

Human resource factors affecting enterprise resource planning acceptance



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Orientation: A section of the workforce in the studied entity was not fully appreciative of implemented enterprise resources planning (ERP) systems. The study viewed that using human resource (HR) factors as external variables of the technology acceptance model (TAM) could predict ERP systems acceptance and assist the organisation's ERP systems acceptance levels.

Research purpose: The study focused on evaluating HR factors that affected ERP system implementation at an identified government entity in South Africa.

Motivation for the study: The findings of this study could help increase ERP systems' acceptance and utilisation.

Research approach/design and method: This study used structured questionnaires in a survey of 154 employees who were selected from a government entity using convenience sampling methods. Data were analysed using descriptive statistics and structural equation modelling (SEM).

Main findings: This study identified organisational support to users, training, employee motivation and job satisfaction as key HR factors that affected users' attitudes and use of ERP systems.

Practical implications: There is a need for improved coordination between operational departments and HR units in ERP systems implementation as factors and organisational areas under an HR manager's control play a major influence in ERP acceptance and use. The HR function has an important role in managing the identified HR factors that, in turn, influence ERP systems usage.

Contribution/value-add: This study established a critical link between HR-related factors and change and ERP systems acceptance. It puts HR managers at the centre of technology acceptance in organisations as factors within their control determine user attitude and intentions towards such technologies.

Keywords: support; motivation; job satisfaction; change management; ERP.

Introduction

The State Information Technology Agency (SITA, 2020) highlighted a high rate of failure in the implementation of new Information and Communication Technology (ICT) projects in South African government departments and units. The SITA (2020) further commented that poorly implemented or adopted ICT systems eventually result in poor public service delivery as the new systems fail to support desired productivity and quality. This article will therefore contribute to the development of knowledge relating to enterprise resources planning (ERP) implementation in the face of this stated literature gap. The SITA (2020) considered the human resources (HR) aspect of digital transformation as a critical enabler of ICT programme success by 'providing an enabling environment supportive of the digital transformation'. This particular view motivated the focus of HR factors in ERP implementation at the researched government entity. While South African government entities are discussed as facing severe challenges when it comes to ICT projects because of a myriad of challenges, including HR-related factors, not much has been researched on ERP implementation within the same government entities. Some researchers such as Muyambi (2019) studied ERP implementation challenges but not from a HR perspective that tended to live the HR factors unaddressed.

Kannan, Sujatha and Seema (2011) asserted that HR practitioners play a critical role in technology and innovation acceptance in modern-day organisations. Kaur, Sidhu, Sharma, Narang and Kaur

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(2014) also found that HR managers' roles were changing and now included technology and business model support roles through recruiting and motivating the right human capital that supports organisational technological advances. Human resource practitioners achieve this through managing various factors in their control. For this study, these factors were staff support, job satisfaction, employee motivation, training and change management. Hence, the study focused on the implementation of ERP systems and the effects of factors under the HR manager's control in the acceptance and use of these systems.

Ağaoğlu, Yurtkoru and Ekmekçi (2015) stated that ERP systems consist of a set of integrated software modules in a centralised database that through automation, integration of business processes, data sharing and real-time access to information enable an organisation to effectively and efficiently manage the utilisation of resources such as HR and materials, production, planning and finance. Enterprise resources planning systems are designed to assist organisations to work more efficiently and effectively and with the successful implementation thereof these organisations can achieve a competitive advantage (Bibi & Hassan, 2014). Several investigations reveal that ERP systems implementation has a high failure rate averaging over 50% (Matende & Ogao, 2013). With the given view in mind, it was necessary to investigate the factors affecting the adoption of such systems at a South African government printing entity whose existence support the printing and publication of important government documents.

Research purpose and objectives

The primary objective of this study focused on the implementation of ERP systems and the effects of factors under the HR manager's control in the acceptance and use of these systems. Specifically, five factors were drawn from the literature, which include support, employee motivation, job satisfaction, change management and training. The study aimed to show how these factors independently and conjointly affected employees' attitude towards using (ATU), behavioural intention to use (BIU), perceived usefulness (PU) and perceived ease of use (PEoU) of ERPs. The above-mentioned research objectives were motivated by resistance issues and a generally low adoption and knowledge of a 2012-implemented ERP system at the studied government entity.

Literature review

The decision to implement ERP systems in an organisation must be well planned, and various technological and organisational issues must be managed carefully to avoid possible costly implementation failures (Matende & Ogao, 2013, p. 520). This literature reviews the various factors and components of the modified TAM whose applicability to the government entity under study will eventually be tested in the data analysis section as illustrated in Figure 1.

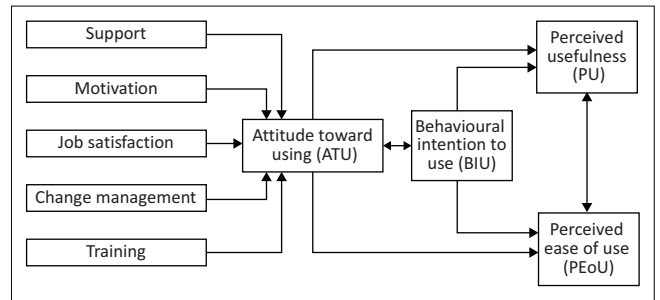


FIGURE 1: Modified technology acceptance model.

