major limitation of this study is that it was impossible to identify all the factors influencing behaviour intention, as human behaviour is difficult to measure. The other unidentified factors account for 45% of variance not accounted for by the predictor factors. This is an indication that there is a need for an in-depth study, preferably a longitudinal, unlike a cross-section, study like this one that critically probes the factors of technology adoption in work processes by a large set of individuals in a developing world context.

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Introduction

The integration of technologies in the different public service business processes in Botswana has prompted many parastatal and government departments or units to seriously consider electronic records management strategies. As a result, many of these organisations are implementing different types of electronic document and records management systems (EDRMSs). In the context of Botswana, the integration of electronic records (e-records) management in the public sector poses many challenges, such as low adoption and underutilisation (Kalusopa & Ngulube, 2012; Mosweu, Bwalya & Mutshewa, 2016). This research posits that the understanding of the factors at the centre of low adoption and underutilisation of EDRMSs is cardinal to ensuring that there is enhanced adoption of electronic records (e-records) utilisation in the Botswana public sector. Further, the understanding of factors influencing the adoption and utilisation of EDRMSs is important given the significant sums of money that are spent in procurement of records management systems, necessitating that there exists not even the slightest chance of their absolute failure.

There has in the past generally been low adoption and use of information systems in public sectors in Africa (Kipsoi, Chang'ach & Sang, 2012; Zaied, 2012; Akande & Van Belle, 2014). Low adoption entails that many benefits are missed, and the intended purpose of a technology is not met. For example, low adoption of electronic documents and records management systems (EDRMS) entails that public organisations miss out on a number of benefits, which can be harnessed in the realm of improving the effectiveness of public service delivery. Some of these missed opportunities include the following: quicker completion of tasks; streamlined business processes and automated workflows; reduced efforts in compliance with legislation or records management principles; quicker information retrieval for decision-making processes; better management of diverse information resources; greater access control and security over classified information; controlled disposal of corporate information; dynamic audit controls; etc. (Commonwealth of Australia, 2011; Ojo & Grand, 2011). Given the multi-dimensional nature of technology adoption and usage, low adoption is entrenched in a diverse range of factors influencing the individual, organisation and the environment in which technology is introduced (Banderker & Van Belle, 2010;

Singh & Punia, 2011; Zaied, 2012; Akande & Van Belle, 2014). A comprehensive understanding of factors influencing low adoption and underutilisation of EDRMSs involves a careful analysis of factors pertinent to each of the three layers: individual, organisation and environment. This study intends to understand the factors that are at the centre of low adoption and utilisation in the case of the Botswana public sector, focusing on the individual level.

There is a dearth of studies that have investigated individual factors influencing technology adoption in the developing world contexts, despite this being a hot topic in the Global North countries (Zaied, 2012; Akande & Van Belle, 2014). Jain and Mutula (2001) and Iyanda and Ojo (2008) conducted exploratory studies in Botswana, investigating technology adoption in the public sector and pinpointed factors such as limited management support and resistance to change, lack of awareness, lack of training and computer skills, etc., as some of the reasons for low adoption. Like the studies above, studies conducted in Qatar, South Africa, Uganda and India have only identified general factors influencing adoption and use of document workflow management systems (DWMSs) (Al-Shafi & Weerakkody, 2009; Banderker & Van Belle, 2010; Singh & Punia, 2011). Globally, the general challenges influencing individual adoption of technology have revolved around limitation in ICT-skills, lack of support infrastructure, unawareness of technology platforms, resistance to change, cultural barriers, lack of support, etc. (Munetsi, 2011; Akande & Van Belle, 2014; Mutimba, 2014; Ambira, 2016). Although there are countless studies explaining adoption and usage of technology at the individual level, many studies have utilised the technology acceptance model (TAM) and the unified theory of acceptance and use of technology (UTAUT). Using the UTAUT as the theoretical lens, this study investigates the determinants of DWMS (synonymous with EDRMS) adoption and use, specifically focusing on line managers who are the custodians of DWMS usage and integration in the business processes. The study is important because it has the potential to guide the implementation of DWMS in contextually similar environments.

