

# The Effect of Information Systems on Firm Performance and Profitability Using a Case-Study Approach

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**Abstract:** Beale and Cole is a company that was experiencing significant levels of growth in its business. However, its existing operational practices and ICT infrastructure were incapable of efficiently sustaining their level of growth. A thorough analysis of the operational systems was carried out covering both the manual systems and those supported by its computerised accounting system. A number of beneficial changes were made, including the implementation of a major new business system replacing the old accounting system. In all these developments, the work of a teaching company associate, now known as knowledge transfer partnerships associate supported the analysis, but the full participation and support of all key personnel within the company was essential. Although there were problems during the implementation, these have been resolved and Beale and Cole now has a fully supported and integrated IT system which will maintain their competitive advantage and facilitate their continued growth and profitability.

**Keywords:** information, communication and technology (ICT), business systems integration, SMEs.

## 1. Introduction

A business information system is defined by Hooper and Page (1997) as “the sum of all the tools, techniques and procedures used by the business to process data”. Fisher and Kenny (2000) suggested that organisations infuse information systems into their operations so as to enhance competitiveness and facilitate business growth and success. On the other hand, Laudon and Laudon (2001) believed that information systems are embedded in organisations and are the result of standard operating procedures, work flows, politics, organisational culture and structure. Although organisations have different information systems because they have varying information needs, they all strive for competitive advantage through continuous improvement; re-evaluation of the effectiveness and efficiency of their business information system (Chaffey and Wood 2005). The purpose of this paper is to investigate the Information System of Beale and Cole, to examine the course of action taken to implement changes to the existing IS practises, and to share experiences and lessons learnt from the change process and the effect on the organisation’s performance.

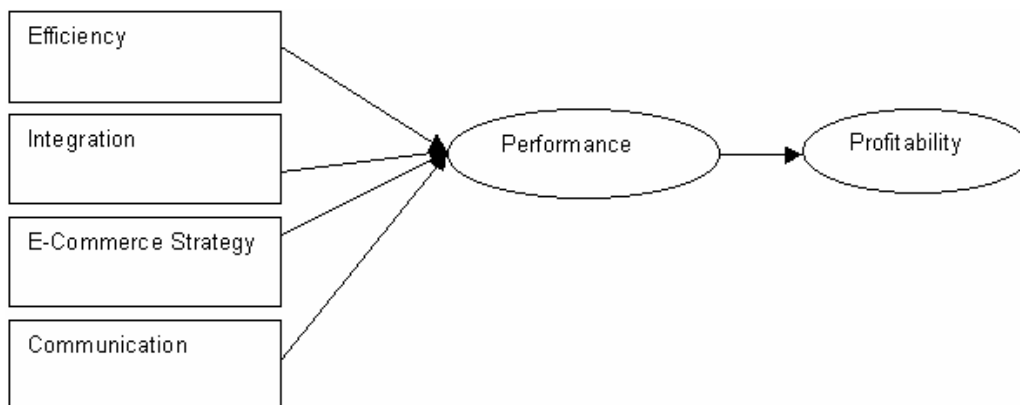
Beale and Cole Building Services was established in 1967. The company started out in Exeter as a small family business but today, it is one of the leading firms of building services engineers in the South West of England with branches in Exeter, Yeovil and Plymouth. The company has witnessed a significant level of growth over the years. However, the existing operational practises, processes and supporting Information, Communication and Technology (ICT) infrastructure were inadequate to efficiently sustain this level of growth.

Subsequently in the summer of 2003, Beale and Cole in partnership with the University of Plymouth embarked on a Department of Trade and Industry (DTI) funded initiative known as the Teaching Company Scheme (TCS) now called Knowledge Transfer Partnerships (KTP). The main objective of this coalition was to implement new integrated business and supporting IT systems which would streamline operations, increase internal efficiency, facilitate sustained growth and increase profitability.

In order to achieve the objective of this investigation, a Knowledge Transfer Partnerships Associate with a background in business information management systems was recruited to conduct an in-depth analysis of the business information system and to propose and implement recommendations for improvement. Therefore, this paper will reflect on the experiences of this process by all parties involved in the project including management and staff of the organisation.

## 2. Initial review of Beale and Cole’s information systems

This stage was conducted by the associate, Matthew Simmons. The first step was to review the internal processes and existing Information systems in the organisation so as to highlight the major problem areas. The main problems were found to be; duplication of effort, inefficiency in some processes including e-commerce strategy and problems with communication.. We developed a simple model, shown below, to explain all the main problems in detail and to highlight the impact of the improved information systems on operational performance and profitability in the organisation.



**Model 1:** Proposed framework for the effect of information systems on performance and profitability

### 2.1 Efficiency

The unprecedented expansion and consequent physical and commercial growth of the organisation opened up crevices in the organisation’s business processes.

Nicholls-Nixon (2005) found in his study that rapid growth in business generates dramatic changes in the scale and scope of a firm’s activities. According to her, entrepreneurs in rapidly growing business enterprises experience more difficulties in comparison to small growth companies when deciding or establishing the type of changes or evolution required to support their level of growth. This is because they face greater managerial complexity than slow growth firms. One of the solutions she recommended to solve this complex issue was that high growth organisations should develop new skills and capabilities which will allow them to cope with the complexity. This can be attained by appointing new personnel or acquiring new resources such as new information systems targeted at improving organisational efficiency and effectiveness.