This review starts with attitude, change management, support, training, job satisfaction and employee motivation as organisational issues to consider when implementing ERP systems. Afterwards, components of the original TAM are discussed. The external factors chosen for this study fall within the HR and organisational behaviour domains. This study being a case study external factors were considered for the model based on the specific situations at the government entity.

Attitude

According to De Waal and Batenburg (2014), attitude is a feeling felt by users concerning change. Users' attitude on ERP systems impacts their behaviours, namely the intent to utilise the system to its full potential and the intent to get assistance. If the user's attitude is negative towards ERP systems, their usage will decrease (Esteves, 2014). Consequently, a positive attitude encourages greater usage. Negative attitudes are prevalent when there is low participation in ERP activities and development (De Waal & Batenburg, 2014). In order to enhance the probability of positive attitudes in systems implementation processes, Nwankpa (2015) recommended that users be provided with technical support and resources, while Esteves (2014) recommended training.

Change management

Change management is a systematic activity that prepares employees for environmental changes within an organisation (Hornstein, 2015). Organisations need constant change to attract and retain customers, stay up to date with new and improved technology and be in a position to compete with rivals. The implementation of ERP systems in an organisation is often accompanied by substantial changes in organisational structure, employees' roles and jobs, reward systems, control and coordination mechanisms and working processes (Rajan & Baral, 2015). According to Ramburn and Seymour (2014), managing change is undoubtedly one of the principal concerns of ERP systems implementation. Inadequate communication channels and planning together with non-existent change management initiatives result in employees' confusion, instability and resistance (Matende & Ogao, 2013). This study takes a view that change management is an organisational change dimension that HR is responsible for (El-Dirani, Hussein & Hejase, 2019).

Support

In ERP systems use, user support relates to the technical assistance that users get when there is need. This assistance includes problem identification, error resolution, proper usage advice (Vlasov, Chebotarev, Rakhimov, & Kruglikov, 2017) and systems customisations to meet specific user needs (Tarik, Muharem, & Taric, 2020). The quality of technical support that users get positively influences their perceptions of ERPs and increases adaptation potential (Tarik et al., 2020). Odoyo and Ojera (2020) added that user support also includes strategic support from management, and this involves developing an environment where users are helped to deal with other non-technical challenges such as dealing with change (Odoyo & Ojera, 2020). This support also includes the provision of user training.

Training

The measurable success of any organisation relies primarily on a competent, well-trained and accountable workforce. According to Elnaga and Imran (2013), employees are the most valuable asset of an organisation as they can positively and adversely affect its profitability and survival. According to Shibly, Abdullah and Ahmed (2019, p. 1017), training is 'the central factor for a successful new technology adoption by employees'. Integrated ERP systems are complex, thus making training crucial for an in-depth understanding of how the systems operate and their optimal uses. Therefore, an organisation needs to plan for training programmes for its employees to enhance their required abilities and competencies in using the implemented ERP systems (Elnaga & Imran, 2013). An understanding of effective training strategies is also pertinent to the investigation of the aspects influencing the use of ERP systems (Arasanmi, 2016). The comprehension of training strategies and the impact these have on employees' work can lead to improved ERP training outcomes (Arasanmi, 2016).

Job satisfaction

Eslami and Gharakhani (2012) defined job satisfaction as a pleasing emotional state experienced by a person when receiving a positive review of one's output. The achievement of employees' work objectives can affect and influence work productivity. According to Aarabi, Saman, Wong, Azadnia and Zakuan (2012), ERP systems are significant because they assist organisations to achieve their business objectives and increase employees' productivity and operational efficiency in the work environment. The user's level of satisfaction is improved by the quality of training and support, particularly system support and information transparency. Studies have shown employees' keenness to use ERP systems because of their need for convenience and job satisfaction (Roses, 2011).

Employee motivation

According to Tambovcevs and Tambovceva (2013), motivation is an urge to achieve a specific desire, which leads an individual

to become engaged in a behaviour. Employee motivation, the willingness to adapt to a new technology, the capacity for learning, quality of training and knowledge sharing mechanisms are important drivers of ERP systems use among employees (Kwak, Park, Chung, & Ghosh, 2011). To attain their benefits, ERP systems must be used effectively and continuously, and it is, therefore, necessary for management to comprehend how to motivate the users towards such an effective and continued use (Bhattacharjee & Lin, 2015). A lack of motivational factors could result in the compelled use of ERP systems, consequentially leading to disruptive behaviour that could adversely impact operational efficiency (Recker, 2016).

