

The Impact of IT investment in RSA e-Commerce SME Organisations

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Abstract: This article considers the possibility of a link between organisational performance and information technology (IT) investment intensity in SME organisations practising e-Commerce for the period 2001/2002. The answers to the research questions note that in top performing organisations; (i) IT costs as proportions of operating costs were higher; (ii) IT costs as a proportion of turnover was lower, than in weak performing organisations; and (iii) that a positive correlation exists between the Computerisation Index (CI) and the Operating Costs ratio. The investigation also reveals that Chief Executive Officers (CEO)'s expect additional output while planning e-Commerce operations and keeping IT budgets constant. Evidence is presented that company performance is linked to the level of IT investment intensity in the sample of organisations investigated, even though more output was expected from the IT department.

Keywords: Digital Commerce, e-Commerce, Framework, IT Investment.

1. Introduction

Achieving business value from Information Technology (IT) and e-Commerce investment at the same time is probably one of the more common organisational concerns of (CEOs) today (Lubbe and Pather, 2002). IT and e-Commerce are the growing areas of investment in most organisations; in fact many organisations will not be able to function without IT or digital commerce. The role of IT has also been redefined by some organisations to include attempts to embark on e-Commerce operations. The role of IT in organisations is not merely a tool for processing communication, but a strategic weapon that can thus affect an organisation's competitive position (Weill and Olson, 1989; Lubbe and Pather, 2002).

Some of the variables that will be discussed include IT, e-Commerce, investment and achieving value from IT investment. The contribution of this article is significant as it will contribute to the understanding of managers that the impact of e-Commerce may change the way organisations handle their total IT investment. The article will, however, review only South African organisations and aims to improve on the topic's understanding off IT and digital investment by managers and academics.

2. Review of past research

Mason *et al.* (1997) argue that Information Systems (IS)¹ as a discipline has not yet

developed a tradition of historical research. This historical analysis by them broadens the understanding of the processes and designs during which IT is introduced into organisations and the forces the shape IT investment uses. They argue that a dominant design for this shape could be manifested in several ways; a new organisational infrastructure, new functionality, new products, new services, new production functions or new cost structures. The problem with historical analysis is to discover why some organisations led their respective industries in the use, design and application of IT, and why other organisations, having spent millions of dollars achieved modest success rates.

Hu and Plant (2001) argue that the promise of increased advantage was the driving force behind large-scale investment in IT since the 1970's. Current debate continues amongst managers and academics with reference to the measurable benefits of IT investment. Return on Investment (ROI) and other performance measures in academic literature, indicates conflicting empirical findings. They also submit that it would be convincing to infer causality if IT investment in the preceding years is significantly correlated to the performance of the organisation in the subsequent year. Hu and Plant (2001) used the Granger causality model with three samples of organisations and discovered that there was no increase in the level of financial performance. Rather, it is the other way round – increased financial performance lead to increased IT investment.

Li and Johnstone (2002) argue that a manager can use the framework within which the appropriateness of using real options theory in strategic IT investment by systematically

¹ Information Technology (IT) and Information Systems (IS) will be used alternatively and for the purpose of this article will be interpreted as meaning the same whilst discussing the investment of IT.

justifies the use of IT. They classify IT costs and provide some insight about the relationship between technology standardisation and IT investment decisions. Research by Lubbe and Pather (2002) also reflects that managers of organisations are concerned whether their organisation is achieving IT and e-Commerce value from their organisation's IT investment (Figure 1).