Background

DWMSs or EDRMSs have been implemented in many parts of the world to improve records management or information integration into business processes with a goal to improving organisations' efficiency and effectiveness (Queensland State Archives, 2010; Mosweu, 2012; Mutimba, 2014). Many organisations around the world have been motivated to implement EDRMSs owing to their many advantages. EDRMS enforces security in government document handling processes and thereby culminates into enforcement of accountability in government business processes (National Archives of Australia, 2011). When successfully implemented, the EDRMS provides information timely with higher degree of accuracy without a significant cost. It is worth noting that an EDRMS is not only a data management and archiving platform, but also an integrated organisation-wide knowledge management system acting as a fuel for organisational market participation trend analysis, integrated decision-making and an information repository for strategic discourse (Mutimba, 2014; Ambira, 2016). Therefore, it can be posited that the EDRMS is a critical aspect of organisations' competitive advantage and long-term survival (Haider, Aryati, & Mahadi, 2015). EDRMSs have been used to check document flow within government entities, thereby having a sense of business processes operations and overall efficiency (Abdulkadhim, Bahari, Bakri, & Ismail, 2015a). For example, the Document Management and Electronic Archiving (DOMEA) system implemented in Germany aimed to achieve a paperless environment in the three levels of government operations. The DOMEA's modular structure comprises documents, records and files (Kunis, Rünger, & Schwind, 2007).

EDRMSs, in their different forms such as DWMS, have been implemented the world over but few studies have attempted to understand the factors that influence the successful implementation in government departments (Abdulkadhim, Bahari, Bakri, & Ismail, 2015a). The majority of studies on implementation has concentrated on understanding factors influencing EDRMS-adoption at early stages. Several factors, both technical and managerial, have been identified to impact on DWMS-implementations and the prominence of these factors varies according to context. After recognising some challenges in implementation, New Zealand designed the EDRMS with user-friendly interfaces so that individuals could easily adopt the interventions

(Yin, 2014). Yin (2014) further posits that senior management support in the EDRMS-interventions may go a long way in influencing the early adoption of EDRMS-platforms and effectively, their usage. The analysis of the implementation of EDRMSs in South Africa showed that socio-technical factors, inadequate capacity and computer anxiety prevented individuals from appropriately adopting and utilising EDRMSs in the Eastern Cape (Munetsi, 2011). Ambira (2016) investigated the challenges of implementing EDRMSs at different levels of Kenya's public sector. The study found that individual adoption of EDRMSs and therefore e-records is limited due to multi-dimensional factors that negatively affect individuals' adoption and utilisation of e-records. In the Kingdom of Eswatini, an EDRMS is planned to be implemented for the first time in 2019, with technical and managerial preparations currently underway (ICDF, 2016). Understanding factors influencing EDRMS-implementation needs to include the time factor to understand how the effects of these factors evolve over time. Factor exploration to harness factors as predictor variables to a given phenomenon is largely a static endeavour unlike a desired dynamic one (Abdulkadhim et al., 2015a).

Generally, successful EDRMS-implementation depends on a careful synthesis of supporting technological (hardware and software design, security, access platform design, data quality, security, etc.), organisational (procedures, processes, rules, regulations, etc.) and user factors (culture, drivers, barriers, training and capability and resistance to change (Kwatsha, 2010; Yin, 2014; Mosweu, 2016). A robust measurement of what factors are the most critical in the implementation of EDRMSs would assist in understanding the contribution brought about by each of the individual factors (Haider, Mahadi, & Haslina, 2015). Although this is the case, it is worth mentioning that the central tenet of meaningful adoption and use of technology depend on individuals (Isaac, Des Horts & Leclercq, 2006; Radu, 2016).

Another eminent factor influencing EDRMS adoption and use is the way in which implementation is approached. For example, with a goal to achieve excellence in information management and governance, the global leader of e-government services, South Korea, implemented an EDRMS using integrated portal websites providing a ubiquitous and integrated information service to its citizens and businesses (Abdulkadhim, Bahari, Bakri, & Ismail, 2015b ; Ambira, 2016). Implementation of an EDRMS is a pre-requisite to meaningful e-government implementation. Migration into

more efficient web-based systems from traditional government systems without critically considering contextual nuances and re-engineering current business processes, is a risky undertaking (Hassan, Shelab, & Peppard, 2011).