Technology acceptance model

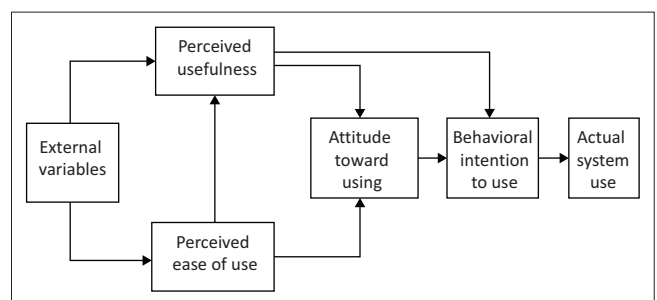
The TAM is a behavioural model based on Ajzen and Fishbein's (1980) theory of reasoned action (TRA). The development of the TAM was first presented by Fred Davis in 1989. The TAM states that when presenting new technology to users, their decisions about how and when to use the technology are affected by numerous aspects. System-salient beliefs related to the PU and the PEOU of technology influence a person's intent to voluntarily utilise the technology (Al-Nawafleh, Ali ALSheikh, Abdulllah, & Tambi, 2019).

Thus, the TAM is used for predicting and explaining user behaviour and IT usage (Davis, 1989). The variables of the TAM are illustrated in Figure 2.

The variables of the TAM consist of PEOU, PU, ATU, BIU and actual system use. The PU and PEOU are the two most important determinants of system usage and intention to use (Teo & Zhou, 2014) and predictors of ATU and BIU (Lule, Omwansa, & Waema, 2012). The previous research confirmed that TAM is an acceptable model that represents an important theoretical framework to explain and predict technology acceptance behaviour (Al-Gahtani, 2016). The five variables of the TAM are explained as follows:

Perceived usefulness

Davis (1989) defines PU as 'the degree to which a person believes that using a particular system would enhance his or her job performance'. In the TAM framework, PU is hypothesised to be the direct predictor of the intention to use the technology of interest (Park, Rhoads, Hou, & Lee, 2014). Lin and Wang (2012) indicated that PU is



Source: Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly* 13(3), 319–340. <https://doi.org/10.2307/249008>

FIGURE 2: Technology acceptance model.

positively associated with continuance intention in the context of learning.

Perceived ease of use

Perceived ease of use is 'the degree to which a person believes that using a particular system would be free of effort' (Davis, 1989). According to the TAM, PEOU primarily influences intended acceptance (Abdullah, Ward, & Ahmed, 2016). As with many technology-driven systems, the adoption of ERP systems should be predicted by PEOU (Davis, 1989). In the context of this study, PEOU refers to the extent to which users believe that their continued use of the ERP systems is free of effort. If a system is relatively easy to use, individuals will be more willing to learn about its features and made continued use of it (Hamid, Razak, Bakar, & Abdullah, 2016).

Attitude towards using

According to Al-Smadi (2012), ATU described someone's approving or disapproving evaluation with regard to the behaviour in question. According to TAM, greater PU and PEOU of an information system will positively affect users' ATU. The ATU influences the intention to utilise the system leading to the actual utilisation if such an intention is strong enough and is supported (Al-Smadi, 2012).

Behavioural intention to use

Concerning TAM, BIU defines the actual utilisation of an information system and thus ascertains technology acceptance (Alharbi & Drew, 2014; Davis, 1989). Teo et al. (2019) indicated that BIU is a necessary process in behaviour and is the decisive factor before the actual behaviour appears. Al-Smadi (2012) stated that BIU measures the depth of a person's inclination to use a system.

Actual system use

According to Isaac, Abdullah, Ramayah and Mutahar (2017), actual system use is defined as how frequently the technology is used and usage times. Delone and McLean (2016) indicated that among the most important directions in technology usage is the need for assessing the impact of system usage on IS success factors such as performance. According to TAM, users accept to use a new system after their perception that the system is useful and easy to use (Davis, 1989).

External factors

This study will substitute support, training, change management, job satisfaction and motivation as the external factors in the TAM model. Thus, critical HR factors that have been discussed as major drivers of employee attitude across the literature were examined within a TAM context.

Summary of factors to constitute new model

The model that will be tested in the article consists of PU, PEOU, ATU, BIU and actual system use as the original TAM

factors. The model will substitute support, training, change management, job satisfaction and motivation as the external factors in the TAM model. Except for this substitution, the original factors of the TAM will be maintained.

Research methods

Research paradigm

The research method was guided by the positivist paradigm. Positivism is a paradigm primarily developed for the natural sciences. It focuses on the objectivity of findings and the use of systematic methods aimed at producing highly reliable results.

Research approach

This study applied a quantitative research method using an explanatory research design. An explanatory study was relevant for testing TAM as a model of interest to the study in as far as it relates to the five HR factors.

Research design

A survey design was used for data collection that was analysed to examine the frequency and relationships between constructs such as support, motivation, job satisfaction, change management and training (Salkind, 2014). Descriptive research was used to rate and describe relevant factors that influence the effective implementation of ERP systems, while structural equation modelling (SEM) was used to test the relationships among HR and behavioural factors affecting ERP systems use.

