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# Enterprise Systems Benefit Framework For Medium Sized Manufacturing Businesses In The UK

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# ENTERPRISE SYSTEMS BENEFIT FRAMEWORK FOR MEDIUM SIZED MANUFACTURING BUSINESSES IN THE UK

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## Abstract

*This study aims to develop an Enterprise Systems benefit framework by identifying the benefits accrued by Medium Sized Manufacturing Businesses from the adoption of Enterprise Systems. For this study, Enterprise Systems consist of ERP, CRM and e-Procurement. Through a critical literature review, a conceptual model is proposed which classifies the benefits as cost reduction, time reduction and quality improvement. Through ten case studies the proposed model was enhanced to a framework that groups the benefits as Procurement & Forecasting, Manufacturing & Logistics, Sales, Marketing & Customer Service, IT infrastructure, organisational benefits.*

**Keywords:** Enterprise Systems, Benefits, SME, ERP, CRM, e-Procurement, Manufacturing, Benefit Framework

# 1. Introduction

The category of micro, small and medium enterprises (SMEs) is made up of companies which employ fewer than 250 persons and which have an annual turnover not exceeding €50 million, and or an annual balance sheet total not exceeding €43 million (European Commission, 2005). The Manufacturing sector in the North West of England is crucial to the economy of the region as it employs over half a million people and contributes 25 % of the region's GDP (NWDA, 2006). It contributed 21% of UK Gross Value Added in 1997 but by the end of 2005 this had reduced to 14% (Benchmark Research, 2007). Various experts and Government bodies opine that improving the adoption levels of Information & Communication Technologies can help to revive the failing sector (European Commission, 2002; Levy et al., 1999; Ravarini et al., 2000). However, due to the *productivity paradox* of Information Technology (IT) investments (Love & Irani, 2001), SMEs are cautious to adopt new technologies leaving them competitively weaker when compared to their larger counterparts. A report by Accenture, an IT consultancy firm, indicates that IT project failure rates are between 41% and 70% (Ranger, 2005). In the context of SMEs, failure rates are even higher with a ratio six times greater than larger businesses (Levy & Powell, 2005).

For maximising the potential of IT, Gyampoh-Vidogah et al., (1999) suggest that companies must evaluate its direct and indirect benefits prior to the implementation. Various studies highlight the low adoption level of e-commerce, IT and e-Business amongst SMEs (Arminas 2002); Taylor and Murphy, 2004; OECD, 2004; Simpson and Docherty, 2004). Although many reasons can be attributed to low adoption levels, lack of awareness about the benefits of IT is seen as a significant barrier. Daniel & Myers (2000) supports this view by emphasizing the "need for education" about the

benefits of IT. IT is a broad term that encompasses a single stand alone computer system with office applications to highly integrated enterprise system and is analogous to the central nervous system of the human body. Since there is little research into Enterprise Systems and benefits realisation in the context of SMEs (Ballantine et al., 1998; Love & Irani, 2004), a rigorous study of the benefits accrued by SMEs from Enterprise Systems (ES) is necessary.

The main objective of this study is to develop a comprehensive benefit framework by identifying the benefits accrued by Medium Sized Manufacturing Businesses (MSMB) from ES implementation. MSMB are manufacturing businesses with employee strength between 51 and 250 and a turnover between €10M and €50M (European Commission, 2005). MSMBs have been chosen since the adoption levels of Enterprise Systems are very low amongst the micro and small segments and might not be pertinent (Oliver et al., 2004). To accomplish this objective, the core components of Enterprise Systems viz Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and e-Procurement systems has been considered (Norris et al., 2000; Kalakotta & Robinson, 1999).

The structure of this paper proceeds as follows. Section 2 provides a brief overview about ERP, CRM and e-Procurement and their benefits. This is followed by a critical review of existing benefit frameworks. Based on the review, a conceptual framework has been proposed. Section 8 discusses the research design and the development of the benefit model. The remaining sections display the results of the case study and subsequent findings. The paper concludes with a discussion of the research limitations and directions for future research.

## 2. Enterprise Systems

Enterprise Systems (ES) are modular software systems that intend to integrate the enterprise by

- Optimising business processes
- Providing a single source of information through integrated databases
- Improving links between suppliers, customers and employees

  (Sarkis & Sundarraj, 2001; Shang & Seddon, 2002)

The benefits of ES are experienced by the entire organisation. Typically they include ERP, CRM, e-Procurement, Supply Chain Management, Supplier Relationship Management, Human Resource Management and Knowledge Management Systems. This paper focuses on ERP, CRM and e-Procurement systems. ERP can be defined as a packaged business solution that is designed to automate and integrate business processes, share common data and practices across the enterprise and provide access to information in a real time environment (Deloitte, 1999). CRM is defined as the application of technologies such as POS (Point of Sales), EDI (Electronic Data Interchange), Call Centres, Database, Data marts, ERP systems, Internet, Web Integrated Systems and strategies to business processes, which would enable organisations to identify and provide value added services; target, and retain the right customers in a cost effective way, leading to increased revenues and long term relationships with the customers (Vedanthachari, 2007).