The main problem area highlighted by the associate was the organisation’s accounting system. The company’s business system had been purchased from a software company many years ago. Initially, the software was run on a leased line which was very expensive. This was later changed to a Virtual Private Network (VPN) by the associate thereby greatly reducing the operating cost.

The software was supposed to be an extensible accounting system capable of managing all financial aspects of the organisation and though it appeared to be a tool that can be fully integrated with MS excel or access so as to facilitate data analysis and report creation; it would have required a database translation to function effectively. However, as the structure of the database was weak, translating it would have been very difficult, time consuming and cumbersome. Moreover, the system was generic, had limited documentation which was very difficult to understand and as it was outdated, the system would have failed to meet legislative regulations by 2007.

Furthermore, the software company had since changed ownership. Presently, their have been no new developments but extensions and upgrades to their existing software. Although the supplier offered these more up to date upgrades (which was not free), it still appeared to use some of the features that proved unsatisfactory in the original system. Another drawback to using this system was the maintenance agreement. Although it had been properly structured, it was however inconvenient as the software company had a third party agreement with another company which managed the maintenance of the software. Invariably, turnaround time for maintenance could sometimes be very high, prolonged and time consuming.

Another operational concern was that the company had not altered its recording procedures despite its rapid growth. The method used for monitoring labour needed to be improved as it was not centralised and was

deficient in forward planning. The job costing system that was used did not take into account the availability of labour while there was a lack of consistent structure in the recording of unstructured information about projects. Although a manual index of documents was stored online, it had become ineffective since the organisation had expanded to a second location.

A manual procedure of operation that needed much improvement was the time sheet recording. This involved engineers completing a complex time sheet which would then be faxed to the office for the contracts manager to check and calculate the necessary payment agreements. Once this stage had been completed, the time sheet would be passed on to the administration department where the time would be checked again before inputting it onto the system. Finally, the information would be printed out so that the details can be used to generate the engineers' wages. This procedure would normally take about 6 office hours and would involve about 60-70 engineers, all the contracts managers (7), 2 administrative assistants and a payroll officer.

## **2.2 Lack of uniformity and integration**

The major concern was that there were many bespoke systems and undocumented manual system, and very little uniformity in operational procedures. This followed from the recent merging of a part of the company specialising in plumbing with the original business which specialised in electrical services. Crist (2002) observed a similar situation in his study suggesting that "traditional document control processes were usually a combination of manual and electronic systems which may result in duplication of effort and further expenditure of time". Winch and Carr (2001) recommended that an appropriate remedy was to use process mapping which focuses on actual flows of information within the organisation. They maintain that this method is less demanding with regards to resources and engenders a process whereby there are standardised protocols for business operations. Furthermore, Fisher and Kenny (2002) pointed out that there were two mandatory steps required to implement an organisation-wide information system and these are; well designed set of business processes or value chain and secondly, a cautious exercise in strategic thinking, operational planning and consultation with all end users of the system to facilitate user satisfaction and in turn better use of systems and improve performance.

Researchers like Weill and Baroudi, (1990) cited in Caldeira and Ward (2002) and Delone and Mclean (1992) established that user satisfaction was the most widely used variable for measuring IS success because there exists a strong correlation between this variable and firms' performance. However, other studies by Kim (1989) and Melone (1990) have disputed these findings as inconclusive because user satisfaction failed to consider the diverse roles, needs and interests of the users. In this study, a thorough analysis of the alternative systems was carried out by the associate and involving all the main users of the system to enhance user satisfaction. However, some users were initially opposed or averse to the change, while others had mixed feelings. The observation and interviews showed that with gradual induction of changes and good training, this might lead to improvement of performance.

## **2.3 e-Commerce strategy**

Although Beale and Cole had a website, it did not give a clear and up to date picture of who they are and what they had achieved. The deficiencies apparent on the website meant it could not be effectively utilised as a strategic e-commerce tool for marketing the company's services. Taylor and Murphy (2004) highlighted that E-commerce strategies can be adopted by Small and Medium Enterprises (SMEs) for customer base expansion. Other researchers suggested that e-commerce strategy enhances performance in general and time-based delivery performance in particular (Jeffcoate, J., et al. 2002; Iyer, Karthik N.S., et al. 2004).

## **2.4 Communication**

Information in the organisation was stored at a very high cost rather than being shared. The main modes of communication within branches were through phone and fax, face to face and limited use of e-mail, while for customer and suppliers, telephone and fax were used. There were also the lack of network capabilities for file sharing and organised postal system and no internal communications link for the offices. This translated to increased expenditure on telephones.

This existing communication arrangement promoted data duplication, loss of information, elongated processes and increased time frames for decision making. A lot of studies showed that clear communication channels within the organisation and between the organisation and its customers have a positive effect on firm performance, see for example (Carr, Amelia S. Kaynak, Hale, 2007).