Population and sample

The target population identified for the study was 256 administrative employees who worked with ERP systems in the government entity. The researcher adopted the convenience non-probability sampling strategy to ensure the engagement of willing best-placed ERP system users. With the total population of $N = 256$ end-users at the government entity, the researcher used the minimum sample size of $n = 154$ at a 5% margin of error and a 95% confidence interval.

Data collection processes

Data were collected using an online structured questionnaire. Likert scale questions were used to rate the participants' views on the tested variables. A pilot study was conducted and 15 questionnaires were tested to ensure that most of the possible obstacles and errors within the questionnaire could be identified and corrected before data collection commenced (Babbie, 2013). Cronbach's alpha coefficient was utilised as a reliability measure to establish the internal stability statistics for this study.

Statistical analysis

The study approach was to collect and rate data on the extent to which research participants were satisfied with the

organisation's management of ERP support, training and change management. It then assessed the participant's job satisfaction and motivation. The plan was to assess how the given external factors eventually influence ATU, BIU, PEoU and finally actual ERP usage. Prima facie, the HR factors were therefore independent variables that affected ATU and the other behavioural elements in TAM.

Descriptive statistics were used to analyse the data. Pearson's chi-square test was used to test for correlations between defined variables. The results were regarded as significant if the probability value was below the 0.05 level of significance. Stat V15 was used to analyse the data. Structural equation modelling was used to test the hypothesis that the modified TAM consisting of support, training, change management, job satisfaction and motivation as the external factors can explain ERP systems usage at a government printing entity. Under this hypothesis, PU, PEoU, ATU and BIU are tested for any moderation and/or mediation effect in the relationship between the given external factors and actual system use. Structural equation modelling was performed using the partial least squares path modelling approach (PLS-PM).

Research procedure and ethical considerations

This study took full consideration of the fundamental research ethics, namely informed consent, anonymity and confidentiality, voluntary participation and permission to withdraw from the study. Permission was obtained to conduct the research at a government entity of interest.

Ethical considerations

The researchers will conduct the study according to the procedures and methods indicated in the approved proposal, particularly in terms of any undertakings and assurances made regarding the confidentiality of the collected data.

The researchers will act within the parameters of any applicable national legislation, professional code of conduct, institutional guidelines and scientific standards relevant to the specific field of study (The Faculty of Management Sciences Research Ethics Committee Tshwane University of Technology FCRE2018/FR/09/014-MS).

Results

Demographic results

By gender, 61.04% were female and 38.96% were male respondents. By age group, 50.65% of the respondents were in the age group 24–42 years, 48.70% in the age group 43–54 years and 0.65% above 55 years. The majority of the respondents had either a diploma, degree or postgraduate qualification (89.60%). Of interest is that 67.53% of the respondents were employed for more than 5 years at the entity. This indicates a relatively stable and experienced workforce that has worked with the ERP systems in question for a considerable time. The data show that 44.16% of the respondents were from the finance department, 28.57% from

the supply chain department and 27.27% from the production department.

Human resource factors

The respondents' Likert scale ratings of statements on support, training, change management, job satisfaction and motivation are briefly discussed. On support, 62.3% of the respondents agreed they knew where to get assistance, 39.6% agreed that such assistance is provided by a specific person, while 52.6% disagreed they got assistance with ERP. In the survey 44.8% agreed that specialised ERP instruction was available to them, 79.2% agreed they went for training and 43.5% disagreed on receiving ongoing training. It is interesting to observe that only 47.4% of the respondents 'agreed' and 18.8% 'strongly agreed' that in their organisation change is communicated before it is implemented, which is very crucial. Also, 29.9% disagreed that the organisation gave enough planning time for ERP change. Concerning job satisfaction, the results show that 85.1 and 74% agreed that their jobs were satisfying and fulfilling, respectively. Also, 33.8% disagreed that they would prefer to spend the rest of their careers at the organisation. On motivation, 90.9% of respondents agreed that their manager motivated them, while 90.3% also agreed that their job enabled them to fully utilise their skills. At the same time, 26.6% did not believe they were recognised for their work, while 19.5% did not feel appreciated.

Generally, the respondents positively rated (agreed and strongly agreed) the entity's performance on support, change management, training, job satisfaction and employee motivation. At the same time, there were small but considerable groups that negatively ranked the entity's performance on the same variables.

Enterprise resources planning behavioural factors and perceived usefulness

Table 1 presents the descriptive statistics on PU, PEoU, BIU and ATU. A sample of 154 respondents was used.

On average, the respondents were generally positive that using ERP systems at the government entity would enhance their job performance ($M = 1.9$; $s.d. = 0.79$). It is evident from the results that PU of ERP systems relates to better decision making, enhances confidence and effectiveness, and increases productivity in the work environment. On PEoU, they were positive that if a system is relatively easy to use, they will be more willing to learn about its features and ultimately continue using it ($M = 1.98$; $s.d. = 0.61$). A total of 83.1% of the respondents 'agreed' that ERP systems do not require much effort to use. Also, only 42.2% of the respondents believed that they become skilful while using ERP systems. Overall, on average, the data also indicate that the respondents were very positive on the BIU of ERP systems ($M = 1.5$; $SD = 0.54$). Also, on average, the respondents were generally positive on use attitude (ATU) towards ERP systems ($M = 2.2$; $SD = 0.87$).