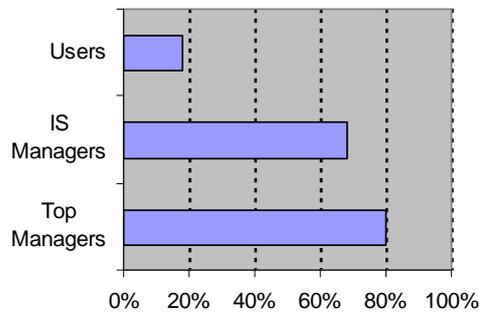


Figure 1: Number of top managers and IS managers concerned about achieving value from IT and e-Commerce

Bui *et al.* (2003) argue that technology and societal changes are moving the global market rapidly towards a new economic order rooted in e-Commerce. They investigate some factors including macro economy, ability to invest, access to skilled workforce, cost of living and pricing. The authors also state that many organisations face a chronic shortage of resources (including funding). Management should be aware that e-Business is part of the complex and general economic structure and the success of organisations depend on that structure as well as the optimum allocation of resources.

Dykman (2003) notes that Information Systems (IS) represents a significant investment for many organisations. Managers need to know that the decision made to spend money on IS should be analysed like any other major purchase. She argues that general management often gives in to the expert power of the technologists, both internal and external to the organisation to invest in IS. The ROI on an IS acquisition may not be quite as simple or straightforward as other capital expenditure. She, however, states that it is still possible to do the financial analysis for the investment.

Dykman (2003) argues that it would be of great benefit if there were a general recipe that could assist to ensure success. Ideally all the strategies (e-Commerce, IT and organisation), including the framing of all investments, could be aligned around business requirements,

rather than on technology requirements. She further argues that managers should be measured against the accuracy of their financial projections for IS investment. Every investment should be justified with benefit and expense commitments. A Dykman (2003) note that managers should aim to do good job assessing benefits associated in proposed IS investment in tangible and financial terms. Executives demand this when evaluating the approval, or denial, of any other capital expenditure. IS investment decisions are business decisions and therefore not technology decisions.

Moodley (2003) argues that e-Commerce technologies are becoming increasingly important to South African apparel producers as they are integrated into global value chains. Moodley (2003) suggests that the empirical evidence emanating appears that e-Commerce is still in its infancy but there is potential for growth. The problem is to ensure that there is sufficient financial support to sustain success of e-Commerce. Moodley (2003) argues that South African organisations should increase their investment in e-Commerce.

Quayle (2003) notes that the awareness and level of implementation of e-Business in European Small and Medium Enterprises (SME)'s differ in some aspects from larger organisations. He argues that the issues of highest importance are leadership, time to market, marketing and financial management and a narrow vision of business survival. He further states that small firm's perception of quality, price, production reliability, service reliability and capability to provide support are normal buyer's demands. Nowhere is the aspect of value from IT investments reflected. The idea is that the cost to execute transactions be reduced. He states that developing e-Business expertise is essential to sustain the competitive advantage. SME's must be aware that some aspects such as financial management could impact on their future plans.

It is also argued by Santhanam and Hartono (2003) that the resource-based view can be used to investigate the impact of IT investment on organisational performance. A strong IT capability can support improved organisational performance. Furthermore, their results indicate that organisations with superior IT capability, exhibit current and sustained organisational performance. They note however, that previous performance must be

taken into account while doing these calculations.

Kearns (2004) states that while IT investment has the potential of providing competitive advantage, actual returns on such investment vary widely and a majority of CEO's rank past IT investment disappointing. There are many methods for investment evaluation, but traditional methods do not adequately account for the intangible benefits that characterises strategic investments. They also lack other features of portfolio selection. He describes a model based on the analytic hierarchy process that could possibly overcome the deficiencies associated with traditional approaches to economic evaluation of IT investment. This approach reflects both on tangible and intangible methods and links IT investment to business strategies.

3. The research questions and research methodology

3.1 Research questions

3.1.1 *The relationship between profitability (operating expense ratio) and IT investment (IT ratio)*

Lubbe and Pather (2002) noted that a relationship exists between profitability and IT expenditures in South African e-Commerce organisations. Quayle (2003) notes that no relationship exists between organisational performance and the relative portion of resources allocated to IT. He argues that the measure of performance will not capture all factors that contribute to the organisation. Using case studies, Weill and Olson (1989) reveal the importance of converting IT investment into productive inputs with different levels of effectiveness, depending on the organisation. There is also empirical evidence that the use of IT results in lower cost (Santhanam and Hartono, 2003). The first research question can thus be formulated as:

Is there a negative correlation between IT investment and profitability in e-Commerce intense organisations?

