UNDERSTANDING THE IMPACT OF STRATEGIC ALIGNMENT ON THE OPERATIONAL PERFORMANCE OF POST IMPLEMENTED TECHNOLOGICAL INNOVATIONS

Ricardo Santa1, Ram Vemuri1, Mario Ferrer2, Phil Bretherton1, Paul Hyland1

1Charles Darwin University, Australia
+61(0)8 8946 6843
[ricardo.santa, ram.vemuri, phil.bretherton]@cdu.edu.au
2Central Queensland University, Australia
m.ferrer@cqu.edu.au
3Queensland University of Technology, Australia
p.hyland@qut.edu.au

ABSTRACT

Purpose – The purpose of this paper is to examine the role of three strategies - organisational, business and information system – in post implementation of technological innovations. The findings reported in the paper are that improvements in operational performance can only be achieved by aligning technological innovation effectiveness with operational effectiveness.

Design/methodology/approach – A combination of qualitative and quantitative methods was used to apply a two-stage methodological approach. Unstructured and semi structured interviews, based on the findings of the literature, were used to identify key factors used in the survey instrument design. Confirmatory factor analysis (CFA) was used to examine structural relationships between the set of observed variables and the set of continuous latent variables.

Findings – Initial findings suggest that organisations looking for improvements in operational performance through adoption of technological innovations need to align with operational strategies of the firm. Impact of operational effectiveness and technological innovation effectiveness are related directly and significantly to improved operational performance. Perception of increase of operational effectiveness is positively and significantly correlated with improved operational performance. The findings suggest that technological innovation effectiveness is also positively correlated with improved operational performance. However, the study found that there is no direct influence of strategies - organisational, business and information systems (IS) - on improvement of operational performance. Improved operational performance is the result of interactions between the implementation of strategies and related outcomes of both technological innovation and operational effectiveness.

Practical implications – Some organisations are using technological innovations such as enterprise information systems to innovate through improvements in operational performance. However, they often focus strategically only on effectiveness of technological innovation or on operational effectiveness. Such a focus will be detrimental in the long-term of the enterprise. This research demonstrated that it is not possible to achieve maximum returns through technological innovations as dimensions of operational effectiveness need to be aligned with technological innovations to improve their operational performance.

Originality/value – No single technological innovation implementation can deliver a sustained competitive advantage; rather, an advantage is obtained through the capacity of an organisation to exploit technological innovations’ functionality on a continuous basis. To achieve sustainable results, technology strategy must be aligned with organisational and operational strategies. This research proposes the key performance objectives and dimensions that organisations should focus to achieve a strategic alignment.

Research limitations/implications – The principal limitation of this study is that the findings are based on investigation of small sample size. There is a need to explore the appropriateness of influence of scale prior to generalizing the results of this study.

Keywords: Technological Innovation Effectiveness, System Effectiveness, Operational Effectiveness, Information Systems Alignment, Strategic Alignment.
1. INTRODUCTION

Innovative organisations are those that are able to do things differently or better to improve their processes, products and services (Tidd, Bessant and Pavitt, 2001). These firms are faced with competitive pressures to improve efficiency and productivity through technological innovation (Ifandoudas and Chapman, 2006). In addition, organisations need to respond to market changes through product or service innovation, as organisational effectiveness derives in large measure from innovation (Tidd, Bessant and Pavitt, 2001). Many organisations are investing substantial resources in technological innovation such as Enterprise Information Systems (EIS), but the extent to which implementing such complex information systems enhances the organisations’ performance is not yet well understood (Mabert, Soni and Venkataramanan, 2003).

There is an expectation that EIS will increase a firm’s operational effectiveness (e.g., decrease operational costs, increase flexibility and reliability, and improve quality and productivity). There is also often an expectation that EIS will not only boost profitability (Masini, 2003), but also ensure the firm’s sustainability and enhance its competitive advantage. There is evidence however, that many of these innovations fail to deliver the expected outcomes, and often fail completely (Cotteleer, 2001; Davenport, 2000; Jamieson and Hyland, 2004).