EDRMS implementation in Botswana

As the anchor department in the Ministry of Investment, Trade and Industry (MITI) of Botswana, the Department of Corporate Services is responsible for a whole spectrum of tasks within the ministry's mandate. MITI is implementing the DWMS to manage electronic records and therefore is central to process automation and integration in a dynamic information environment. The ministry has implemented the Government Accounting and Budgeting System (GABS) to manage accounting processes, the Computerised Personnel Management System (CPMS) for staff management and the Ministry of Trade and Industry Information Management System (MTIMIS) for the registration of businesses, coordinating competition among industry players, facilitating Botswana's participation in international trade, etc., in addition to the DWMS. Of these, the DWMS is central to electronic records management and therefore central to process automation and integration. Although implementation of the DWMS has been ongoing since 2008, the Action Officers who are at the centre of DMWS implementation most often opt to ignore it, culminating into overall under-utilisation (Consult IT, 2012). The case in point evidently shows that the DWMS has been adopted at institutional level, but ignored at the individual level making its ultimate adoption difficult. For this particular context, therefore, there is a need to understand the inherent factors that have nurtured this underutilisation.

Theoretical framework

Studies on the adoption and use of diverse information and communication technologies across a whole spectrum of organisational functions in both the private and public sector have been undertaken in Africa, using various technology adoption models (Kilangi, 2012; Akande & Van Belle, 2014; Murgor, 2015). These included the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, and Davis, 2003). Such studies have covered a number of areas such as student utilisation of computer information retrieval systems in an academic library at

the University of Ghana (Boakye, 2015), the adoption of mobile money usage by SMEs' customers in Uganda (Mugambe, 2017), acceptance of e-prescribing technology by South African physicians (Cohen, Bancilhon & Jones, 2013), determining factors for the adoption of an EDRMS in the public sector of Malaysia (Aziz, Yusof, Mokhtar & Jambari, 2017), an assessment of the adoption of ICTs in Kenyan public universities (Chumo & Kessio, 2015), highlighting the determinants of user adoption of e-government services in Greece and the role of citizens (Voutinioti 2013), South African physicians' acceptance of e-prescribing technology (Cohen, Bancilhon & Jones, 2013) and the likelihood of computer adoption by school principals in Botswana (Totolo, 2007). The use of UTAUT to explain technology adoption and use is thus widely spread across disciplines in different countries, both developing and developed.

According to the UTAUT-model, effort expectancy, performance expectancy, social influences and facilitating conditions are determinants of the intention to use technology at the individual level (Venkatesh et al., 2003). The following are some of the factors that globally define individuals' motivation to adopt technology, which were subsequently turned into research objectives in this study:

- Effort expectancy is defined as the degree to which technology is perceived to be easy to use. The easier the technology is to use, the more it is embraced. Technologies have been rejected because of the perception that it would be difficult to use them. For example, Behrens, Jamieson, Jones & Cranston (2005) studied factors that contributed to the success of an Online Assignment Submission, Infocom System (OASIS) used by distance learners in an Australian academic institution. The students who were technologically savvy found the system easy to use, adopted, used it while their opposites found it difficult to use, and were less keen to use it.

- Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance. As an objective, respondents were to state from a number of options, the extent to which they viewed the DWMS as an EDRMS that would assist them to better carry out their day to day duties. An adopted technology

is normally deployed to improve job performance. However, if it turns out that the deployed technology makes job performance a difficult undertaking, they tend to reject it (Orlikowski, 2000; Rogers, 2003). Calisir and Calisir (2004) explored perceived usefulness of technology as a factor in the adoption of Enterprise Resource Planning (ERP) by end users. The end users were from a wide range of positions in e.g. manufacturing, healthcare, transportation, telecommunications and consulting companies. The purpose of the study was to examine the influence of interface usability characteristics, perceived usefulness and perceived ease of use on end user satisfaction with ERP. Perceived usefulness of technology was found to be the best predictor of end user satisfaction with information systems.

Facilitating conditions are referred to as the degree to which individuals perceive that organisational and technical infrastructure support system usage (Venkatesh et al., 2003). This includes user training and communication. In a study that analysed and shared the experience of implementing an EDRMS at the European Central Bank in Germany, by identifying what went well and what could have been done better by Di Biagio and Ibiricu (2008), it emerged that successful EDRMS implementation benefited from project management and communication. The researchers concluded that management support and communication eased worries brought on by new systems, thereby countering user resistance. In this study, respondents were asked whether the organisation's work environment has prepared the ground, including the availability of technical equipment for the adoption and use of the DWMS.