3.1.2 *The relationship between profitability (financial ratios) and Computerisation Index (CI)²*

Weill and Olson (1989) argue that two key factors are emerging: determining the return on investments (ROI) on IT is difficult; and investment in IT alone is not sufficient. Dykman (2003) suggests that IT investment reduces the cost of revenue generation. IT investment intensity is the level of infiltration of IT into the organisation. Santhanam and Hartono (2003) suggest that evidence indicates that organisational performance is linked to the level of IT investment intensity. This research question specifically compares the overall performance of the organisation with the CI index (another measure of how the organisation computerised their operations) and not the IT Expense (ITEX) ratio as used previously in Question 1.

The second research question can thus be stated as (based on the study of Santhanam and Hartono (2003)):

Is there a positive correlation between IT investment intensity and organisational profitability?

3.1.3 *The relationship between profitability (return on assets and return on equity) and IT/e-Commerce strategic management integration with organisational strategic management (business management processes)*

The third research question is formulated as:

Is there a positive correlation between IT investment and strategic management of IT and e-Commerce operations?

3.2 Research methodology

The author had decided to use qualitative research because it is designed to help him understand the people and the social and cultural contexts within which the organisation operates. To establish the best design it was decided to collect the data needed to answer the research questions discussed above using a structured questionnaire. The population consisted of all IT intensive organisations that have just started an e-Commerce operation during the period 2001/2002. From this list a

² Computerisation Index was discussed in detail in a previous paper of Lubbe, Hoard and Parker: *The Profit Impact of IT* (JIT, March, vol. 1, no 10, pp.44 – 51)

number of companies were selected who indicated their willingness to cooperate with the investigation. They were mailed a copy of the questionnaire with a request to include financial statements for the period covered (2001/2002).

The completed questionnaires were analysed to extract the data. The CI was calculated from data collected using the questionnaires. Financial Ratios were calculated using data from the statements and the questionnaires. Data showing the relationships between the CI and measure of financial performance were plotted on graphs using Microsoft Excel.

3.3 Limitations of the study

It is acknowledged that there are other factors could affect the research but the author has decided to limit the study to the papers that were available to him. It was assumed that the organisational financial and other figures, as rendered, were accurate and complete where they could be verified with audit/working papers. Additionally it was assumed that the respondents completing the questionnaire did so accurately. However, a possible source of error lies in the respondents' interpretation of the terminology used in the questionnaire, although it was pre-tested.

Furthermore, some data given by the respondents could not be verified fully, owing to its sensitivity. Also, it was not possible to check the method of accounting and it is acknowledged that this could have influenced some financial ratios. However, given these limitations, it was still possible to use the models to answer the research questions since these sources of error did not differ from those evident in other studies (e.g. Lubbe and Pather (2002) and Weill and Olson (1989)). It was also possible to interpret the results based on the data obtained as no statistical technique could show them to be unreliable.

4. The results

4.1 Information Systems in South Africa in context

South Africa is a medium sized country, 471,000 square miles at the southern tip of the African continent with a population of some 45 million people. Relative to the rest of Africa, South Africa is substantially industrialised. South Africa is a wealthy country from an industrial and agricultural point of view and computers have been actively in use in South African business, education and industry since

the early 1960s when both IBM and ICL opened offices in Johannesburg. Today South Africa employs computers in every aspect of industry, business and government as well as having a relatively high percentage of home computers among the middle class. All the major vendors are present and there is considerable interest in hi-tech.