Improving operational effectiveness involves determining key performance objectives and establishing benchmarks, but also continuous measurement and changing processes to add value to customers. Furthermore, some organisations are failing to benefit from the implementation of EIS because they either do not measure performance, or what they do measure is inappropriate (White, 1996). On the other hand, effectiveness needs to be measured from an information systems (IS) perspective, as organisations need to better understand if EIS that has been implemented, has contributed to achieving the expected organisational goals and benefits, or how far the implemented EIS is from the real needs of the organisation. Organisations need to quickly adapt the IS strategies to the changes in business strategies due to dynamic nature of the market. To do so, organisations need to develop several capabilities that represent real strategic assets related to IS driven innovation (Neiroti, Cantamessa and Paolucci, 2006). In understanding the difference between the proposed and the implemented EIS, it is necessary to explore the strategic triangle, which is the alignment among business strategies, organisational strategies and information system strategies (Pearlson and Saunders, 2004). Nonetheless, the strategic planning process approach is usually related to an existing dualism between formulation and implementation phases (Cicchetti 2003).

The dualism between the formulation and implementation of EIS leads us to investigate the alignment between system effectiveness and operational effectiveness that needs to exist in any organisation, after the implementation of an EIS. In addition, the influence of organisational factors, such as strategies, in the alignment between system effectiveness and operational performance, is addressed. As the research issue is not comprehensively addressed by the current literature, this research proposes to answer the question, ‘Is operational performance determined by strategies of the organisation?’ In addressing the research question, this research uses both qualitative and quantitative approaches.
2. BACKGROUND

2.1 OPERATIONAL EFFECTIVENESS AND CONTINUOUS INNOVATION

Bessant and Boer (2002) argue that organisations need to engage in continuous innovation, that is they need to be both operationally effective in exploitation and strategically flexible in exploration. It was often argued that these two capabilities could not be combined successfully. Yet, according to Bessant and Boer (2002) recent developments in society, markets, technology and industry suggest that leading organisations need to find configurations of processes, procedures, people, technologies and organisational arrangements that allows them to become continuously innovative. According to Boer (2002) continuous innovation is the ongoing interaction between operations, incremental improvement, learning and radical innovation aimed at effectively combining operational effectiveness and strategic flexibility, exploitation and exploration. In seeking to develop a culture of continuous innovation there needs to be a focus on an organisation’s capability to renew all or part of its managerial competencies and to create radically new competencies in order to achieve congruence with the changing business environment (Teece, Pisano and Shuen, 1997).

In order to face changing market conditions, service firms need learning processes to build the flexible capability to reconfigure and transform their processes. In dynamic and unstable environments firms need to constantly scan their environment and government policies, and develop agile behaviours or competencies to rapidly accomplish changes (Teece, Pisano and Shuen, 1997). In addition, an increasing number of factors are prompting organisations to seek to operate more efficiently and to ensure they have effective operational processes (Hill, 2005; Slack, Chambers and Johnston, 2007). This involves the need to deliver value-adding products or services of exceptional quality, on time, at a competitive price. Thus, organisations attempting to meet these objectives need to pay attention to their operational effectiveness as this is a primary driver of business performance (Slack, Chambers and Johnston, 2007).

Operational effectiveness refers to the ability of setting processes, based on core capabilities within the organisations, which work well (Porter, 1996). Operational effectiveness involves improving process performance by leading and controlling the processes within the firm as well as measuring and improving the processes. A better use of resources through these core processes enables the organisation to eliminate waste, adapt more appropriate technology innovation and therefore perform better than competitors (Porter, 1996). By studying how a firm performs the primary and support activities for a product or service, a firm can explore how it might add value at every stage of the production, and seek ways to continuously improve processes.

