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Information and Communication Technology (ICT) Risk Models and Performance of Small and Medium Enterprises (SMEs)

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ABSTRACT The focus of this study was to investigate the relationship between: (1) *Information and Communication Technology* (ICT) operational risk management (ORM) and (2) performances of SMEs. In order to understand the degree of association between the performances of SMEs and the independent variables, multiple regression was performed. The study was based upon survey design to collect the primary data from 107 respondents using the simple random sampling technique. The findings of the distribution revealed that only one variable made significant percentage contribution to the level of ICT operation in SMEs, thus (Payback method) ($\beta = 0.410$, $p < .000$). Conclusively, in answering the two questions (1) degree of variability explained and (2) predictors, the results revealed that the variables contributed approximately 88.4% of the variations in evaluation models affecting ICT adoption within SMEs. Following the findings of the current research, it is recommended that managers in SMEs need to be equipped to identify, analyse and manage ICT operation from a more diverse range of sources and contexts.

INTRODUCTION

An information system can provide business value for a firm in many different ways, including increased profitability and productivity. Some, but not all, of these business benefits can be quantified and measured (Froot and Stein 1998; Balbas 2007). It has been pointed out that "one of the fundamental roles of banks and other financial intermediaries is to invest in assets which, because of their information-intensive nature, cannot be frictionlessly traded in the capital markets" (Froot and Stein 1998: 55). The authors indicate that "the standard example of such an illiquid asset is a loan to a small or medium-sized company (Froot and Stein 1998: 55). It is imperative to also note that:

At the same time that they are investing in illiquid assets, most banks also appear to engage in active risk management programs. Given a fixed capital structure, there are two broad ways in which a bank can control its exposure to risk. First, some risks can be offset by hedging transactions in the capital market. Second, for those risks where direct hedging transactions are not feasible, another way for the bank to control its exposure is by altering its investment policies. Therefore, with illiquid risks, the bank's capital budgeting and risk management functions become linked (Froot and Stein 1998: 56).

This reasoning suggests that capital budgeting models are used to determine whether an investment in information technology produces sufficient returns to justify its cost. Arguably, the principal capital budgeting models are the payback method, accounting rate of return on investment, net present value cost, cost benefits ratio, profitability index, and internal rate of return.

"Perhaps because the classical finance approach does not speak to their concerns with risk management, practitioners have developed alternative techniques for capital budgeting" (Froot and Stein 1998: 57). Other models for evaluating information system investment involve non-financial considerations (Sholes 2007; Balbas 2007). It has been argued that another important contribution is the Portfolio Theory (Balbas 2007: 207). It was suggested that it is possible to maximise the expected return of a portfolio of stocks but the risk level [is] measured by the probability of losing money (Balbas 2007: 207). Nevertheless, since this probability is bounded from above by using variances and the Tchebycheff inequality, in practical situations, the variance becomes the risk measure once more (Balbas 2007: 207).

Additionally, portfolio analysis and scoring models can be used to evaluate alternative information system projects. Real option pricing models, which apply the same techniques for valuing financial options to system investments,

can also be useful when considering highly uncertain IT investments. Thus, these evaluating models (capital budgeting models) are applicable in large organisations (Froot and Stein 1998). Although, information technology has increased productivity in manufacturing, especially the manufacture of information technology products, the extent to which computers have enhanced the productivity of the SMEs remains debatable (Foot and Stein 1998; Balbas 2007). In addition to reducing costs, evaluation models may increase the quality of products and services for the consumer or may create an entirely new product and revenue streams. These intangible benefits are difficult to measure and consequently are not addressed by conventional productivity measures (Balbas 2007).

Consequently, an evaluation model is one of the most important aspects of operation risk management, and financial institution supervisors regard evaluation models as a key element in the regulatory framework (Froot and Stein 1998; COBiT 2004).

Recent studies define two major concepts that constitute the critical role of evaluation model in the management of financial institutions portfolios (South Africa 2006; Balbas 2007). Firstly, to assess and manage risks, an institution must effectively determine the appropriate evaluation model necessary to absorb unexpected losses arising from its market, credit and operational risk exposures (Froot and Stein 1998). Secondly, profits that arise from various business activities need to be evaluated relative to capital necessary to cover the associated risks. There are few conceptual explanations on the association between risk management and capital adequacy and also fewer on empirical studies that show the relationship between an evaluation model and ITRM that affect performance of SMEs (Froot and Stein 1998; Balbas 2007).