E-Procurement is a collective term for a range of technologies that can be used to automate the internal and external processes associated with strategic sourcing and purchasing (NePP, 2005).

It can be inferred from the definitions that these three systems, when implemented in an organisation, can provide tight integration between customers, employees and suppliers (trading partners). By integrating with customers and trading partners,

SMEs can gain greater competitive advantage to compete with larger corporations

| ERP | CRM | E-Procurement |
|---|---|---|

(Chen et al., 2003). Literature research reveals that, an organisation can also reduce inventory costs, reduce order processing times, improve customer service, improve flexibility and responsiveness to demand through the application of Enterprise Systems (BMED, 2000; Essig and Arnold, 2001; Mclaren et al., 2002, Mentzer et al., 2000). By reviewing academic literature and popular press, benefits of ERP, CRM and e-Procurement systems were identified and it is depicted in Table 1.

| | | |
|---|---|---|
| 1. Head count reduction<br>2. Improved Productivity<br>3. Procurement Cost Reduction<br>4. Inventory Cost Reduction<br>5. Cost reduction in product development<br>6. IT cost Reduction<br>7. Transport / Logistics Cost Reduction<br>8. On – Time Delivery Improvements<br>9. Cycle time Reduction<br>10. Customer Responsiveness<br>11. Better Information Flow<br>12. Improved IT System (Y2K compliance, Ease of Integration etc)<br>13. Standardised Business Process<br>14. Implementation of desired business Process<br>15. Improved decision making<br>16. Improved customer service, Retention and Customer satisfaction<br>17. Improved organisational Structure & Knowledge<br>18. Improved Financial Management<br>19. Increased Organisational Flexibility<br>20. Improved Innovation capabilities<br>21. Increased Revenue<br>22. Improved competitive advantage | 1. Reduced Cost of Customer handling, e.g., Lower Call Centre Costs<br>2. Reduced costs of buying and using products and services<br>3. Cost savings due to head count reduction<br>4. Reduced expenditure on marketing and sales<br>5. Reduction of duplicated data, Unified Customer Data<br>6. Ability to simulate the impact of the launch of new product<br>7. More effective Marketing<br>8. Improved Customer Satisfaction, Loyalty, Customer service ,support and retention<br>9. Increased ability to understand customer's needs<br>10. Improved Competitive Advantage<br>11. Product customisation and tailored service<br>12. Increased revenues and profit margin<br>13. Ability to provide multi channel communication<br>14. Improved decision making | 1. Less paperwork<br>2. Reduced error rate<br>3. Reduced cost of purchased items<br>4. Reduced transaction and administrative costs<br>5. Reduction in purchasing cycle time<br>6. Reduction in the number of suppliers<br>7. Elimination of maverick spending<br>8. More accurate deliveries<br>9. Reduction in Inventories<br>10. Greater Management control over corporate spending<br>11. Streamlined procurement process<br>12. Headcount reductions<br>13. Improved relationships with suppliers<br>14. Improved competitive advantage due to lesser time to market<br>15. Improved management information |

**Table 1: Summary of the benefits of ERP, CRM and e-Procurement Systems**

## 3. Review of existing benefit frameworks

A review of academic literature has revealed that there is a dearth in the number of benefit frameworks specifically developed for Enterprise Systems. Hence frameworks developed for expressing the benefits of IT investments in general was also considered for the analysis. Table 2 depicts the frameworks that have been identified from the review of literature.

| S.No | Description about the study | How benefits were classified? |
|---|---|---|
| 1 | This is one of the pioneering works on the benefits of IT investments. Through multiple case studies and author's own experience, a benefit framework for IT investment has been proposed | Strategic, Management, Operational efficiency and effectiveness, Functionality, Support, Information, Communication and learning benefits (Farbey et al., 1993) |
| 2 | A list of MRP II benefits were identified through in-depth case study of a manufacturing organisation | Strategic, Operational and Tactical. [Irani & Love, 2001] |
| 3 | A survey was conducted amongst 62 Fortune 500 companies to identify the benefits of ERP implementation. Resulting benefits were classified as tangible and intangible | Tangible and Intangible [43] |
| 4 | An ES benefit framework was developed by analysing vendor published reports about the success of ERP implementations and through multiple case studies | Operational, Managerial, Strategic, IT Infrastructure and Organisational (Shang and Seddon , 2002) |
| 5 | A list of factors that should be considered while evaluating ERP systems were identified by the authors | Operational and Strategic (Stefanou, 2001) |
| 6 | To determine the benefits from the implementation of integrated IT infrastructure, a multiple case study approach. | Operational, Managerial, Strategic, Technical and Organisational (Themistocleous, 2004) |
| 7 | Information Management: evaluation of Information Systems investments | Financial, Project, Process, Customer, Learning and technical aspects, and Measured organizational performance [56] |