The five performance dimensions or objectives an organisation seeks to fulfil to attain operational effectiveness include cost, quality, flexibility, speed and reliability (Hill, 2005). Improving on cost means that an organisation seeks the elimination of waste which comes from efficiencies attained in processes such as purchasing, production, and staff performance. An appropriate disaggregation of the cost components impacting on the total cost performance of an organisation gives the opportunity to identify the areas for improvement (Slack, Chambers and Johnston, 2007). Furthermore, improving on quality provides an opportunity to bridge the gap of what organisations are capable of offering and what customers demand. That is, viewing quality as a consistent provision of services that satisfy customers rather than only conforming to specifications without any clear continuous improvement. The third operational performance objective consists of being flexible which includes an organisation’s ability to adjust to changes to
respond to customers (Slack, 1991). Additionally, improving on speed prompts an organisation to be able to shorten the time between the service request and delivery of the service with the frequency and at the time that a customer requests (Hill, 2005). Finally, reliability suggests that an organisation’s processes consistently perform as expected over time. That is, customers are satisfied by organisations that provide services that do not fail over a period of time or with services that are delivered as has been agreed (Porter, 1996).

2.2 Technological Innovation Effectiveness

Technological innovation effectiveness or system effectiveness can be described as the extent to which information systems contribute to achieving organisational goals and benefits (DeLone and McLean, 2003). Companies deriving the greatest benefits from their systems are those that, from the start, view them primarily in strategic and organisational terms. These companies stress the importance of operational effectiveness, not the system (Davenport, 1998). However, the high failure rate in implementing such systems is a major concern (Davenport, 1998). However, the medical informatics literature presents, by and large, a picture of successful implementation of health information systems (Heeks, 2005) but the current literature fails to report the failures found after implementation of information systems (Heeks, 2005). Failure rates for large-scale system development projects are extremely high and many information system projects are failing to achieve their stated outcomes (Jamieson and Hyland, 2004). However, as it is difficult to quantify, the real level of information system failure could be far greater than is reported (Jamieson and Hyland, 2004).

The revised DeLone and McLean model (2003) includes six interrelated dimensions of information systems success: information quality, system quality, service quality, intention to use, user satisfaction, and organisational impact as dimensions to measure the dependent variable IS effectiveness. In the DeLone and McLean’s success model, system quality measures technical efficacy – the desired characteristics of the system. This assessment is based on the performance and productivity of the system. Information quality is the measurement of output from the EIS. It measures semantic success – characteristics of the information and its desired form; the degree to which information produced has the attributes of content, accuracy, and format required by the user. Service quality is the level of service received by the users of the EIS and the manner in which the service is provided by the IS department as it influences the degree of satisfaction with an EIS. Intention to use and user satisfaction measure effectiveness success through studies that attempt to analyse and measure the interaction of the information product with its recipients, the degree to which the user believes that using a particular system has enhanced his or her job performance. User satisfaction is defined as the user’s response to the use of the output of an EIS, the psychological state after the use of an EIS. User satisfaction goes hand in hand with user involvement, particularly during the phases of the analysis, design and implementation of an EIS in an organisation. In addition, Baroudi et al. (1986) argued that user involvement in information system development is generally considered an important mechanism for improving system quality and ensuring successful system implementation. Thus user involvement can be used as a dimension to measure system effectiveness. Individual impact is the effect the information has on the behaviour of the user, including improving personal or departmental performance, relating to what influences the information product has on management decisions. This impact occurs when the information is received and understood by the users, and applied to their tasks.
In measuring performance it is important to have a clear understanding of the outcomes from the investment of a significant amount of human and economic resources in EIS solutions that cannot always be properly adapted to particular circumstances. Management accounting systems have been traditionally used to measure performance which focuses on data such as profit, return on investment and cash flow. These types of measures merely rely on financial performance and do not reflect the requirements that an organisation must fulfil in today’s competitive business environment, or operational requirements. The effectiveness of an EIS, should be measured in terms of the real customer oriented operational benefits rather than through the achievement of information systems outcomes only.

2.3 STRATEGIC ALIGNMENT

Strategy is viewed as a long-term approach to implementing a company’s plans and the resources needed to achieve its goals and objectives (Warnock, 2000). There has been much debate, however, about ‘what strategy really is’ since the early 1990s (Cummings and Daellenbach, 2009). There has also been a consistent analysis of the importance of strategy to technology, change and innovation over the last four decades (Cummings and Daellenbach, 2009), which clearly demonstrates the significance of increasing the understanding of the role of strategy in managing technologies to improve operational performance. Thus, the aim of this article is to examine the role of strategy in aligning technological innovations such as enterprise information systems and operational effectiveness to achieve positive impacts on operational performance.