Yet, others investigated how active management of financial institution exposure through loan sales market (such as the present case) affects capital structure, lending, profits, and risks (Froot and Stein 1998; Balbas 2007). Their findings show that financial institutions that use the loan sales market for risk management purposes rather than to alter their holding of loans hold less capital than other financial institutions. Finally, effective risk management strategies should contribute to the financial institution's ability to assess not only the level of capital it would need in relation to assets and deposits, but also, in principle, mitigate the risk of financial institutions failures (Froot and Stein 1998).

From the literature, it is expected that there is a relationship between risk management practices and evaluation models. Hence, it is expected that good risk management involves good IT operational risk management.

In the last six years, the Basel Committee on Banking Supervision (2004) theory of specific models in the values and beliefs that constitute ORM has gained significant prominence. One of the most important aspects of the Basel Committee on Banking Supervision's (2004) work is that they successfully linked the dimension of ORM to management practice. Other studies supported the above study by arguing that:

Performance measurement is essential for IT governance. It is supported by COBIT and includes setting and monitoring measurable objectives of what the IT processes need to deliver (process outcome) and how to deliver it (process capability and performance). Many surveys have identified that the lack of transparency of IT's cost, value and risks is one of the most important drivers for IT governance (ITGI 2007: 6).

Inferring from the aforementioned quote, there is an indication that the IT Governance Institute described the central concept of IT as having a coherent set of activities with a set of shared core values. ITGI (2007: 17) arguing that "modelling for management and control over IT processes is based on a method of evaluating the organisation, so it can be rated from a maturity level of non-existent (0) to optimised (5)." However, research notes that in reviewing the progress of the industry in the measurement of operational risk "…causal measurement and modelling of operational risk remains at the earliest stages" (Basel Committee on Banking Supervision 2004: 2).

Inferring from the above caution, it can be established that 'evaluation models' affect the way an organisation operates, its values and its basic underlying assumption to technology diffusion. It is evident that evaluation models of an organisation either facilitate or impede the process of technology diffusion.

However, Liebenberg and Hoyt (2008) studied this variable, while looking at the attitudes of end-users, but could not find the support of evaluation models with the attitudes of the end-us-

ers, suggesting that the use of this variable in their earlier work on SMEs did not receive the support for evaluation models impacting on ORM. However, the relevance of this variable in inter-organisational decision making has led the researcher of the current study to include this to study ORM adoption.

Concept of SME

SME definitions vary from country to country and are ideally defined specifically according to sector. The cut-off point in terms of size for this study was based on a recommendation from the African Development Bank, which defines SMEs as having less than 50 employees.[1]

In the information society environment, successful enterprises produce high technology goods and services and transform human effort materials and other economic resources into product and services that meet customer need (COBIT 2007). In such a society, in order to be successful, an SME would need high quality information and must always provide superior value, better than competitors, when it comes to quality, price and services (COBIT 2007).

There is no acknowledged universal definition of an SME. For this reason the researcher restricted the motive of the study to the common definition of the aforementioned, based on employment figures (COBIT 2007). The widely accepted definition points to Small Sized Enterprises with between 1 to 49 employees, while Medium Sized Enterprises have between 50 to 100 employees. According to this definition, Small Sized Enterprises are defined as firms that are registered and have less than 50 employees. On the other hand, Medium Sized Enterprises are defined as registered firms with less than 100 employees.

Concept of ICT

For the last two hundred years, economics has recognised only two factors of production: labour and capital; this is changing. Information and knowledge are replacing capital and labour as primary wealth creating assets (COBIT 2007). Information has become a critical resource, a priceless product and basic input to progress and development. Information has become synonymous with power. Therefore, accurate, rapid and relevant information are considered essential for an SME (COBIT 2007).

SME needs effective information systems to support and deliver information to different users. Such information systems would include technology that supports decision-making, provides an effective interface between users and computer technology and provides information for managers on the day-to-day operations of the enterprise. Information is needed for various purposes and serves as an invaluable commodity or product. Information is a highly important aspect of decision making in all levels of management in an enterprise (COBIT 2007). The ability of SMEs to realize their goals depends on how well the organization acquires, interprets, synthesizes, evaluates and understands information and how well its information channels support organisational processes.

Research Purpose

This research presented the findings of the empirical investigation. The paper commenced with an overview of the specific research questions, statistical techniques, demographics of respondents and data reduction, data reduction technique: factor analysis, and finally analysis of each research findings (hypotheses/objectives).

Main Research Questions

The two main questions were (1) how well do the measures of the five variables predict ORM adoption within SMEs? and (2) which is the best predictor of the sub-variables? Multiple regression analysis was used to test for the significant predictors. Thus, addressed findings related to those factors impacting on ICT and operational risk management within SMEs.