**Table 2: Review of existing benefit frameworks**

The benefit frameworks depicted in table 2 have been developed by applying the theories behind organisational structure, balanced scorecard, and whether the benefits

can be quantified or not. They have been developed to assist organisations to conduct benefits evaluation for IT investments. The following section describes the two main issues identified from these classifications.

### 3.1 Benefits overlap within the framework

In some of the frameworks, the demarcation between various classifications is blurred and there is a greater chance of managers getting confused with this. For example Farbey et al., (1993) classifies the benefits of IT investments as Strategic, Management, Operational, Functional and Support which is based on the organisational structure as defined by Mintzberg. By classifying the benefits in these dimensions, it will be difficult to differentiate between operational and support benefits. Farbey et al., (1993) acknowledges this by stating that the classification is not watertight and the classes do overlap. Likewise Shang and Seddon's (2002) ES benefit framework classifies benefits in terms of operational, managerial, strategic, IT infrastructure and Organisational, based on Anthony's organisational pyramid. In this classification, there would be an overlap when differentiating between organisational and strategic benefits because both these benefits would impact on the entire organisation.

### 3.2 Lack of a common unit of measurement

According to Hares & Royale (1994) methodology, IT investment evaluation starts with the identification of benefits which are quantified and then expressed in terms of monetary value. The benefit frameworks would enable organisations to identify the potential benefits of their IT initiatives. While making the business case, Gumberg of Meta Group suggests that technology managers should develop a language that can be understood. *"It's not appropriate to talk about 'bandwidth' or 'throughput.' What does*

*that mean in dollars and cents, both in costs and benefits?"* (Fryer,1999). But the presence of intangible benefits and lack of an investment evaluation tool can make the quantification process difficult and complex. From an SME perspective, the quantification process would be more difficult because of their lack of knowledge regarding the benefits of IT investments. A common feature among the existing benefit frameworks is the absence of a common unit of measurement. It is like describing the time taken to travel between point A and point B by various means of transport instead of stating the distance between them. Applying this analogy to IT investment evaluation, it can be argued that, the evaluation process can be made simpler, if the benefits are classified in terms of a combination of measurable and non measurable units and expressed in a language which is easily understood by SME managers. Considering this view, the author proposes the concept of expressing the benefits of Enterprise Systems in terms of Quality, Cost and Time which has been defined by Gardiner and Stewart (2000) as the 'golden triangle' for project management. Supporting this view Atkinson (1999) defines them as the 'iron triangle' for project management**.** Sarkis & Sundarraj (2001) name them as the strategic performance metric for project management.

## 4. Quality Cost and Time

Quality, Cost and Time are the three variable parts of a project. These three factors are related to each other. By reducing the cost and time, there is a greater chance for the quality reduction (Beecroft, 1999). Thus an organisation should be judicious when setting values for these variables. These variables are also used to rate suppliers. Ideally every organisation likes to hunt for a supplier who can deliver a product with the lowest price, on time and of good quality (BMED, 2000). Maximov & Gottshclich (1999) argue that by optimising the interface of Cost, Quality and Time, a

congruence of customer satisfaction and corporate success can be achieved which they term as time – cost-quality leadership.

Thus the concept of Quality, Cost and Time is used extensively and for a long period of time. Although it is popular, extant literature research indicates that the benefits of Enterprise Systems in terms of cost reduction, time reduction and quality improvement have not been discussed. The main advantage of expressing the benefits in these categories is the common unit of measurement. Benefits which directly aid in reducing costs are grouped under cost reduction benefits, benefits which reduce the time taken to accomplish the various activities are grouped under time reduction benefits. The benefits which improve the quality of service or product or experience are under the quality domain. Another advantage is that the benefits can also be expressed in a language easily understood by SME managers. As stated earlier, evaluation starts with the identification of benefits which is followed by quantification for expressing it in monetary values. By expressing the benefits in measurable units, the evaluation process becomes easier.