- Social influences are defined as the degree to which individuals perceive that organisational and technical infrastructure support system usage. Mazman, Usluel, and Cevik (2009) have described the same concept as social factors. According to Zeal, Smith and Scheepers (2010:2), social influences "encompasses both how an individual can effect attitude and behaviour change in others, and how individuals are influenced by the attitudes and behaviour of other people." They include the influence of experts, mass media reports, word of mouth from superiors, friends and colleagues. Social influence has been

found to be a good predictor of the acceptance of information technology by healthcare professionals (Yi, Jackson, Park & Probst, 2006; Ifinedo, 2012).

UTAUT is also made up of four moderating factors namely gender, age, experience and voluntariness. For this study, voluntariness as a moderating factor was excluded as a DWMS is neither compulsory nor voluntary. Experience was also left out as this study is cross sectional while the original study that originated UTAUT was longitudinal (Venkatesh et al., 2003).

A modified Unified Theory of Acceptance and Use of Technology (UTAUT) made from a synthesis of eight different models, was used as a theoretical framework. The models were:

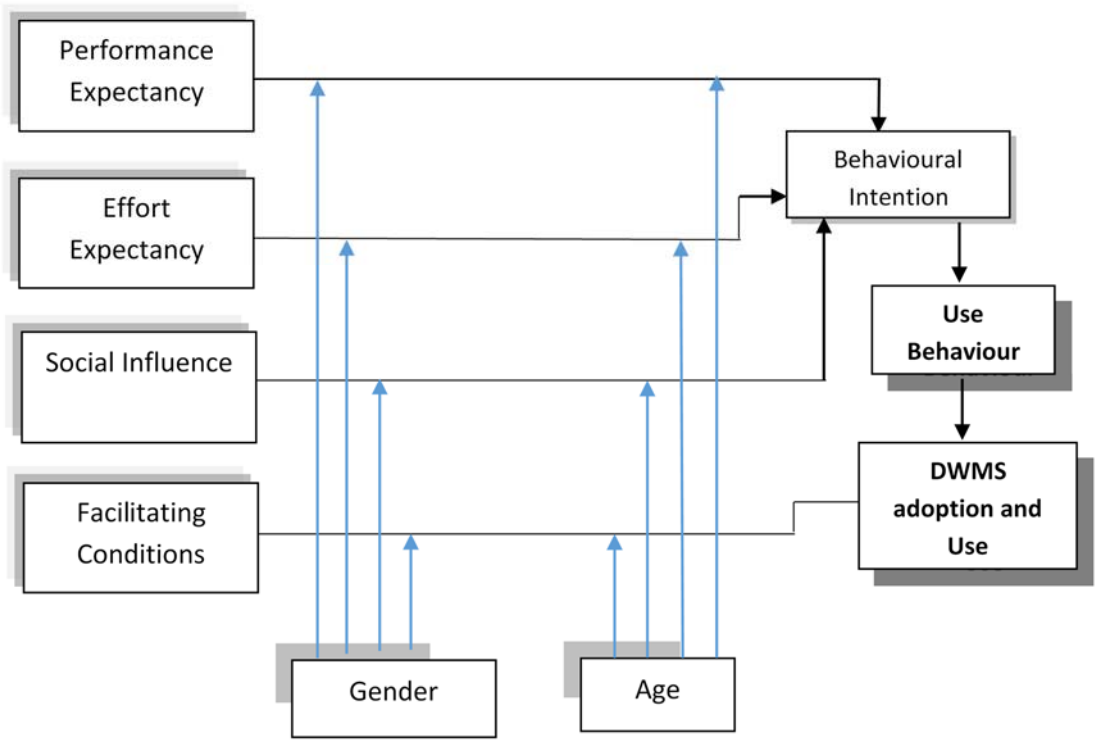
- The Theory of Reasoned Action (TRA), which was drawn from social psychology. It is one of the influential theories of human behaviour. The construct subjective norm was adopted for the study (Fishbein & Ajzen, 1975).
- The Technology Acceptance Model (TAM), which was used to predict information technology acceptance and usage on the job in an information systems environment. The constructs adopted were the perceived ease of use and perceived usefulness of technology (Davis, 1989).
- The Motivational Model from which literature in psychology has supported general motivation theory as an explanation of behaviour. The adopted construct, extrinsic motivation, posits that users of technology would perform an act “because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions” (Davis et al. 1992:1112).
- The Theory of Planned Action, which extended TRA by adding the construct of perceived behavioural control that is similar to the perceived ease or difficulty of performing some behaviour (Ajzen, 1991).
- Combined TAM and TPB, which combined the predictors of TPB with perceived usefulness from TAM (Taylor & Todd, 1995). The adopted constructs were subjective norm, perceived usefulness and attitude toward behaviour.
- The Model of PC utilisation that is suitable to predict individual acceptance and use of a range of information technologies. The adopted constructs were