Henderson and Venkatraman (1993) argue that the inability to realize value from information systems investment is, in part, due to the lack of alignment between the operational and IS strategies of organisations. In addition, Pearson and Saunders (2004) point out that successful firms have an overriding business strategy that drives both organisational strategy and IS strategy. Successful firms carefully align these three strategies, as the three strategies are linked and affect each other. The importance of strategic alignment is recognised by Delery and Doty (1996) for an effective organisational performance. In other words, no single IS application can deliver a sustained competitive advantage; rather, an advantage is obtained through the capacity of an organisation to exploit IS functionality on a continuous basis. To achieve a competitive advantage, the technology strategy must be aligned with organisational and operational strategies. Strategic alignment is dynamic process of continuous adaptation and change (Henderson and Venkatraman, 1993; Pearson and Saunders, 2004). Sabherwal et al. (2001) stated that alignment among two or more organisational dimensions, may be defined as the extend to which these dimensions meet theoretical norms or mutual coherence. Strategies must be synchronized to maintain the stated alignment due to an ever changing environment.

Research in service organisations (Cicchetti, 2003; Geisler, Krabbendam and Schuring, 2003) has identified that strategic planning is crucial to management of service organisations, even when the characteristics of each organisation vary. Public and private service organisations are called to continuously improve their managerial processes, with particular attention to the efficacy of strategic planning models applied. Organisations which aim to achieve world-class performance must make decisions on what objectives will enable them to gain a competitive advantage or differentiate themselves (Hill, 2005; Slack and Lewis, 2003). Key competitive business strategies include both achieving lower cost and adding value through differentiation (Porter, 1980). One important way in which competitive performance may be achieved is
through quality improvement. This strategy can be used both to differentiate products and services and to obtain lower costs through enhanced productivity and the elimination of waste (Thawesaengskulthai, 2007). However, one of the well-recognized pitfalls of the strategic planning process approach is related to existing dualism between formulation and implementation phases (Cicchetti, 2003). This dualism is seen as the lack of strategic role of information systems application or to a misalignment among organisational, business and information systems strategies. Consequently, organisations that fail to align strategies are more likely to fail in the implementation of the EIS, or implement IS that fails to deliver on strategic objectives.

Technological innovations must support operational and organisational strategies, as this alignment will lead organisations to improve the operational performance and gain a competitive advantage. According to Thawesaengskulthai (2007) an important question for managers is ‘what is the most appropriate way to improve? There are a number of steps that need to be performed before IS strategic policy is investigated and implemented. If the EIS is to have a strategic role, IS strategies must begin by understanding how other stakeholders see the role of IS. Key stakeholders include: senior executives, board members, the government, senior departmental managers, users, engineers, field staff, and the IS department. Based on the current view of key stakeholders, the IS department must define the role that IS must have and achieve in the organisation, if the organisation is to grow and improve its performance. The IS strategy must be linked to the organisational strategy and performance indicators. Strategy begins by defining what the role of the EIS must be, at present, in 5 years and in 10 years. Beyond scoping roles, a bottom-up definition of the core IS function is required (McNurlin and Sprague, 2002). Once the role and functions of EIS have been identified, it is essential that objectives are identified and performance targets defined. This approach will allow IS to demonstrate its strategic value and importance to the organisation. In setting objectives, it is imperative to determine the role that IS will play and what functions need to be delivered to achieve the performance targets set. However, it is important to emphasise that results indicate that in uncertain environments subject to ongoing change, a phased information strategy implementation is more successful (or less risky) than single-step organisational change (Laudon and Laudon, 2004; McNurlin and Sprague, 2002). As part of this process, the organisations need an overall business strategy that drives both organisational and IS strategy, and these three strategies must be in alignment. This strategic alignment among the three strategies is also known as the strategic triangle (Pearlson and Saunders, 2004).