## 5. Conceptual Benefit Framework for Enterprise Systems

A conceptual framework has been proposed through the process of grouping and abstraction of the benefits identified in the literature. This exercise resulted in the benefits being expressed in terms of cost reduction, time reduction and quality improvement (Fig 1 and Table 3). Increased revenues have been placed at the epicentre of the framework to signify the overall objective of Enterprise System implementation. This framework serves as the starting point to achieve the goal of this study. To enhance this framework, empirical data was collected through appropriate research methods.

| Benefit Categories | Benefit Metrics | How respondents use the system to accrue the benefits? |
|---|---|---|
| Time reduction in purchase order cycle (BC1) | Time reduction in information exchange (BM1) | Through the usage of digital catalogues, EDI, Web Integrated systems, e-Mail and Purchase Order Processing Systems instantaneous information exchange is facilitated. |
| | Improved forecasting (BM2) | Ability to analyse past purchasing and sales history Usage of forecasting module in the Enterprise System |
| | Implement new procurement process (BM3) | Enterprise Systems provided the necessary infrastructure to implement new processes such as Vendor Managed Inventory and Web Integrated Systems |
| Improved Supplier Relationship (BC2) | | Better information about stock levels has enabled the respondents to place order well in advance which has improved the relationship with the suppliers |
| Better Control Over purchasing (BC3) | Streamlined Procurement Process (BM4) | Procurement process was centralised and streamlined due to the functionalities in Enterprise Systems |
| Cost reduction in procurement related activities (BC4) | | By centralising the procurement process, maverick buying was eliminated which resulted in cost savings to respondent SMEs |

**Table 3: Benefit Categories and Metrics Associated with Procurement and forecasting activities**

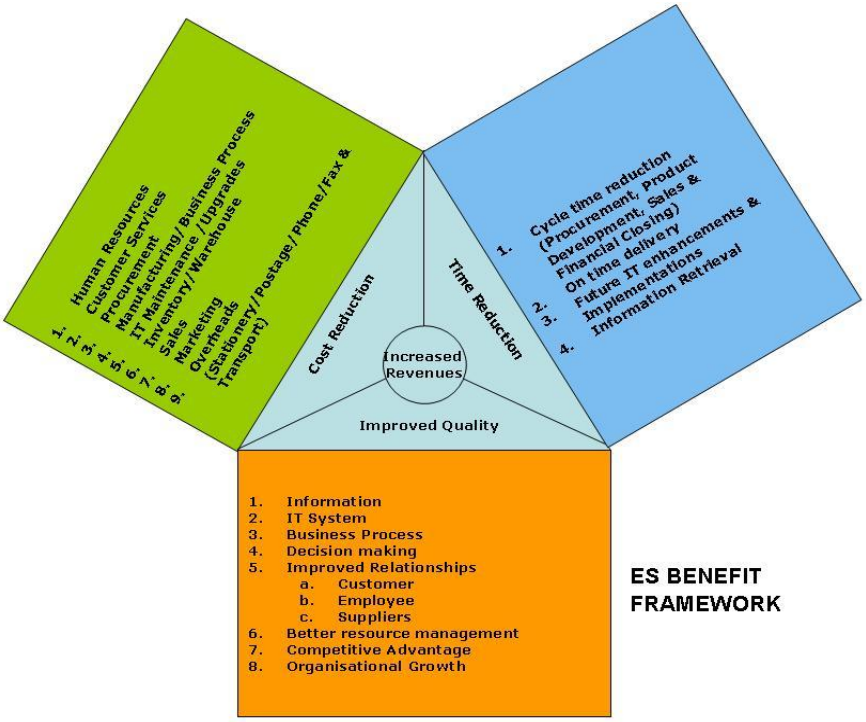


**Fig 1: Conceptual Framework**

## 6. Data Collection – Multiple Case Studies

Most of the benefit studies discussed in the literature is based on the impact of Enterprise Systems on large organisations. Hence it is pertinent to conduct empirical studies with regard to MSMB. Data for this research was collected through ten in-depth case studies with MSMBs in the North West of England. Case study methodology has been chosen for this research because it enables the capture of reality in considerably greater detail than is possible when compared to other approaches (Galliers, 1991). Jankowicz (1991) supports this argument by describing the case study as comprehensive, and involves the researcher in describing and analysing the full richness and variety of events and issues with in the organisation.

Applying these arguments to the present scenario, 'case study' was conducted to study

- the current IT infrastructure of the organisation

- Why Enterprise Systems were implemented and how it supports the organisation's various business processes.