TABLE 1: Descriptive statistics – Attitude, intention and usage factors.

Variable	SA	A	N	D	SD
Perceived usefulness ($M^* = 1.9$; $s.d.^* = 0.79$)					
Using ERP systems enables me to accomplish my tasks quicker.	31.8	45.5	11.0	1.3	10.4
Using ERP systems improves my job performance	31.8	46.1	16.9	5.2	–
Using ERP systems increases my productivity.	39.0	49.4	6.5	5.2	–
Using ERP systems enhances my effectiveness on the job.	39.0	55.8	–	5.2	–
ERP systems provide me with information that leads to better decisions.	38.3	53.9	2.6	5.2	–
Perceived ease of use ($M = 1.98$; $s.d. = 0.61$)					
The interface of ERP systems is clear and understandable to me.	30.5	61.7	2.6	–	5.2
My interaction with ERP systems does not require much effort.	9.1	83.1	–	–	7.8
Learning to use ERP systems is easy for me.	24.0	74.7	–	0.7	0.7
I find ERP systems flexible to interact with.	9.7	78.6	0.7	7.1	3.9
It is easy for me to become skilful when using ERP systems.	37.0	42.2	18.8	2.0	–
Behavioural intention to use ($M = 1.5$; $s.d. = 0.54$)					
I intend to continue to use ERP systems in the future.	52.6	45.5	–	2.0	–
I intend to use ERP systems in my job as often as possible.	55.2	42.9	–	2.0	–
I expect that I would use ERP systems in the future.	68.8	31.2	–	–	–
I plan to use ERP systems in the future.	61.7	32.5	0.7	0.7	4.6
Attitude towards use ($M = 2.2$; $s.d. = 0.87$)					
I am satisfied with my participation during the decision-making process.	0.7	68.8	7.1	20.8	2.6
I am given enough work to fill my workday.	50.0	35.7	–	2.6	11.7
I generally look forward to coming to work.	48.1	24.7	22.1	1.3	3.9
I feel positive about my future at the government entity.	8.4	61.0	13.0	16.9	0.7

M^* = mean, $s.d.^*$ = standard deviation; ERP: enterprise resources planning.

Factor analysis

Average variance explained (AVE) is an indicator of how much the construct explains the variance of its observed variables (Ravand & Baghei, 2016). The final AVE for the variables is shown in Table 2.

The given AVEs were observed once all statements and questions that had loadings below 0.5 were removed. In total, 11 statements with loadings ranging between -0.61 and 0.47 were removed.

Reliability tests

Cronbach's alpha was used to evaluate how well grouped indicators measure their corresponding latent constructs or to test the internal consistency among the grouped variables (Sanchez, 2013, p. 57). The alphas were as follows: PU (0.83), PEoU (0.83), BIU (0.85), Support (0.84), Training (0.85), Change management (0.83), Job satisfaction (0.81), Motivation (0.8) and ATU (0.82). This means that the multiple items in each dimension reliably measured the same underlying construct as all alphas were above 0.7 (Hatcher & O'Rourke, 2013).

Tests for normality

Kurtosis and skewness tests were carried out to measure normal distribution. The results are shown in Table 3:

In all the variables, Kurtosis fell within a range between -2.0 and 2.0, leading to a conclusion that the data were close to a normal distribution and therefore eligible for SEM.

Pairwise correlation

Table 4 shows the association between the adopted TAM model and the factors influencing the utilisation of the ERP systems at the government entity.

TABLE 2: Average variance loadings – model factors

Variable	AVE (factor loadings)
ATU	0.65
BIU	0.76
Change management	0.71
Job satisfaction	0.62
Motivation	0.64
PEoU	0.60
PU	0.84
Support	1.00
Training	0.76

ATU, attitude towards using; BIU, behavioural intention to use; PU, perceived usefulness; PEoU, perceived ease of use.

TABLE 3: Skewness and Kurtosis tests for normality

Variable	Kurtosis	Skewness
PU	1.245	1.971
PEoU	-0.941	-1.114
ATU	0.224	0.14
BIU	0.1489	0.214
Support	1.12	0.224
Training	0.284	0.365
Change management	1.665	0.985
Job satisfaction	2.2	1.25
Motivation	0.5874	0.214

ATU, attitude towards using; BIU, behavioural intention to use; PU, perceived usefulness; PEoU, perceived ease of use.