Cotteleer (2001), Masini (2003), McAfee (2002) Romano (2003) and others, have conducted research in the context of EIS linked with operational effectiveness. However, these authors have not considered the inclusion of the five operational performance measures (cost, quality, flexibility, speed and reliability) as measures of effectiveness linked with system effectiveness dimensions (system quality, information quality, service quality and user satisfaction). In addition the role of strategies in the alignment between the effectiveness of the implemented EIS (system effectiveness) and operational effectiveness has not been discussed. Thus, the main purpose of this research is to build on and extend the existing literature and to propose a theoretical framework based on the conceptual model in figure 1.
The conceptual model in figure 1 proposes links between strategies on operational effectiveness, system effectiveness and improved operational performance. In addition, figure 1 shows the four hypotheses tested in this study. The hypotheses are: H1) Strategies impact on improved operational performance, H2) Information system strategy influences technological innovation effectiveness and leads to improved operational performance, H3) Business strategy influences operational effectiveness and leads to improved operational performance and H4) organisational strategy influences technological innovation and operational effectiveness and impacts improved operational performance. This stage of the research is not measuring the impact of strategies among each other.

3. Methodology

A multiphase approach was used to examine the proposed relationships in this research. First, unstructured interviews formed the initial basis of inquiry in order to identify preliminary issues and variables that needed detailed investigation. Second, a more detailed analysis was conducted using semi-structured interviews. Third, the results of triangulation were achieved through the analysis of companies’ documentation related to the information strategy and post implementation reports. The results of triangulation along with a literature review informed the development of the survey instrument which was used to collect quantitative data, this being obtained through a self-administered questionnaire. The questionnaire was administered in large service organisations which had recently implemented an enterprise information system. The questionnaire was administered to managers, engineers (technologist), and administrative and operational staff as, according to Orlikowski and Gash (1994), different actors in an organisation have different assumptions, expectations, knowledge and perceptions of technological innovation. Of the 450 surveys distributed among the service organisations, 144 were returned (32% response). Each returned questionnaire was reviewed for completeness and, of the 144, six were considered unusable due to large amounts of missing data, lack of involvement of the respondent in the use of EIS, or the impossibility of identifying the role of the respondent (manager, engineer or operator-user).

In the process of constructing measures of key variables and refining the survey instrument, four pilot tests were conducted. These pilot tests enabled the introduction of
a number of revisions carried out to improve the survey instrument between the initial
draft and the final instrument. The final questionnaire was divided into six sections.
The first section was used to identify the background, the areas of responsibility and
involvement of the respondent in the use of enterprise information system applications.
Section two was related to strategies. The third section was prepared based on previous
studies in organisational behaviour such as Schein (1996), Orlikowski and Gash (1994),
among other studies mentioned in DeLone and McLean (DeLone and McLean, 2003).
The fourth section (technological innovation effectiveness) had nineteen questions
selected from three previous studies mentioned in the DeLone and McLean (2003) ten-
year update as an appropriate empirical test and validation of the DeLone and McLean
information system success model.

The studies were: Seddon and Kiew (1994) who surveyed 104 users of a recently
implemented university accounting system, Rai, Lang and Welker (2002) who surveyed
274 users of a university student information system, and from Pitt, Watson & Kavan
(1995) who administered their questionnaire in three service organisations in three
different countries to test the validity of “quality of service” as a measure of information
system effectiveness. Rai, Lang and Welker (2002) believed that there is a danger that
information system researchers will mismeasure information system effectiveness if
they do not include in their assessment package a measure of information system
service quality. In the fifth section of the questionnaire, twenty questions were prepared
about operational effectiveness, drawn from the literature review and relevant
interviews undertaken during the qualitative phase of the research. The final section
addressed questions related to the improvement in operational performance, based on
the literature review, plus factors identified in the interviews.