### 6.1 Sample Selection for case studies

Sample selection will play a vital role in understanding the phenomenon that is being investigated. The case organisations for this empirical study were chosen through purposive sampling. Ten organisations were chosen and efforts were taken to make sure that they fell into the domain of Medium Sized Business as defined by the European Commission (2002). The case study organisations were from the manufacturing, engineering, textile and chemical industries. Their IT investment ranged from £20,000 to £200,000 on their Enterprise Systems (During implementation). All the implementations were more than three years old. They had implemented at least of two of the three systems (ERP, CRM and e-Procurement) under study. These organisations were the

### 6.2 Data Collection

Data was collected through semi structured interviews developed through the conceptual framework developed from the literature review. Interview method was preferred to achieve our objective of exploring the benefits accrued by medium sized manufacturing businesses from the implementation of Enterprise Systems. This is because the researcher is interested in understanding the impact of IT on the business and this is best if it is narrated. It was also found that SMEs do not have a formal benefit management process that documents the benefits of Information Systems. However in certain case study organisations, direct observations were made to gather more information about business processes and IT infrastructure. Interviews were held with IT managers / Directors who had in-depth knowledge about the business process and IT system. The entire conversation was digitally recorded to aid in-depth analysis.

## 7. Analysis

The data collected through interviews were transcribed and thoroughly examined to remove incomplete and ambiguous information. The entire transcripts were provided to the respondents to improve the accuracy of the collected data. The transcripts were then analysed by applying open, axial and selective coding processes stated in Grounded Theory which has been acknowledged as a robust methodology for analysing qualitative data (Hussey & Hussey 1997, Kandadi 2006, Gray 2004 and Strauss and Corbin, 1998). This analysis resulted in the development of Benefit Metrics, Benefit Categories and Benefit Functions. Benefit Metrics can be used to quantify the impact of Enterprise Systems. These Metrics were grouped together to form Benefit Categories which express the benefits in terms of cost reduction, time reduction and quality improvement. The identified Benefit Categories were grouped to form the Benefit Functions which represent the business functions of an organisation that are impacted by Enterprise Systems. To be classed as a benefit following qualifying criteria was adopted

- Each benefit should be mentioned by respondents from two or more of the organisations under study
- Each benefit should have played a significant role in improving the business process
- Respondents should have provided instances on how they were able to identify that particular benefit

Following benefit functions were identified.

1. Procurement & Forecasting
2. Manufacturing & Logistics
3. Marketing, Sales & Customer service

4. IT Infrastructure

5. Organisational benefits

Organisational benefits denote the benefits that are common to all business functions. As a result of this analysis Thirty Two Benefit Metrics, Eighteen Benefit Categories and Five Benefit Functions have been identified. Table 4 presents the framework developed from this study.

Figure 2 depicts a thematic representation of the identified benefit functions. IT Infrastructure is placed at the epicentre to indicate the fact that all functions are impacted by Enterprise Systems. All the functions are encompassed within the organisational domain to demonstrate that Enterprise Systems play a vital role in the success of an organisation. The following section elucidates the benefit functions that have been identified from the study.

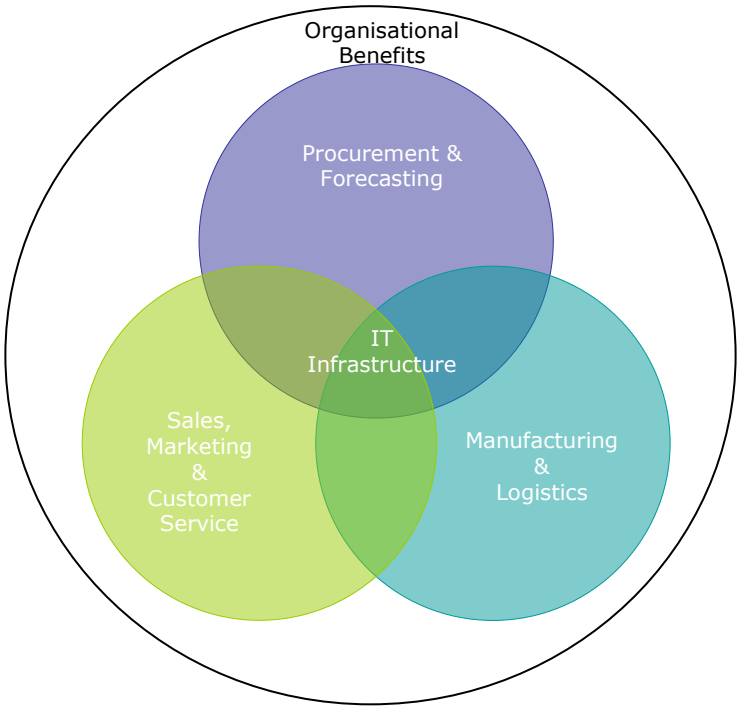


**Fig 2: Thematic representation of the impact of identified categories**

### 7.1 Procurement & Forecasting (BF1)

This study reveals that a majority of the researched organisations have realised benefits in the procurement domain. Procurement is an important activity especially for manufacturing SMEs because procurement expenditure often equates to 30% to 40% of the value of the sales turnover (Maringanti, 2006). The core steps of procurement: Identification of need, Requisition approval and creation of purchase order can be automated by the procurement module in the enterprise application. The procurement systems in respondent organisations are comprised of purchase order processing systems, digital catalogues, EDI and preferred supplier databases. Some of the respondent SMEs have integrated their systems with their suppliers and some are in the process of integration. By integrating with suppliers, the information flow will be instantaneous and less erroneous and can improve the visibility of the purchase order cycle. In spite of these benefits, some of the respondent organisations have not integrated with their suppliers due to a lack of suitable IT infrastructure at the supplier end.