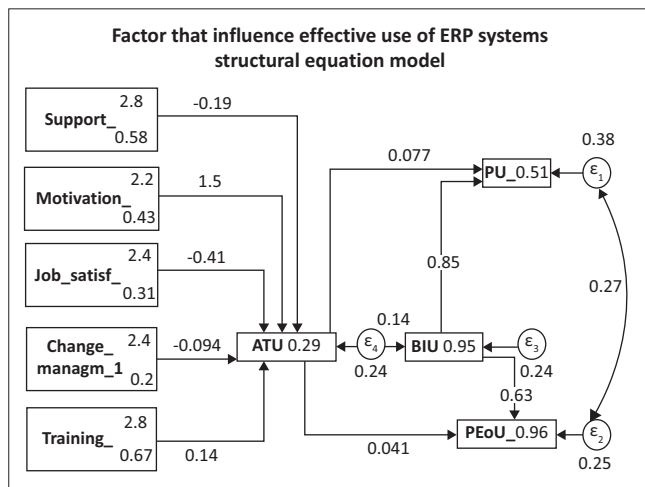
All the HR variables were positively correlated with attitude, indicating that a unit increase in each of these factors increased the attitude to use the ERP systems. Motivation had the strongest correlation coefficient with ATU ($r = 0.87$, $p < 0.05$), followed by job satisfaction ($r = 0.56$, $p < 0.05$) and change management ($r = 0.53$, $p < 0.05$). Change management was weakly and positively associated with PU ($r = 0.225$, $p < 0.05$), suggesting a unit increase in change management is likely to result in a 0.2 times increase in PU. Job satisfaction was moderately and positively associated with PU ($r = 0.473$,

TABLE 4: Correlation between perceived usefulness, perceived ease of use and independent variables.

Variable	PU	PEoU	ATU	BIU
PU	1.0000	-	-	-
PEoU	0.9243*	1.0000	-	-
ATU	0.3054*	0.2693*	1.0000	-
BIU	0.6088*	0.5750*	0.3819*	1.0000
Support	0.1458	0.1326	0.1878*	-0.1559
Training	-0.0497	-0.0619	0.3223*	-0.2551*
Change management	0.2251*	0.2748*	0.5295*	0.2928*
Job satisfaction	0.4736*	0.4895*	0.5567*	0.1829*
Motivation	0.4414*	0.4423*	0.8740*	0.4100*

*Correlation is significant at 5% level-2 tail.

ATU, attitude towards using; BIU, behavioural intention to use; PU, perceived usefulness; PEoU, perceived ease of use.



ERP, enterprise resources planning.

FIGURE 3: Adapted technology acceptance model and path analysis of variables.

$p < 0.05$), suggesting a unit increase in job satisfaction to use the system is likely to result in a 0.5 times increase in PU. Motivation to use ERP systems was moderately and positively associated with PU, ($r = 0.441, p < 0.05$), suggesting a unit increase in the respondents' motivation to use the system is likely to result in a 0.6 times increase in PU. Support ($r = 0.188, p < 0.05$) and training ($r = 0.322, p < 0.05$) were weakly and positively associated with attitudes to use ERP systems. As support increases and training improves so do the respondents' attitudes to using ERP systems. The significant correlations among the given variables justify testing them in a single model.

Structural equation modelling results

In the SEM, the observed endogenous variables were BIU, PU, PEoU and ATU. These were the dependent variables, while ATU and BIU were also moderators. Observed exogenous variables were support, training, change management, job satisfaction and motivation. The model used a maximum likelihood estimation method with the fitting target model log-likelihood of 764.64592. The results of relationships between variables are displayed here.

The path analysis in Figure 2 illustrates that there were five independent variables (exogenous) to ATU, and each

arrow depicts a structural equation. The direction of the arrow points to the dependent variable and points away from the independent variable. The second set of arrows points from ATU towards two dependent variables in the SEM, PU and PEoU directly and indirectly through BIU. The path analysis provides the alternative direct and indirect causal pathways between support, training, change management, motivation, job satisfaction (exogenous variables) and two moderators BIU and support. Table 5 reflects the SEM factors that influence the effective utilisation of ERP systems.

Human resource factors and attitude towards enterprise resources planning use

There was a negative relationship between support in the use of ERP systems and ATU ($B = -0.186, p < 0.05$). This suggests that a unit drop in support for the utilisation of the ERP systems is likely to result in an 18.6% decrease in ATU; hence the lower the support, the lower or negative the attitudes to utilise ERP systems. Motivation was strongly related to ATU ($B = 1.47, p < 0.05$). The results suggest that a unit improvement in employee motivation is bound to improve their attitude by over 100%. Job satisfaction was negatively related to ATU ($B = -0.413, p < 0.05$). The results suggest that as job satisfaction declines, so does the ATU ERP systems. When employees derive satisfaction from their job, they will have a positive attitude towards their work and will ensure that their productivity in the work environment is maximised. The ERP training was positively related to ATU ($B = 0.140, p < 0.05$). The results suggest that a unit improvement in training is likely to result in as much as a 14% increase in attitudes towards ERP systems; hence, training is a predictor of attitudes in this respect but a weak moderator of PU. Change management had nothing to do with employees' ATU of ERP systems as its beta was not statistically significant at a 5% level.