The business and industrial sectors in South Africa are as sophisticated as anywhere in the world in the use of information systems. South Africa leads the world in deep level mining and supports this activity extensively with computer systems. The country also has a substantial financial services sector that has won international recognition for its excellence in information technology. For example the First National Bank (FNB) of South Africa was named one of the world's top 100 computer users by ComputerWorld Magazine in May 1995 and in July 1996 the same bank also won the prestigious Smithsonian Institute prize for the innovative application of biometrics in their Information Technology.

4.2 Discussion of the results

In order to test the validity of aspects of the questionnaire respondents may have had difficulty understanding when answering, a pilot study was conducted using some of the companies in the sample. This was done to ensure that it was possible to collect all data required for the ratios. Ambiguities were removed in order to reflect a concise research instrument.

4.2.1 *Research question 1: The relationship between profitability (operating expense ratio) and IT investment (IT ratio)*

The data needed for this section was gathered from financial returns provided by the organisations. Figure 2 illustrates a profile of both, the turnover and operating expenses for the organisations in the sample (2001/2002). Turnover exceeds the operating expenses in 2001 as can be seen from Figure 2. However, in 2002, the effects of a low growth rate in South Africa manifests in the turnover slumping to a low. One organisation spent additional resources to expand their operations affecting the overall picture.

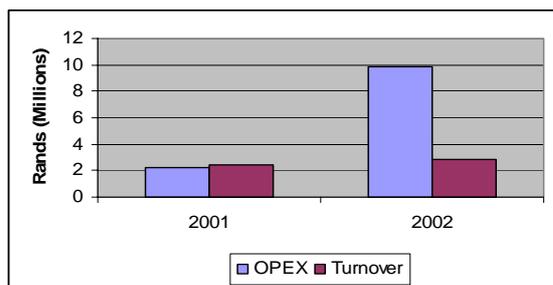


Figure 2: Turnover versus Operating Expense

Operating Expense Ratio (OPEX)³ and Information Technology expense ratio (ITEX)⁴ were the two ratios used in this instance. These were calculated and presented in Table 1.

Table 1: Operating Expense Ratios (OPEX) and IT Expense Ratios (ITEX)

Co	2001		2002	
	OPEX	ITEX	OPEX	ITEX
1	0.152	0.119	0.157	0.128
2	0.128	0.037	0.148	0.053
3	0.162	0.117	0.180	0.145
4	0.257	0.160	0.427	0.180
5	0.172	0.483	0.252	0.820
6	0.422	0.139	0.374	0.232
7	0.783	0.118	0.718	0.099
8	0.916	0.002	0.933	0.003
9	0.991	0.002	0.963	0.001
10	0.987	0.003	0.980	0.003
11	1.009	0.062	0.860	0.082
12	0.093	0.001	0.963	0.000

These ratios were calculated and averaged over the period under investigation, to negate the effects of seasonal and abnormal influences as indicated. Finally the organisations were sorted in ascending order using the OPEX ratio as a primary key in and grouped in quartiles (Table 2). This was done partly to disguise the data and to neutralise the effect of seasonal and other influences.

Table 2: Quartile groupings for organisations (2001/2002)

Quartile	OPEX	ITEX
I	0.155	0.100
II	0.317	0.336
III	0.734	0.037
IV	0.965	0.076

As stated before, Table 2 is the result of sorting the organisations (OPEX as the primary key) in ascending order and grouped together in quartiles; the first three companies were used for quartile I, the second three for quartile II, etc. Although all the above-mentioned operations were used to negate the effects of seasonal and economic fluctuations, the results of a loss by one organisation could be seen in the second quartile. There is a

³ OPEX = non-interest operating expenses to income.

⁴ ITEX = IT expenses to non-interest operating expenses.

negative correlation of 0.5425 between the Operating expense ratio and the IT ratio. This provides evidence that there is a link between the two ratios and supports statements by authors such as Weill and Olson (1989) and Lubbe and Pather (2002).