Forecasting, which is another important activity of an organisation is accomplished by analysing past sales history and staff knowledge of the market trends. Based on the sales forecast, purchase planning is accomplished. In some case organisations, forecasting is not possible due to the nature of their business. One of the respondents stated: *if we are going to forecast with the true sense of the word, we would always get it wrong because there is no seasonality, there is nothing you could say because the things affecting us are wars, civil disobedience etc.*

In the procurement and forecasting functions, four 'Benefit Categories' (BC) have been identified which are Time reduction in the purchase order cycle, improved

supplier relationships, better control over procurement processes and Cost reduction in procurement related activities. Table 4 depicts the benefit categories and metrics and indicates how the respondent SMEs were able to identify the benefits.

| **Benefit Categories** | **Benefit Metrics** | **How respondents use the system to accrue the benefits?** |
|---|---|---|
| Time reduction in purchase order cycle (BC1) | Time reduction in information exchange (BM1) | Through the usage of digital catalogues, EDI, Web Integrated systems, e-Mail and Purchase Order Processing Systems instantaneous information exchange is facilitated. |
| | Improved forecasting (BM2) | Ability to analyse past purchasing and sales history Usage of forecasting module in the Enterprise System |
| | Implement new procurement process (BM3) | Enterprise Systems provided the necessary infrastructure to implement new processes such as Vendor Managed Inventory and Web Integrated Systems |
| Improved Supplier Relationship (BC2) | | Better information about stock levels has enabled the respondents to place order well in advance which has improved the relationship with the suppliers |
| Better Control Over purchasing (BC3) | Streamlined Procurement Process (BM4) | Procurement process was centralised and streamlined due to the functionalities in Enterprise Systems |
| Cost reduction in procurement related activities (BC4) | | By centralising the procurement process, maverick buying was eliminated which resulted in cost savings to respondent SMEs |

**Table 4: Benefit Categories and Metrics Associated with Procurement and forecasting activities**

### 7.2 Manufacturing & Logistics (BF2)

Manufacturing and Logistics form the core functions of an organisation. This study reveals that organisations implement Enterprise Systems with the main aim of improving control over their resources and optimising their business process.

By implementing Enterprise Systems, the majority of organisations were able to improve the visibility of the manufacturing process, reduce costs through improved productivity, reduce inventory & wastage, reduce manufacturing time, improve product quality, schedule orders more efficiently and improve control over resources. Most of the respondents had implemented job costing, bill of materials, scheduling, inventory management, warehouse management and Materials Requirements Planning modules of Enterprise Systems. As a result of the implementation, respondents were able to reduce costs due to process optimisation, reduce manufacturing cycle time, and improve the overall product quality. Table 5 depicts the benefit categories and metrics that has been identified and explains how respondents were able to accrue benefits.

| **Benefit Categories** | **Benefit Metrics** | **How respondents use the system to accrue the benefits?** |
|---|---|---|
| Cost reduction due to manufacturing process optimisation (BC5) | Reduction in inventory (BM5) | Through improved information about inventory levels, respondents were able to reduce their inventory significantly |
| | Optimum usage of warehouse space (BM6) | Warehousing module helped in using the warehouse space to the optimum |
| | Reduction in wastage (BM7) | Bill of Materials Module helped in accurately defining the requirements hence reducing the wastage |
| Time reduction in manufacturing life cycle (BC6) | Improved visibility of manufacturing process (BM8) | Enterprise Systems improved the visibility of manufacturing process by integrating sales, inventory, and work in progress modules. |
| | Improved Scheduling (BM9) | By scheduling the orders based on priority, respondents were able to schedule the orders effectively |
| Better Control Over | Ability to locate goods easily (BM10) | Warehousing module helped them to locate the goods in the inventory |

| | | |
|---|---|---|
| Inventory (BC7) | | easily |
| | On-time deliveries (BM11) | Hand held systems integrated with the Enterprise System and GPS ensured on-time delivery and helped in locating the goods |
| Improved Product Quality (BC8) | Capture of product defects and customer complaints (BM12) | By storing design information & customer complaints in a central repository, respondents were able to respond to the complaint quickly and it was useful in developing future products. |