Specific Research Questions

Building on prior research related to:(1) impact of information communication technology (ICT) and (2) operational risk management (ORM) in the context of SMEs, the focus of this study was to investigate the relationship between:(1) ICT operational risk management (ORM) and (2) performances of SMEs. To achieve the focus, the research investigated specific research objective, thus:

❖ Evaluating models for understanding the value of ICT ORM in SME.

These models were based on the Table 1.

Table 1: Evaluation models and ICT adoption

1.	Payback method is used to evaluate and align objectives of executive management and information systems projects.
2.	Net Present Value (NPV) method is used to evaluate and align objectives of executive management and information systems projects.
3.	Internal Rate of Return (IRR) method is used to evaluate and align objectives of executive management and information systems projects.
4.	Portfolio analysis and scoring models are used to evaluate and align objectives of executive management and information systems projects.
5.	ValIT framework is used to evaluate and align objectives of executive management and information systems projects.
6.	COBIT framework is used to evaluate and align objectives of executive management and information systems projects.

Research Hypothesis

Following the research objectives and the reviewed literature, the hypotheses that emerged included that:

H1: there is a significant relationship between evaluation models and likelihood of ICT ORM adoption within SMEs.

H0: there is no a significant relationship between evaluation models and likelihood of ICT ORM adoption within SMEs.

To analyse the hypotheses, various statistical techniques were deemed appropriate.

RESEARCH METHODOLOGY

Simple descriptive and inferential statistical methods were incorporated into the statistical package for social sciences (SPSS) programme for analysing the data. The variables were precoded in preparation for entry into the programme (Tabachnick 2008).

Despite the fact that the variables were descriptive in nature, they were assigned numeric codes to facilitate different statistical analysis (Tabachnick 2008). Some of the measurement level (scale of measurement) was nominal and others ordinal. After the data had been checked, the codes were entered into the programme and the process of data cleaning ensured.

Appropriate statistical procedures were then performed. Frequency counts and percentages were applied to the data relating to the demographic details of the respondents in order to determine the distribution of gender, age group, position, department and level of education. A bivariate analysis between the respondents demographic characteristics and the relationship between; (1) ICT operational risk management and (2) performances of SMEs was performed.

Data Analysis

Factor Analysis was used as data reduction technique (Tabachnick 2008). For this reason, it was used to reduce a large number of related variables to a more manageable number, prior to using them in other analyses such as multiple regression or multivariate analysis of variance (MANOVA) (Tabachnick and Fidell 2007).

In order to understand the degree of association between the performances of SMEs and the independent variables, multiple regression, Repeated-Measures Analysis of Variance[2] RM-ANOVA and Repeated-Measures Multivariate Analysis of Variance - RM-MANOVA were performed (Cody and Smith 2005). Where a significant value was observed, either Betas of multiple regression or significant levels of RM-ANOVA or RM-MANOVA ascertained these differences (Tabachnick 2008). The outcomes of these analyses are described in subsequent sections.

One of the objectives of this study was to find the factors predicting ICT operational risk within SMEs. Multi- item constructs were used to capture the information about various types of variables to adopt ICT operational risk. Multi-items construct of the instrument were used. To assess as seen in the questionnaire, a construct was used to measure five main support items. The items were adapted after literature and research questions.

Research Design

The study was based upon survey design to collect the primary data from 107 respondents using the simple random sampling technique. A one stage normative model that is associative in nature, was developed based upon reviewing the previous researches and further in line with the research objectives. The model elicited five factors.

Sample Size and Sampling Technique

The study was conducted at a South African based micro finance company with a staff of about 1400 members and 90 branches nationally. The company's product range includes unsecured loans, secured loans, insurance, cellular and educational products. The products are sold through its various channels: branches, tele-sale call centres and agents. From the review of literature, an instrument was developed with the aim of covering the research objectives. In terms of sample size calculation, Tabachnick and Fidel (2001: 117) recommend a formula for calculating sample size requirements, taking into account the number of independent variables that a researcher wishes to use; $N \geq 50 + 8m$(m= number of independent variables). Due to the hypotheses posed questionnaires were sent to a minimum of N=90 respondents[3] of the SME according to simple random sampling plan.

RESEARCH FINDINGS

Descriptive Analysis

This section sought to determine the significant relationship between evaluation models and ICT adoption in SMEs. The object of this research question was to answer the question, (1) how well do the measures of evaluation models and ICT predict ORM adoption within SMEs? (2) Which is the best predictor of evaluation models and ICT in SMEs?