4.2.2 Research question 2: The relationship between profitability (financial ratios) and Computerisation Index (CI)

Table 3 compares the operating expense ratio, IT expense ratio and CI⁵. The CI indicates and supports the second research question noting that there is a link between computerisation and organisational performance. The better an organisation performs, the higher the CI. From a statistical point of view, the Spearman ranking indicates a high negative correlation of 0.8842 between the CI and the OPEX, while only a positive correlation of 0.4126 was measured between the OPEX and ITEX ratios. CI is therefore a better measure for the intensity of computerisation in an organisation. Lubbe *et al.* (1992) indicated that the CI applies to other industries as well and this further supports this finding.

Table 3: Relationship between CI and Operating and IT ratios

C	CI	OPEX	ITEX
1	73	0.155	0.124
2	47	0.138	0.045
3	13	0.171	0.131
4	10	0.342	0.170
5	7	0.212	0.652
6	6	0.398	0.186
7	5	0.751	0.109
8	5	.0925	0.003
9	5	0.977	0.002
10	5	0.983	0.003
11	8	0.934	0.072
12	6	0.528	0.000

Further statistical analysis indicates an F-Ratio of 3.89 and squared mean deviation of 0.384485 between the CI, OPEX and ITEX ratios. The correlation matrix used to estimate the coefficients produced a correlation-coefficient of -0.8778 between the CI and OPEX ratio and a correlation-coefficient of -0.675 between the CI and ITEX ratio. The correlation was in both instances negative and high. There was also a weak correlation between the CI (the constant, level of computerisation) and the ITEX and OPEX ratios (the variables). It thus helps to answer the second question by delivering proof that

⁵ CI means the extent and sophistication of computerisation. Ten variables (for example years using computers, management activity level, etc.) were selected to collectively represent the computerisation process.

there is a relationship between profitability and computerisation. Figure 3 below illustrates the link between CI and OPEX clearly.

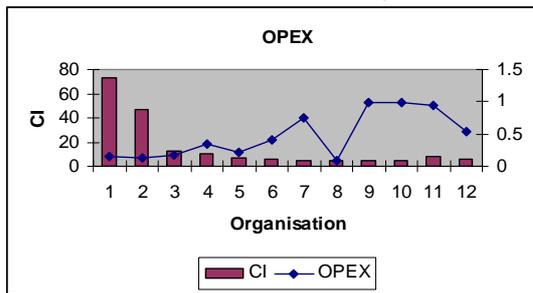


Figure 3: CI versus OPEX ratio

4.2.3 Research question 3: *The relationship between Profitability (return on assets and return on equity) and IT/e-Commerce strategic management integration with organisational strategic management (business management processes)*

A positive correlation of 0.54 was calculated which led the researcher to accept the fact that there is a relationship between profitability and IT/e-Commerce strategic management integration at the 95% level. A problem that all the respondents mentioned is that they still get the same amount of funding but that top management expects more from them. In real terms, this means that top management expects e-Commerce to stem naturally from the IT department. All the responding organisations placed e-Commerce as part of the IT department.

5. Discussion and conclusion

The relative high correlation that is evident from Figure 3 may be attributed to the strategy employed with IT investment decisions and is supported by Dykman (2003). The strategic importance of IT investment should be emphasised and the importance of IT investment decisions needs to be considered by business managers. The reason being stated is that it may affect their e-Commerce and other commercial operations. Organisations also need to ensure that e-Commerce is not part of the IT department but a department on its own with an own strategy.

It is important to note that the more integrated IT and e-Commerce investment decisions become the better chance for full alignment with the overall organisational strategy. This will help businesses in the long run. Although

the study does not conclusively deliver proof of a positive or negative correlation in one instance, it shows that in the sample used, a strong tendency exists that:

- Organisational performance is correlated with IT investment intensity.
- IT investments will be correlated to IT and e-Commerce intensive organisations with their profitability.

It should be noted that to find organisations just embarking on e-Commerce is extremely difficult and explains the reason for the small sample size.

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