**Table 5: Benefit Categories and Metrics Associated with Manufacturing & Logistics**

### 7.3 Sales, Marketing & Customer Service (BF3)

Customer Relationship Management systems help to automate and improve customer related activities. Creating awareness, gaining new customers, satisfying customer orders and offering sales service are the main activities associated with a customer. From this study it has been found that the majority of respondent SMEs do not have a fully-fledged CRM system. The respondents claim that either a small customer base (<200) or the preference for face to face communications is the main reason for not implementing a CRM system. One of the respondents stated: *Our CRM usually involve having a cup of tea on a kitchen table.* Another respondent stated …*The client base is relatively small and the need for a CRM system is not perhaps as great as it would be for a mail order company who have thousands and thousands of customers…One of the issues of not introducing a new CRM system is it would take months and months to input the data we have and its always in the back of your mind, Is it worth the investment? Not just the money but the time involved in inputting all the data you need to use the system properly.*

However, this study revealed that CRM implementation can result in cost reduction in sales order management. Sales order processing systems help to store customer details, generate quotations, invoices, and track the status of an order. The majority of the respondents manage their customer orders through integrated sales order systems which are a part of the ERP/ CRM package. Orders are taken via Phone, FAX, EDI, e-Mail, Post and in person. One of the respondents has integrated their systems with their customer so that orders can be fulfilled as soon as the customer's inventory falls below a certain limit. E-Mail is the most commonly used medium of communication with the customers. A respondent while emphasising the importance of e-Mail stated: *I would say in the last few years, the best benefit is e-mail communication, ease of it, speed of it; it actually grows sales and brings the suppliers and customers closer, it's just mainly the speed. Also it has given quiet a large cost reduction to the company*. This study revealed that organisations send regular mail shots to existing customers to inform of about new products and services. Many of the respondents disseminate information about new products and services to existing customers via e-Mail reducing costs and time. However, to gain new customers, many respondents opine that sending 'flashy e-Mails' and improving search engine visibility is not an effective strategy. Cost reduction in sales and marketing expenditure, time reduction in sales order cycle and improved customer relationships were the main categories that were identified in this domain. Table 6 depicts the benefit categories and metrics that has been identified in this domain and explains how respondents were able to accrue benefits.

| **Benefit Categories** | **Benefit Metrics** | **How respondents use the system to accrue the benefits?** |
|---|---|---|
| Cost reduction in sales and marketing | Time reduction in developing & running marketing | • Instant communication with potential customers and reduced time taken to generate marketing |

| | | |
|---|---|---|
| expenditure (BC9) | campaigns (BM13) | material<br>• Usage of digital product catalogues and website for marketing the organisation<br>• Reduction in the number of customer enquiries due to the ability to track the progress of the orders through secure connections. |
| Time reduction in sales order cycle (BC10) | Accurate invoicing (BM14) | |
| | Time reduction in generating quotes (BM15) | Job costing module helps the respondents to generate quotes for complex bespoke orders |
| | Improved visibility of sales order cycle (BM16) | Integrating inventory, sales, work in progress helps in improving the visibility of sales order. |
| Improved customer relationship (BC11) | Personalised customer service (BM17) | Respondents were able to offer personalise customer service by suggesting solutions to customer's issues. This was accomplished by utilising information about previous orders |
| | Time reduction in answering a query (BM18) | Information visibility has helped the respondents in reducing the time taken for responding to a query |

**Table 6: Benefit Categories and Metrics Associated with Sales, Marketing & Customer Service**

### 7.4 IT Infrastructure (BF4)

The majority of respondents reported that improving the existing IT infrastructure is one of the primary reasons for implementing Enterprise Systems. One benefit category and six benefit metrics were identified in this function.

Enterprise Systems reduce maintenance costs by providing a single common platform for all processes thus eliminating legacy systems (Davenport & Linder, 1994). In one of the case study organisations, the intricacies of the bespoke software were known only to that employee and it was not documented clearly. Also, the software was constantly failing and obtaining the required information was cumbersome. If they were to continue with the system, the system should be documented from scratch and

a competent person be recruited to enhance the legacy system. This was not cost justifiable. Hence the management decided to implement a new ERP system so that future enhancements and maintenance would be easier and quick. This implementation also improved the quality of information.

Another case study organisation started to expand and its software vendor could not provide adequate support for the constantly failing software. To overcome these problems, the organisation implemented an ERP system for which international support is offered. In this case the ERP system would support the organisation's long term strategy of capturing an international market.

Some of the respondent organisations enjoyed the benefit of integrating with disparate systems, customers and suppliers after implementing Enterprise Systems. This was not possible prior to implementation.