Once more, about two-thirds (66.4%, n= 71) agree that payback method is used to evaluate and align objectives of executive management and information systems projects. About one-third (33.6%, n= 36) disagree.

Well over half (59.8%, n= 102) agree that the Net Present Value method is used to evaluate and align objectives of executive management and information systems projects. Meanwhile, 40.2% (n= 43) disagree.

Nearly two-third (64.5%, n= 69) agree Internal Rate of Return (IRR) method is used to evaluate and align objectives of executive management and information systems projects. 35.5% disagree.

A little over three-quarter (75.7%, n= 81) agree that Portfolio analysis and scoring models are used to evaluate and align objectives of executive management and information systems projects; 24.3% disagree.

Nearly a half (49.6%, n= 53) agree that the Val IT framework is used to evaluate and align objectives of executive management and information systems projects. More than half (57%, n= 61) agree that the COBIT framework is used to evaluate and align objectives of executive management and information systems projects; 43.0% disagree.

[4]Table 2: Analyses of hypothesis[5]

Model	*Unstandardized coefficients*		*Standardized coefficients Beta*	*T*	*Sig.*
	B	*Std. error*			
1	(Constant)	1.651	0.345	4.780	0.000
	A	0.430	0.164	0.410	2.618	0.010
	B	0.164	0.136	0.180	-1.205	0.231
	C	0.187	0.103	0.190	1.813	0.073
	D	0.114	0.110	0.142	-1.034	0.304
	E	0.055	0.113	0.065	0.487	0.627

Analysis of Hypothesis

Multiple regression analysis was utilised to determine the percentage contribution of some of the identified significant predictors of evaluation models affecting ICT adoption within SMEs.

The distribution revealed that only one variable made significant percentage contribution to the level of ICT operation in SMEs. This is; A ($\beta = 0.410$, $p < .000$). It may thus be inferred that 'A' is the variable, prominent in explaining the variation in level of evaluation models affecting ICT adoption within SMEs.

In answering the two questions (1) degree of variability explained and (2) predictors, the results revealed that the variable contributed approximately 88.4% of the variations in evaluation models affecting ICT adoption within SMEs. The analysis of variance also revealed that the regression coefficients were real and did not occur by chance.

It may therefore be inferred that relatively, 'A' impacts on evaluation models which affects ICT adoption within SMEs.

By implication there seems to be enough evidence to suggest that evaluation models in ICT operation would become more effective if efforts were targeted towards A. Thus, the hypothesis was accepted.

Table 3: Multivariate tests

Effect		*Value*	*F*	*Hypothesis df*	*Error df*	*Sig.*	*Partial Eta Squared*
Intercept	Pillai's Trace	0.980	967.9	5.000	98.0	0.000	0.980
	Wilks' Lambda	0.020	967.9	5.000	98.0	0.000	0.980
	Hotelling's Trace	49.38	967.9	5.000	98.0	0.000	0.980
	Roy's Largest Root	49.38	967.9	5.000	98.0	0.000	0.980
Dep'tt	Pillai's Trace	0.184	1.306	15.000	300.0	0.197	0.061
	Wilks' Lambda	0.825	1.302	15.000	270.9	0.020	0.062
	Hotelling's Trace	0.201	1.295	15.000	290.0	0.204	0.063
	Roy's Largest Root	0.124	2.474[b]	5.000	100.0	0.037	0.110

For further analysis using Wilk's statistics, there was no significant effect of department λ=.825, (5, 15) = 1.30, $p < .05$. Additionally, a one-way repeated measure ANOVA was conducted to compare scores on the various departments. There was a significant effect for evaluation models (Wilks' lamda = 0.25, F (2, 28) = 41.17, p>.000, multivariate partial eta squared = 0.75), noting that this result suggests a small effect size. This suggests that there is a significant relationship between departments and evaluation models in ICT operations.

Additionally, data was analysed using a mixed-design ANOVA with a within-subjects factor of subscale (years of service) and a between-subject factor of gender (male, female).

Mauchly's test indicated that the assumption of sphericity had been violated (χ^2= 16.8, p < .001), therefore degrees of freedom were corrected using Greenhouse-Geisser estimates of sphericity (ε = 0.98).

The results revealed no main effects of subscale, $F(1.91, 1350.8) = 378$, $p > .05$, $\eta p^2 = .03$, and gender, $F(1, 709) = 78.8$, $p > .05$, $\eta p^2 = .10$, were qualified by an interaction between subscale and gender, $F(1.91, 1351) = 30.4$, $p > .05$, $\eta p^2 = .041$.