facilitating conditions, complexity, job fit and social factors (Venkatesh et al., 2003).

- Innovation Diffusion Theory that has been used by Rogers (1995) to study individual acceptance of technology. The constructs adopted for the study were relative advantage, ease of use, compatibility and results demonstrability (Venkatesh et al., 2003).
- The Social Cognitive Theory, which has been applied to the context of computer utilisation. The adopted constructs were anxiety, self-efficacy and outcome expectations (Venkatesh et al., 2003).

The UTAUT was chosen owing to its wider usage, viability and stability in similar studies in similar research contexts as the current study (AlAwadhi & Morris, 2008; Sykes, Venkatesh & Gosain, 2009; Al-Shafi & Weerakkody, 2009; Khan & Shahid, 2011; Alrawashdesh, 2011; Barua, 2012; Alshehri, 2012). However, there was a need to adapt it somewhat to ensure that the unique contextual characteristics were taken into consideration. The conceptual outlay of the UTAUT is shown in Figure 1 below:

Figure 1: Modified UTAUT model (Source: Venkatesh et al., 2003)



The Moderating factors 'experience' and 'voluntariness' are not included as it is mandatory for all Action Officers to use the DWMS at MTI. Longitudinal studies mostly consider 'experience' as one of the constructs but not as desired when the study is cross sectional like the current one. The constructs in Figure 1 were included in the data collection instruments.

Methodology

Although complemented with some interviews with individuals purposively identified, the main data collection point was the questionnaire that was adapted from the originators of the UTAUT Model (Venkatesh et al. 2003). Some limited questions were open ended and the study population comprised of 61 officers. A census survey design was thus preferred in line with Yount (2006) who states that when the study population

is fewer than 100 potential participants, all of them should be selected. The principal respondents were the Action Officers and Line Officers based at MITI headquarters in Gaborone. For questionnaires, out of 61 distributed, 53 (86.9%) were returned and included in the analysis.

Multivariate analysis

a) Pre-tests

The research begins with understanding whether each of the actors espoused in the adapted UTAUT model followed statistical significance, validity and normality so that all statistical methods applied on the data set qualify for statistical inference. The nonparametric Kolmogorov-Smirnov and Shapiro-Wilk tests are used in testing whether the data set followed accepted normal distribution. Because the study's dataset is initially unstandardised, it was standardised and compared with the probability density function (standard normal distribution). After statistical testing, the data fitted into the bell-shaped Gaussian distribution, demonstrating normality and readiness for further statistical use. Therefore, it was appropriate to draw statistical inferences from the data set as the data was obtained from normally distributed samples (Ghasemi & Zahediasl, 2012). The results of the two tests are shown in Table 1.

Table 1: Normality testing

	Kolmogorov–Smirnova			**Shapiro-Wilk**		
	Statistic	df	Sig.	Statistic	df	Sig.
Behavioural Intention (BI)	.422	53	.000	.598	53	.000
Effort Expectancy (EE)	.288	53	.000	.824	53	.000

Performance Expectancy (PE)	.290	53	.000	.830	53	.000
Facilitating Conditions (FC)	.327	53	.000	.787	53	.000
Social Influences (SI)	.258	53	.000	.859	53	.000

a. Lilliefors significance correction

Further, the results have revealed that the data was statistically significant, justifying its statistical readiness. In order to understand the inter-correlations between variables, the Pearson correlation was utilised. In all the cases, the skewness coefficients were less than their standard errors meaning that the data set was normally distributed and ready to be used in the analysis. The dataset showed a weak negative correlation r=0.2 between performance expectance and effort expectance and between social influences and effort expectance which are consistent with what would be expected in real life situations – the more effort to use a system, the less performance is expected of that system. The results further revealed that the empirical data was significant at level 0.05 ($p<0.05$) giving more basis to reject the null hypotheses and rely on the UTAUT variables in the understanding of the key factors influencing adoption.