4. **CONFIRMATORY FACTOR ANALYSIS**

As the main purpose of the study is to examine the impact of the three strategies –
organisational, business and information systems- on the operational effectiveness (OE),
technological innovation effectiveness (TIE) and the improvement of operational
performance (IOP), the next step in the data analysis was to perform a confirmatory
factor analysis (CFA). Initially, exploratory factor analysis (EFA) was considered to
investigate the data. This was found useful in discovering potential latent sources of
variation and covariation in observed measurement (Ho 2006). However, as pointed out
by Segars and Grover (1993), although exploratory factor analysis with orthogonal
rotation represents a rigorous assessment of measurement properties, it too has a
number of significant shortcomings. Among other issues, EFA can produce distorted
factor loadings and incorrect conclusions regarding the number of factors, also the
solution obtained is only one of an infinite number of solutions (Segars & Grover 1993).
Therefore, confirmatory factor analysis (CFA) was chosen.

CFA was used to study the relationships between the set of observed variables and the
set of continuous latent variables. The overall fit of a measurement model is determined
by a CFA (Cooksey, 2007; Hair et al., 2010). In the CFA all factor loadings are freed
(i.e., estimated); items are allowed to load on only one construct (i.e., no cross loading);
and latent constructs are allowed to correlate which is equivalent to oblique rotation in
exploratory factor analysis (Figure 2). The input covariance matrix generated from the
model’s 11 measurement variables contains 66 sample moments. There are 54
regression weights, 0 covariances, and 26 variances, for a total of 80 parameters to be
estimated. The model therefore has 159 degrees of freedom.
The chi-square goodness-of-fit test shows that the model did not fit the data well, $X^2(N=138, \text{df}=159) = 117.5$, $p < .001$. Although the model did not fit well by the chi-square test, the baseline comparisons fit indices of the NFI, RFI, IFI, TLI and CFI are close to or exceed the accepted cut-off value of $\geq .80$ (Table 1). This suggests that the hypothesised model fitted the observed variance-covariance matrix well, relative to null or independence model. The only possible improvement in fit for these two models range is from 0.079 to 0.146.

<table>
<thead>
<tr>
<th>Model</th>
<th>NFI Delta1</th>
<th>RFI rho1</th>
<th>IFI Delta2</th>
<th>TLI rho2</th>
<th>CFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default model</td>
<td>0.831</td>
<td>.796</td>
<td>.883</td>
<td>.856</td>
<td>.881</td>
</tr>
<tr>
<td>Saturated model</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Independence model</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 1: Baseline Comparisons

The estimates were analysed for the measurement model. The unstandardised regression weights were all significant by the critical ratio test ($> \pm 1.96$, $p < .001$). The standardised regression weights range from 0.655 to 0.901. These values indicate that the 11 measurement variables are significantly represented by their respective latent constructs. Explained variances (Squared Multiple Correlations) and residual variances for correlations ranged from 0.353 to .811. The residual (unexplained variances were from 18.9% to 64.7%).

The study now turns to examining the hypothesised structure model. The chi-square value for the models (Figure 3) was significant $X^2 (N = 138, \text{df} = 159) = 117.52$, $p < .001$. The chi-square per degree of freedom was 2.867. The baseline comparisons fit
indices of NFI, RFI, IFI, TLI and CFI for the model was close to the suggested cut off value 0.90 and the SRMR was of 0.05. This suggests that the hypothesised model somehow fitted the observed variance-covariance matrix reasonably well relative to null or independence model. The only possible improvement in fitness for this model ranges from 0.074 to 0.146.

Regression weights (Table 2), Standardised regression weights and Squared Multiple Correlations: Of the 5 coefficients associated with the paths linking the model’s exogenous and endogenous variables, two are significant by the critical ratio test ($\pm 1.96, p < .05$). Therefore, there is no support for hypothesis 1, that there is a direct impact of strategies (organisational, business and IS) to improvement in operational performance. The impact of strategies is related indirectly to the improved operational performance, being mediated by technological innovation effectiveness and operational effectiveness. Thus, the greater the perception of the importance of effectiveness in an aligned approach, the greater is the operational effectiveness and the greater the improved operational performance ($\beta=0.54$).