Furthermore, an ANCOVA [between-subjects factor: gender (male, female); covariate: Education] revealed no main effects of gender, $F(1, 732) = 2.00$, $p = .16$, $\eta p^2 = .003$, or education, $F(1, 732) = 3.25$, $p = .072$, $\eta p^2 = .004$, and no interaction between gender and education, $F(1, 732) = 0.016$, $p = .90$, $\eta p^2 < .001$.

In any case, all other main effects and interactions were non-significant and irrelevant to the hypotheses, all $F \leq 0.94$, $p \geq .39$, $\eta p^2 \leq .001$

DISCUSSION

Evaluation Models Affecting ICT Adoption within SMEs

Evaluation models are found to be important for ICT operational risk in SMEs. The plausible reason for the relevant importance of this variable in SMEs is due to the A[6] and D[7] (cf. results). The respondents considered the evaluation models an important pre-requisite to decide on technology adoption. Thus, the organisation may pay more attention to the viable benefits, although not all the models in the study were agreed upon. This might be because evaluation models process in SMEs is always short-term (Conner and Coviello 2004). Also, evaluation models can be regarded as a substitution for ICT operation to ensure a financial institution's safety (Lam 2006). For instance, the role of equity capital in SMEs is a substitute for transferring risk and hence, a buffer that protects the SMEs against unexpected shocks to its capital base (Lam 2006).

The findings of this study support the reviewed literature which suggests that evaluation models can act as motivators to encourage the adoption of an innovation (CAS 2003). This is because direct benefits are more viable and are easier to measure (CAS 2003). So this study supports the prior study of CAS (2003), that evaluation models were influential determinants of the technology usage in SMEs. A similar finding is reported by a previous study of ICT operation (Calder 2006). The study found relative advantage of evaluation models a significant factor of adoption within SMEs. The study however does not support the previous findings of Burget and Ruschendorf (2006), which contrasted the view of evaluation mode usage in SMEs.

The existing models of information management recognise the potential impact of the revolution that is taking place within the global economy (Balbas 2007). Such models, particularly in SMEs, have not fully articulated the changes that have occurred or are likely to occur, nor have they developed effective management strategies to handle these and the consequent ICT risks. The developments in information, computing and communication technologies, together with

the consequent erosion of entry and trading barriers, represent factors which are likely to alter commercial relationships fundamental in SMEs operations.

In support of the current study's position, Lam (2006) noted that even the smallest of businesses now have the potential to trade in the global economy using ICT. Lam (2006) maintains that these changes in the nature of the competitive processes and commercial relationships provide significant strategic opportunities for the smaller organisation, arguably placing them on an equal footing with their larger competitors already established in the marketplace.

For example, it is likely that substantive change in technology and other product/service innovations will be disseminated more rapidly and evenly across the globe. It will become increasingly difficult to segregate market segments in terms of design, technology, service levels and pricing (for example, delaying implementation of new products to lesser developed market segments, or economies may cease to be a viable strategic model).

CONCLUSION

In conclusion, once SMEs give attention to such development, they (SMEs), like the larger multinational organisations, will be exposed to the consequences of these developments which will arguably provide competitive opportunities. Another likely result is the effects of localised incidents and market developments being experienced across the globe. A significant feature is that any opportunity will no longer be restricted to the large organisations, which arguably possess the necessary resources, structures and processes to undertake global ICT operation.

RECOMMENDATIONS

Following the findings of the current research, it is recommended managers in SMEs need to be equipped to identify, analyse and manage ICT operation from a more diverse range of sources and contexts. If this is not carefully considered, SME managers, irrespective of whether they engage in business or not, may find it more difficult to avoid the risks resulting from increased ICT global competition in their home markets.

NOTES

1. In this study 'business', 'firm' 'organisation' and 'institutions' are used interchangeably
2. A four point Likert scale also cf. questionnaire
3. N>50 + 8m(m=5 number of independent variables)=90: Note that it was anticipated that more cases were used to cater for any possible skewness for dependent variable such that the distribution of data satisfies the assumptions of multiple regression related to sample size.
4. Assess evaluation models affecting ICT adoption within SMEs
5. B- Internal Rate of Return (IRR) method is used to evaluate and align objectives of executive management and information systems projects.
   C- Portfolio analysis and scoring models are used to evaluate and align objectives of executive management and information systems projects.
   D- Val IT framework is used to evaluate and align objectives of executive management and information systems projects.
   E- COBIT framework is used to evaluate and align objectives of executive management and information systems projects.
6. Payback method is used to evaluate and align objectives of executive management and information systems projects
7. Portfolio analysis and scoring models are used to evaluate and align objectives of executive management and information systems projects

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