b) Empirical results

The results of the study were considered in line with each of the constructs from the UTAUT deemed relevant given the context of the study as follows:

1. **Effort Expectance (EE) in using the DWMS**: It was important to understand the experiences advanced by first time users of the DWMS with regard to the effort needed to learn to use the system. An overwhelming 98.1% of the individuals in the study mentioned that the system was easy to use and that interaction with the DWMS was clear and understandable; 1.9% remained neutral. All respondents agreed that developing skills for first-time users of the system is easy. Given the above, it is easy for the DMWS to be integrated into MITI's business processes.

The study results have accentuated findings from other studies that an easy-to-use system stands a higher chance of being adopted by users (AlAwadhi & Morris 2008, AbuShanab, Pearsony, & Setterstrom, 2010: Bugembe, 2010: Bwalya, 2011: Barua, 2012: Alshehri et al., 2012).

2. **DWMS Performance Expectance (PE)**: PE articulates the extent to which individuals assume that utilisation of technology in their everyday work processes will improve job performance (Venkatesh et al., 2003). A total of 93.4% of the respondents believed that using the DWMS would enable them to accomplish tasks easily, reduce time spent on doing routine tasks and generally culminate in making their jobs easier. PE is a huge motivation factor for technology adoption as espoused in other studies in Saudi Arabia, Botswana and South Africa (Alsheri et al., 2012; Totolo, 2007; Seymour, Makanya & Berrang, 2007).

3. **Facilitating Conditions (FC) at MTI**: FC is a set of all possible incentives and initiatives put in place to create a conducive environment to facilitate enthusiastic adoption and use of technology platforms in everyday work processes. In contrast to what was generally posited, 45.2% of the respondents indicated that they do not feel that they have the necessary knowledge to use the DWMS. These respondents indicated that there was adequate user support for individuals facing problems with the DWMS. Individuals with obvious challenges are offered training opportunities to enhance their usability. As posited in other studies, FC has a greater impact on behavioural intention to adopt and use a technology (Di Biagio & Ibiricu, 2008; Yusof & Ramayah, 2011; Ghalandari, 2012; Taiwo & Downe, 2013). In Australia, would-be users of the EDRMS were empowered using appropriate training before the system went live, and in the UK prior training of the end users increased the likelihood of system adoption and usage (Maguire, 2005; Wilkins, Holt, Swatman & Khan, 2009).

4. **Social Influence (SI), gender and age**: Many individuals at MITI were attentive to what others thought about using the DWMS. Although 47% disagreed being influenced by others to adopt and use the DWMS, 45% agreed that influential people at MITI had an impact on their adoption and usage of the DWMS. One striking outcome of the empirical study was that most senior executives at MTI

did not directly support the adoption and use of the DWMS as posited by 72% of the respondents. The impact of SI on overall adoption and use of newly introduced technology was also cited as a key factor influencing behavioural intention in the adoption of mobile learning in Taiwan and internet banking in Jordan (AbuShanab et al., 2010; Chen, Li, and Li, 2011). In the context of MTI, gender and age had a negligible effect on the adoption and use of the DWMS. For gender, the study has shown that 10 out of 20 (50%) of male respondents agreed that their behavioural intention to adopt the DWMS was influenced by social factors. An equal number (50%) showed the exact opposite. This suggests that gender seems to have a moderating effect that has more or less equal moderating effect in the adoption of a DWMS. As for age, the results of the study indicated that 39.1% of the respondents aged between 31 and 40 years affirmed that social influences related to the adoption of the DWMS, moderated their behavioural intention to adopt the DWMS while a greater number (56.5%) disagreed. Furthermore, 10 (50%) of respondents with an age range of between 41 and 50 years agreed that social influences moderated their behavioural intention to adopt the DWMS. The same number, in the same age category disagreed. It would seem that age is neither a good nor a bad moderator of behavioural intention to adopt the DWMS by Action Officers and Records Officers.