Hypothesis 2, that information system strategy influences technological innovation effectiveness and leads to improved operational performance has been supported by the critical ratio test (+0.40, p < .01 and +0.48, p<.01). Although there is a significant influence of operational effectiveness (+0.54, p < .01) to the improvement in operational performance, there is no support for hypothesis 3 that business strategy influences operational effectiveness and leads to improved operational performance. Finally, there is no support for hypothesis 4, that organisational strategy influences technological innovation and operational effectiveness and impacts improved operational performance.

Figure 3: Hypothesised structured model
The lack of support for hypothesis 3 and 4 could be explained by the lack of focus of organisational and business strategies on the key performance objectives, cost, quality, reliability, flexibility and speed, when designing business strategies. This fact has been confirmed by the documents studied from the researched organisations related to business strategies.

<table>
<thead>
<tr>
<th>Table 2: Regression Weights: (Group number 1 - Default model)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimate</td>
</tr>
<tr>
<td>Oper_Effect &lt;--- Bus_Strat</td>
</tr>
<tr>
<td>Sys_Effect &lt;--- Inf.Syst_Strat</td>
</tr>
<tr>
<td>Oper_Effect &lt;--- Inf.Syst_Strat</td>
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<tr>
<td>Sys_Effect &lt;--- Bus_Strat</td>
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<tr>
<td>Oper_Effect &lt;--- Org_Strat</td>
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<tr>
<td>Sys_Effect &lt;--- Org_Strat</td>
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<td>IOP &lt;--- Oper_Effect</td>
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<td>IOP &lt;--- Sys_Effect</td>
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<td>IOP &lt;--- Org_Strat</td>
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<td>IOP &lt;--- Bus_Strat</td>
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<tr>
<td>IOP &lt;--- Inf.Syst_Strat</td>
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<tr>
<td>C14 &lt;--- Bus_Strat</td>
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<tr>
<td>C15 &lt;--- Bus_Strat</td>
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<tr>
<td>C16 &lt;--- Bus_Strat</td>
</tr>
<tr>
<td>C19 &lt;--- Inf.Syst_Strat</td>
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<tr>
<td>C18 &lt;--- Inf.Syst_Strat</td>
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<tr>
<td>C17 &lt;--- Inf.Syst_Strat</td>
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<tr>
<td>OS1 &lt;--- Org_Strat</td>
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<td>OS2 &lt;--- Org_Strat</td>
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<td>OS3 &lt;--- Org_Strat</td>
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<tr>
<td>OE2 &lt;--- Oper_Effect</td>
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<td>OE3 &lt;--- Oper_Effect</td>
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<tr>
<td>OE4 &lt;--- Oper_Effect</td>
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<tr>
<td>SE1 &lt;--- Sys_Effect</td>
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<td>SE2 &lt;--- Sys_Effect</td>
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<td>SE3 &lt;--- Sys_Effect</td>
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<tr>
<td>SE4 &lt;--- Sys_Effect</td>
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<tr>
<td>IOP1 &lt;--- IOP</td>
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<tr>
<td>IOP2 &lt;--- IOP</td>
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<tr>
<td>IOP3 &lt;--- IOP</td>
</tr>
<tr>
<td>OE1 &lt;--- Oper_Effect</td>
</tr>
</tbody>
</table>

5. CONCLUSION

In answering the research question, ‘Is operational performance determined by strategies of the organisation?’ this research demonstrated that there is no direct influence or impact of strategy on the improvement in operational performance. This lack of direct influence can be explained by the fact that improved operational performance is the result of the interaction between the implementation of strategies and its related outcomes, which are the dimensions from technological innovation effectiveness and performance objectives from operational effectiveness. Likewise, this
study has demonstrated that the three type of strategy (business, organisational, and information systems) play a very important role in both the effectiveness of the operations and the effectiveness of the implemented EIS. Consequently, operational performance can be improved by strategies but only via the effectiveness of operations and the effectiveness of the technological innovation.