### **3. Research methodology**

This article describes qualitative research into the case study company through a series of in-depth interviews and observation. The evidence from the interviews and observation are compelling, and therefore the overall study is more robust. One of the limitation of case study is that it provides little basis for scientific generalization. To overcome this problem and for future research a multiple case studies approach is required. Multiple case studies are generalizable (though not necessarily to multiple populations or contexts).

### **4. Implementation of improved systems**

To eradicate these deficiencies, a number of changes were made to the existing system. Where possible, the systems which differed on the two sites but served similar purposes were amalgamated and integrated. These changes were supported by a similarly configured file server with a permanent line between them.

The initial enhancements included

1. The introduction of electronic time sheets which has eliminated duplication reduced payment errors by 99.9% and saved 3 staff members half a day per week.
2. Improvements to the telephony system and a change of supplier saved an estimated 312 person hours per year and reduced expenditure considerably.
3. Standardisation of forms and procedures between sites, eliminating duplication of activity, reducing error and improving communication.
4. Enhanced data security through integrating the IT and communications system, improving their reliability, robustness and increasing user confidence.
5. Implementation of a suitable filing structure reduced time spent locating files and enabled improved archiving capabilities.
6. Design and development of the website by an external developer. The site now has a professional image and highlights areas of specialisation of the company and past projects executed. Further developments will be made in the future to incorporate the website onto the business system.

After the successful implementation of a number of immediate improvements, it was further decided that the old accounting business system should be replaced. Numerous studies by (Delone and McLean, 1992; Yap et al 1992; Doukidis et al, 1994) have pointed out the importance of involving all key employees at this stage of the project in order to obtain commitment to the new system. In Beale and Cole, user participation and commitment was achieved through several brainstorming sessions, meetings and thorough analysis of the alternative systems with all the main users so as to agree on the selection criteria and which package best met those criteria.

There were clear differences of opinion about which was the best package for the company's needs. This was probably due to the superiority of one package for the estimating and costing side of the business and another for the financial reporting side. However, the full participation of all key members of the company ensured that there was a high level of commitment when the final choice; Estimation software, an industry specific software package came to be implemented.

The Estimation Plus software was easier to use than its predecessor and allowed greater control. Some of the functionalities of the system were:

1. It was segregated into sections and order list, which made it possible to determine materials required for a building and individual rooms within the building.
2. Price enquiries could be sent to suppliers and purchasers.
3. It made it possible for engineers to purchase materials through the system.
4. Enquiries on job details and all contracts can be easily accessed.
5. Outstanding debtor balances are effortlessly produced.
6. The system allows users to create many of their own reports and also provides management reports which can analyse the business from 15 different perspectives.

## **5. Experiences gained from the implementation and impact of the systems change**

The selection and implementation process took place during a period of rapid growth for the company. Consequently, all concerned were experiencing pressure on their time. The time taken to complete the selection process therefore exceeded the time planned. In an attempt to restrict the degree of consequent slippage in the implementation date, the time analysing the detailed requirements for implementation was restricted. Therefore all the areas of the business system were not completely configured before commencing the phased in implementation. They discovered after implementing some areas in the estimating and accounting software that some aspects of the system should have been done earlier. Consequently, some of the decisions taken such as cost code allocation were regretted and corrected. With hindsight, we feel that more time should have been spent getting used to the package under test conditions before its full scale implementation.

Although the new system is still in its early period of operation, there is wide agreement within the company that operational processes within the company are now running much more efficiently:

1. The communications system has been streamlined. Consequently, there is improved integration and communication, particularly between the Exeter, Yeovil and Plymouth sites.
2. Enhanced customer communications and improved opportunities for maintaining excellent customer relations.
3. Improved management information for tactical and strategic planning and control.
4. The documentation of systems and processes to ISO standards provided a framework for future developments in the organisation.
5. The company has the potential and capacity for more rapid expansion and business growth.
6. There has been increased turnover through business growth
7. Implementation of improved business system has increased profitability and improved cost control in the organisation.
8. The reports produced by the business system make information for decision making readily available to managers.

Presently, the company is considering the procurement of an electronic trade e-invoicing system which would be integrated into the business system. This e-invoicing would eliminate the need for manual input of invoices, greatly enhance cost control and reduce transaction and overhead costs.

## **6. Conclusion**

This study describes the experiences and lessons learnt at Beale and Cole as they implemented changes to their existing IS practises in order to support the level of growth of the business. Initially, the change brought about mixed reactions, some doubt and some opposition amongst employees but these were gradually eliminated through their involvement in the search for alternatives and in the implementation stage of the change process. During the implementation stage, some teething problems were encountered. This was because the time frame allowed for implementing and studying the new system was restricted thereby leading to some errors but these were subsequently corrected.

These changes to the organisation's operational practises, business system and ICT infrastructure have improved operational processes and efficiency of the company. Consequently, this has reduced operating and transaction costs, increased turnover and enhanced profitability. The introduction of this fully supported and integrated IT system will serve as a strategic tool for Beale and Cole to sustain its continued growth and maintain its competitive advantage as one of the leading building services company in the South West region.

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