5. **Behavioural Intention (BI)**: Despite some challenges pointed out by the respondents, 74% indicated that they had the intention to use the DWMS in the near future. The willingness of the Action Officers and Records Officers to adopt and use the DWMS now or in the future is an indication that there is chance that the DWMS can be adopted and used universally at MTI if current challenges limiting usage are overcome.

The empirical results have shown that each of the UTAUT constructs have some impact on the overall degree of adoption and use of the DWMS. In order to quantify the variance of each of the factors, a linear estimation model from the sum of squared residuals was modeled.

c) Linear estimation model

In order to understand which factors/variables are at the centre of contributing the highest variance to the causes of effective adoption and use of the DWMS, there was a need to model the effect of the identified factors to the real situation. To do this, the identified variables were plotted against the expected projectile of the real factors. The variables were identified using in-depth thematic analysis and can be presented using linear combinations of measured variables represented using equation (1):

$$\begin{aligned} X_1 &= I_{11}\lambda_1 + I_{12}\lambda_2 + \ I_{13}\lambda_3 + \ldots\ldots\ldots I_{k1}\lambda_k + \ \delta_1 \\ X_2 &= I_{21}\lambda_1 + I_{22}\lambda_2 + \ I_{23}\lambda_3 + \ldots\ldots\ldots I_{k2}\lambda_k + \ \delta_2 \\ &\ldots\ldots \\ X_n &= I_{n1}\lambda_1 + I_{n2}\lambda_2 + \ I_{n3}\lambda_3 + \ldots\ldots\ldots I_{kn}\lambda_k + \ \delta_n \end{aligned} \qquad [1]$$

where X_1, X_2 and X_n are known variables, δ_j is the j^{th} factor, and λ_{ij} is a constant representing the i^{th} and j^{th} factor (δ represents uncertainty)

From the linear regression [1], the least squares estimator (LS/E) with respect to the sum of squared residuals is represented by equation [2]:

$$\sum_{i=1}^{n}(y_i - \acute{Y}_i)\text{^}2 = \sum_{i=1}^{n}(y_i - b_i - b_i x_i - \cdots .. - b_k x_k)\text{^}2 \qquad [2]$$

where x is the independent variable or explanatory or covariate variable, b1 is the estimated intercept and b2 is the estimated slope coefficient.

The least squares estimator is the basis for the understanding of the contribution of the variance, which is represented by the totality of the R-squared variables, measured in this study. The LSE fits the study's data set with a quadratic equation (refer to equation 2). In this research, multiple regression is denoted using β1 and β2 rather than b1 and b2. The final linear equation estimating the residual (the difference between the fitted dependent variable and the dependent variable – modelling the

outliers in the multivariate sample) takes the general form with systemic and random variables:

$$\acute{Y} = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \mu_i \quad [3]$$

The systemic variables are defined from the dataset and the random variables may take unknown values not explained by the predictor variables (co-variables). Equation (3) is the basis for multiple linear regression at the centre of this study.

Research implications

The data was checked to ensure that all the negative outliers were removed. The key results from ANOVA on the data set are presented in Table 2.

Table 2: Analysis of Variance (ANOVA) in the study constructs

Dependent variable	**Independent variable**	**R square** (R^2)	**Beta**	***t* value**	**Sig.**
Behavioural intention	Social influences	0.148	0.081	0.563	0.081
	Facilitating conditions	0.138	-0.246	-1.694	0.097
	Performance expectancy	0.161	0.252	1.764	0.085
	Effort expectancy	0.103	0.021	0.142	0.887

R squared (R^2) shows the degree of variance accounted for by each of the factors. In line with the empirical results shown above, performance expectance is the highest predictor variable accounting for the highest variance (16.1%) in adoption and use of the DWMS at MTI. Effort expectance with R^2 = 10.3% has the lowest variance. The total variance contributed by all the predictor variables or factors is 55%.