Enterprise resources planning behavioural factors and perceived usefulness

There was a positive relationship between the BIU and ERP systems and the PU ($B = 0.846, p < 0.05$). This suggests that a unit improvement in the BIU of ERP systems (willingness to use a system while performing a certain behaviour), is likely to result in as much as an 85% increase in the use of the system. Hence, BIU was a strong predictor of PU of ERP systems. There was no relationship between the ATU of ERP systems and the PU ($B = 0.077, p > 0.05$). Hence, ATU had nothing to do with the PU of ERP systems. There was a positive relationship between the BIU of the ERP systems and the PEoU of ERP systems ($B = 0.630, p < 0.05$). This suggests that a unit improvement in the BIU of the ERP systems is likely to result in as much as a 63% increase in the PEoU of ERP systems. Hence, BIU the ERP or willingness to use the system while performing a certain behaviour was a moderate predictor of PEoU of ERP systems. There was no relationship between the ATU of ERP systems and the PU ($B = 0.041, p > 0.05$). Attitude towards using had nothing to do with PEoU of ERP systems in this study. There was a

TABLE 5: Structural equation modelling factors that influence the effective utilisation of enterprise resources planning systems.

Coefficient of variation	Standard deviation	Standard error	z Standard score	$P > z$	95%	Confidence interval
Structural						
BIU	<-	-	-	-	-	-
ATU	0.236	0.046	5.13	0.000	0.146	0.326
Construct	0.947	0.108	8.75	0.000	0.735	1.159
PU	<-	-	-	-	-	-
BIU	0.846	0.101	8.37	0.000	0.648	1.044
ATU	0.077	0.062	1.24	0.215	-0.045	0.200
Construct	0.510	0.166	3.07	0.002	0.185	0.835
PEoU	<-	-	-	-	-	-
BIU	0.630	0.081	7.77	0.000	0.471	0.789
ATU	0.041	0.050	0.82	0.414	-0.057	0.139
Construct	0.965	0.133	7.23	0.000	0.704	1.226
ATU	<-	-	-	-	-	-
Support	-0.186	0.093	-2.00	0.046	-0.368	-0.004
Motivation	1.465	0.093	15.83	0.000	1.284	1.646
Job satisfaction	-0.413	0.110	-3.76	0.000	-0.628	-0.198
Change management	-0.094	0.102	-0.93	0.353	-0.293	0.105
Training	0.140	0.076	1.84	0.066	-0.009	0.290
Construct	0.287	0.183	1.57	0.116	-0.071	0.646
variable(e.BIU)	0.245	0.028	0.1956329	0.3058079	-	-
variable(e.PU_)	0.385	0.044	0.3076315	0.480881	-	-
variable(e.PEoU_)	0.248	0.028	0.1985525	0.3103718	-	-
variable(e.ATU)	0.139	0.016	0.1112164	0.1738504	-	-
cov(e.PU_ e.PEoU_)	0.273	0.033	8.22	0.000	0.208	0.338

LR test of model versus saturated: $\chi^2(15) = 163.51$, Prob > $\chi^2 = 0.00$.

ATU, attitude towards using; BIU, behavioural intention to use; PU, perceived usefulness; PEoU, perceived ease of use.

positive relationship between the ATU of ERP systems and the BIU of ERP systems ($B = 0.236$, $p < 0.05$). This suggests that a unit improvement in ATU of ERP systems is likely to result in as much as a 24% increase in the BIU of the system, hence ATU was a predictor of BIU of ERP systems and a moderator of PU or the willingness to use a system while performing a certain behaviour.

Post model estimation

Kline (2005) suggested that at a minimum the following indices should be reported: the model Chi-square, root mean square error of approximation (RMSEA), comparative fit index (CFI) and standardised root mean squared residual (SRMR). The model chi-square assesses the overall fit and the discrepancy between the sample and fitted covariance matrices, the p -value > 0.05, which denotes good fit. The RMSEA is < 0.08, which indicates neither good nor bad fit. The CFI compares the fit of a target model to the fit of an independent, or null, model. The value (0.875) is below the cut-off good fit, $CFI \geq 0.90$, suggesting some compromise in the model. The Tucker Lewis index (TLI), an NFI of 0.675, indicates that the model improves the fit by 67.5% relative to the null model, below the recommended ≥ 0.95 TLI value. However, going by Hu and Bentler (1999), CFI or IFI, with values greater than approximately 0.95, in combination with the SRMR (good models < 0.08) or the RMSEA (good models < 0.06) represent a good fit. The study's model does not meet this full specification albeit its RMSEA, CFI and SRMR fall close. Both baseline comparison indices fall below the goodness-of-fit cut-off points because of a sample size of < 200. The SRMR is < 0.08, indicating model fit that is not good but cannot be taken to be

too bad either. Thus, the model is generally fit for its purpose, albeit there are a few compromises that require one to interpret the results with caution.

Discussion

As far as the researcher could investigate, there are no other studies that combined the TAM with support, training, change management, job satisfaction and motivation as external factors. However, several studies have captured relationships between one and more of these external factors with ERP use, with some of the studies also not using the TAM as a theoretical framework. One of the closest studies was that of Rajan and Baral (2015) who applied the TAM in investigating ERP use. They used different external factors, namely individual, organisational and technical factors, and training and organisational support (under organisational factors) were the only two subfactors in common with this study. Overall, they found both factors to have a positive relationship with ATU.