Figure 4 shows that there is a need for stronger alignment between business and organisational strategy and technological innovation effectiveness. Additionally, Organisational and business strategies need to reinforce the need for technological innovation effectiveness. Innovative technologies such EIS contribute to improve in operational performance when exhibit technological innovation effectiveness. This research has demonstrated the importance of including the performance objectives from operational effectiveness, in the context of information systems, to have a real understanding of the effectiveness of the implementation of an EIS. Previous studies described in DeLone and McLean’s Ten Years Update (2003) have tested the different dimensions in an information systems context; however, that research does not consider the performance objectives of operational effectiveness, such as cost, quality, reliability, flexibility, and speed.

![Figure 4: Hypothesised structured model adapted from regression weights](image)

The findings from this study indicate that there is a weak relationship between strategies and operational effectiveness and technological innovation effectiveness. However, there is as strong relationship between operational effectiveness and technological innovation effectiveness to the improved operational performance. Thus, when formulating strategies it is not only important to put an emphasis on the dimensions from system effectiveness but also on the incorporation of operational performance objectives in order to maximise the improvement in operational performance. Information systems should be focused on attaining the needs of the operations in the terms of: cost, quality, flexibility, reliability and speed, when formulating and implementing strategies, as this study has demonstrated that these performance objectives are very important factors in achieving operational effectiveness after the implementation of a technological innovation such as EIS.

The model that emerged from this research (see figure 4) demonstrated that strategies have no direct impact on the improvement of operational performance. Strategies are
impacting on improved operational performance indirectly through the alignment between technological innovation effectiveness and operational effectiveness. The fact that information system strategy influences technological innovation effectiveness and leads to improved operational performance, demonstrated the focus that information system strategies have in the studied organisations, but also demonstrated the importance of including the performance objectives from operational effectiveness.

6. MANAGERIAL IMPLICATIONS

By shedding some light on the complex phenomena that link strategies with technological innovation effectiveness, operational effectiveness and improvements in the performance of organisations, this work provides useful insights both to managers and academics in to the implementation of EIS. This research has demonstrated that the relationship between operational effectiveness and technological innovation effectiveness is important, because an optimal alignment has a positive influence on the bottom line. The main concern for organisations is to minimise costs and to allocate resources. However, the identification of appropriate systems dimensions and performance objectives becomes essential for continuous improvement. Competition is constantly increasing so business and corporate strategies should be supported by this alignment. Furthermore, organisations need to understand their operations, and adapt the systems to the operational requirements. Also, causes of user dissatisfaction should be estimated, information outcomes should be properly assessed and finally, the performance of operations and systems should be properly evaluated, because if organisations do not pay attention to these issues, they are more likely to continue allocating resources to EIS that do not make business sense. A better approach to technological innovation implementation is based on enhancing the effectiveness and efficiency of operational and system processes, in an aligned or synchronized approach, so technology innovation, such as EIS, can deliver the expected outcomes and help organisations to gain competitive advantage. Additionally, the factors identified in this research form operational effectiveness and technological innovation effectiveness, demonstrate the strategic focus that organisations need to consider when aligning technological innovations with operational effectiveness.

One of the problems in continuously innovating organisations is that although they implement an EIS, this does not lead to improved operational effectiveness. The organisations studied are becoming more complex and more dynamic and they are seeking to innovate to deliver high-quality services, cheaper and faster. However, the extent to which this innovation helps organisations in the delivery of better services and in reducing operational cost is questioned by this study. The challenge for managers is to develop and adopt a prevailing set of goals and set of operating rules and procedures for the enhancement of overall quality across the organisation, in order to maximise improvements in operational performance. Nevertheless, achieving higher levels of quality appears to be more complicated than previously thought, as employees at different levels must have a real commitment to achieve quality in their day-to-day operations. This suggests that organisations must work in all the dimensions mentioned in this research, to maximize the probability of achieving team success and avoid the conflicts between different technological frames, as different actors have different expectations from the technological implementation such EIS. In addition, the challenge for these organisations is to improve the quality of information, the quality of services and speed to deliver high-quality services, as the research has shown the importance of these dimensions or performance objectives.
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