Standardised coefficients, representing how many standard deviations of dependent variables will change per standard deviation increase/decrease in the predictor variable, was therefore desired. Standardised regression coefficients obtained from the multiple regression procedures standardised to ensure that the variances between the dependent (identified variables) and the independent (BI) variables is one, are shown in Table 3. The data in Table 3 show that the unstandardised coefficients indicate that the data set has p-values greater than 0.05 (statistical significance) and therefore does not provide a good fit for the data. Therefore, it was necessary to do data fitting using least squares estimation as shown in Equation (4) below:

Table 3: Regression coefficients of identified variables

Model		**Unstandardised coefficients**		**Standardised coefficients**	**t**	**Sig.**
		B	**Std. error**	**Beta**		
1	(Constant)	1.660	.491		3.380	.002
	Effort expectancy	.019	.132	.021	.142	.887
	Performance expectancy	.251	.142	.252	1.764	.085
	Facilitating conditions	-.205	.121	-.246	-1.694	.097
	Social influences	.053	.094	.081	.563	.576

a. Dependent variable: behavioural intention

The LSE is used as a computationally convenient measurement of fit of the modelled variables and the reality that it attains in real world actual situations. From Equation (3), the LSE, which is the wellness-of-fit and the model equation from the study's data set using the standardised coefficients, will take the following form:

$$\boldsymbol{BI = 1.66 + 0.021x_1 + 0.252x_2 - 0.246x_3 + 0.081x_4} \quad (4)$$

Where BI = Behavioural Intention; x_1= Effort expectancy; x_2=Performance expectancy, x3=Facilitating conditions; x_4=Social influences

Equation (4) shows a linear regression between the dependent variable (BI) and the covariate/systemic variables providing justification for the identified factors explaining adoption and usage of DWMS by different individuals at MITI. The model equation (4) takes a linear projectile confirming the importance of each of the identified co-variables in influencing DWMS adoption and usage. Other than the factors espoused in the model equation above, the empirical study has identified computer anxiety and compatibility of the DWMS as additional factors that influence the decision whether to adopt and use the DWMS.

One of the limitations based on the study results, is that the implication of the factors articulated in this study are a snapshot of what matters most at this point in time. However, the dimensions of these factors might change in time to come, given the turbulent contextual settings of the study area. Despite this being the case, it provides important pointers towards successful design and implementation of DWMS (an EDRMS) in contextually similar environments within a space of ten or more years. Future studies need to explore the possibility of longitudinal studies which can have a more rounded articulation of the intra and interlinkages among the factors explored and their impact on overall successful implementation of technology platforms in business processes.

In order to inculcate the dynamism in DWMS-implementation, this study espouses a rigorous change in management strategy when implementing the DWMS, which will manage the changing dimensions of ICT-integration into the different organisations' business processes. This strategy has two components: individual change management and organisational change management coupled with overarching common factors as articulated in Abdulkadhim et al. (2015b). In this study, issues such as level of bureaucracy at MTI, availability of a competent human resource base to implement DWMS and technical capability were taken to be constant and negligible.

Conclusion

This paper intended to understand what factors influence the adoption and usage of a DWMS and further probed to what extent each of these factors contributed to the total variance as individual predictors. The study was motivated by the fact that MITI had implemented DWMS a long time ago but a recent probe into its usage proved that usage was low and, in many instances non-existent. The opportunity cost paid for ignoring adoption and usage of the DWMS is huge given the many benefits that come with EDRMS implementation on e-record management capability, information integration and overall business efficiency and effectiveness. The dependent variable determining the level of willingness of the individual to adopt and use a DWMS is modelled using behaviour intention.

The predictor factors from the adapted UTAUT account for a 55% variance in behavioural intention to adoption and use the DWMS at MITI. The major implication of this study is that the UTAUT's degree of precision in measuring technology adoption and use is not as high as reported in certain developing world contexts.

The major limitation of this study is that it was impossible to identify all the factors influencing behaviour intention, as human behaviour is difficult to measure. The other unidentified factors accounted for 45% of variance not accounted for by the predictor factors. This is an indication that there is a need for an in-depth study, preferably a longitudinal, unlike a cross-section study like this one that critically probes the factors of technology adoption in work processes by a large set of individuals in a developing world context. Such a study would propose a requisite extension of the UTAUT towards a global model of measuring technology adoption and use with higher predictive capacity. Since this study was done at one government department, it is not representative of all government ministries in Botswana.

This study offers an opportunity for the extension of the UTAUT to be used in similar developing world contexts. This point to the fact that the UTAUT model is limited in measuring factors influencing technology/system adoption especially in developing world contexts. Consequently, the UTAUT is not as efficient as perceived in explaining the factors influencing technology adoption.

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