Human resource factors and attitude towards enterprise resources planning use

There was a negative relationship between support in the use of ERP systems and ATU, suggesting that a drop in support will result in a decline in attitudes to using ERP systems. The negative effect of support on ATU reflects the views of Nwankpa (2015) who recommended that information system (IS) users be provided with technical support and resources as a way of facilitating the usage of such IS. Tsai, Lee, Liu, Lin and Chou (2012) also observed that users' level of satisfaction with IS is improved by the

quality of training and support, particularly system support and information transparency they get as they make use of the systems. However, neither both studies were framed with the TAM context nor did they contain all the external variables used in this study. A study by Shibly et al. (2019) captured organisational support and training as critical components in ERP use attitudes and behaviours. While it agrees with this study on the significance of organisational support in ERP implementation it clashes with it in viewing training as significantly affecting ERP implementation. Shibly et al.'s (2019) study did not use the TAM but like this study, it capture organisational support and training as a variable of interest in ERP implementation. The non-significance of training as an influencer of ATU is interesting considering the broader view that this factor is crucial in ERP and ICT systems in general, more so in an environment where ICT skills are described as scarce.

Motivation was strongly related to ATU. This resonates with the views shared by Bhattacharjee & Lin (2015) that to attain benefits, ERP systems must be used effectively and continuously and it is, therefore, necessary for management to know how to motivate the users, thus ensuring that the systems are continually in use. Kwak et al. (2011) assertion of the importance of motivation in the effective use of ERPs is also evident in the results. Job satisfaction was negatively related to ATU suggesting that as job satisfaction declines, so does the ATU ERP systems. The findings are consistent with the arguments by Nwankpa and Roumani (2014) who saw job satisfaction as a critical driver of ERP usage among employees. However, the given studies did not look at motivation as an external TAM factor or apply the general TAM model as an analytical framework.

In the findings, change management was not statistically significantly associated with employees' ATU of ERP systems. This is despite various arguments and findings that positive change management will result in increased willingness to use IS, including ERP systems. For instance, Tarhini, Hone and Ku (2015) found that ERP systems implementation faced resistance despite improved processes and functionalities indicating the importance of change management in the process. While using TAM, Tarhini et al.'s (2015) study used different external factors with facilitating conditions, which captured change management as being the nearest factor to this study's external factors and this might have affected the differences in results.

There was a positive relationship between the BIU and attitude towards ERP systems. This finding resonates with the original TAM by Davis (1989), which hypothesised that an attitude of a positive technology use resulted in a positive BIU and vice versa. Furthermore, as predicted by the TAM there was a positive relationship between the BIU the ERP systems and the PEOU of ERP and between ATU the ERP systems and the BIU ERP. However, there was no relationship between the ATU of ERP systems and the PU as hypothesised by the original TAM and substantiated by Teo and Zhou (2014). However, the SEM results on the TAM from these

studies also did not incorporate support, training, change management, job satisfaction and motivation as external factors. The presence of different variables could therefore have affected the results.

Practical implications

Thus, the results point out that HR factors are important drivers and determinants of the actual usage of ERP systems. Such usage is, however, also affected by PEOU and ERP usage behavioural intentions. Management must take cognisance of important HR factors when implementing new IS, specifically ERPs. While ERPs generally fall in the accounting and ICT domains, HR functions are critical for driving employees and management towards developing the right attitudinal factors that will facilitate successful systems utilisation. This is in view of their cross-organisational nature that requires coordination across departments and their cross-organisational effects on information sharing, operational effectiveness and security (Bibi & Hassan, 2014). The HR managers must therefore provide adequate training support to employees and enhance ERP utilisation (Bibi & Hassan, 2014). Support could be provided using both online and direct or face-to-face interactions that are designed with users' ICT literacy in mind.

Limitations and recommendations

As a limitation, the study used a sample from one government department. Any references made in this study might not be representative of experiences in other government departments.

The study makes the following recommendations:

- Expert support must be readily available and accessible to address ERP systems problems experienced by the users.
- To ensure continued optimal utilisation of the ERP systems, the study recommends that specialised training must be intensified to realise organisational value from ERP systems usage.
- Management should provide incentives and recognition for the ERP systems users to keep them motivated and satisfied with their jobs.

The recommendations also centre on the need for improved coordination between operational departments and HR units to ensure the nexus between HR and technology is effectively brought out in ERP systems planning and implementation.

Conclusion

Management must take cognisance of important HR factors when implementing new IS, specifically ERPs. While ERPs generally fall in the accounting and ICT domains, HR functions are critical for driving employees and management towards developing the right attitudinal factors that will facilitate successful systems utilisation.

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Competing interests

The authors have declared that no competing interests exist.

Authors' contributions

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Data availability

The data that support the findings of this study are available from the corresponding author (T.M.) upon reasonable request.

Disclaimer

The views expressed in the submitted article are of the authors' and not an official position of the institution they represent.

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