The robustness of the system is a significant benefit cited by respondents.

Irrespective of the number of orders that need to be processed, the system does not crash and is secure against viruses and hacking. Other features of Enterprise Systems such as user friendliness and speed are cited by the respondents to signify user satisfaction.

The majority of the respondent organisations have acknowledged that IT is an important element in their business and without 'IT' it would be impossible to run the business in the current way. Apart from automating transactions it helps to take the organisation to a higher level in e-Business adoption and improve competitiveness. One of the respondents while discussing the calculation of Return on Investment stated: *For instance I won't break my head on networking Capability. I suspect it won't generate any cash amount but it would help us in other ways. It will take us to the next stage that we need to be at.* Some of the respondent organisations have

developed their own customised software as their business is bespoke in nature and they could not find any suitable packaged solution. Some had full time software development teams whereas others outsourced their software development. Table 7 depicts the categories and metrics identified in this study.

| Benefit Categories | Benefit Metrics |
|---|---|
| IT cost reduction (BC12) | • Elimination of legacy systems (BM19)<br>• Reduction in maintenance costs (BM20) |
| Time reduction in future upgrades and implementations (BC13) | • Ease of customisation (BM21)<br>• Ease of integration with disparate systems (BM22) |
| Improved quality of IT system (BC14) | • Improved performance (BM23)<br>• Easy to train (BM24)<br>• Robust (Processes more orders, less crashes and secure) (BM25) |

**Table7: Benefit Categories and Metrics Associated IT infrastructure**

### 7.5 Organisational Benefits (BF5)

From this study, it can be gathered that Enterprise Systems impact the entire organisation and the benefits that are common to all the business functions are grouped under this domain. Most of the respondents had paper based systems prior to the implementation of Enterprise Systems and the introduction eliminated cumbersome paperwork which has therefore resulted in reduced printing costs and improved productivity of employees. It has also improved the communication between employees and additionally organisations have witnessed a change in corporate culture. They were able to increase overall sales due to improved flexibility of the entire organisation from fluctuating demand and improved productivity of employees. Table 8 depicts the benefits that have been grouped under this domain

along with how the respondents were able to identify the benefits. Table 8 depicts the categories and metrics identified in this domain.

| Benefit Categories | Benefit Metrics | How respondents use the system to accrue the benefits? |
|---|---|---|
| Increased Revenues (BC15) | • Cost reduction in printing and postage (BM26)<br>• Increased sales (BM27) | • Reduction / Elimination of paper based systems<br>• Improved productivity of sales employees<br>• Ability to integrate with major customers<br>• Flexibility of the system to handle erratic changes in demand. |
| Change of corporate culture (BC16) | Improved productivity (BM28) | Increase in the number of orders that are processed / secured |
| | Improved decision making (BM29) | |
| | Improved communication amongst employees (BM30) | |
| Better quality reports (BC17) | Time reduction in information retrieval (BM31) | Real time information |
| | Improved information quality (BM32) | |
| Improved competitive advantage (BC18) | | Ability to adapt easily to changing market conditions & Overall organisational growth |

**Table 8: Benefit Categories and Metrics Associated with Organisational Benefits**

## 8. Discussion

Fig 3 depicts the Enterprise System benefit framework that has been developed as a result of the case studies. Since organisational benefits are common to all the business functions, it has been placed on top of other functions. This study confirms the fact that ES impact the entire organisation and the benefits can be expressed in terms of cost, time and quality. To verify the validity of the identified benefits, it is pertinent to compare the benefits identified from other studies with this framework. Hence three benefit studies that concentrated on the

benefits of ERP, CRM and e-Procurement systems are compared with the framework developed in this study. The study that has been chosen includes Deloitte (1999), Chen & Chen (2004), Local e-Gov (2006).

**Deloitte (1999):** A survey was conducted by Benchmarking partners on behalf of Deloitte Consulting to identify the benefits accrued by organisations from ERP implementations. The study involved 62 Fortune 500 companies across the globe. The resulting benefits were classified as tangible and intangible benefits. Table 8 compares the benefit identified from this study with the current study. From the table, it can be inferred that most of the benefits identified from the study conducted by Deloitte (1999) has been identified through multiple case studies. However, globalisation of operations and cash management improvement has not been identified from the study, probably because SMEs have a niche local market and they are not global operators (Karakostas et al., 2005). Although a majority of the respondents had overseas customers and suppliers, they had no registered operations in those countries.

**Chen & Chen (2004)** identified the benefits of CRM system through 36 in-depth interviews and a quantitative survey involving 180 small, medium and large organisations. From table 8, it can be inferred that some of the benefits of CRM have not been identified from case studies. Most of the benefits that have not been accrued by the respondents fall within the marketing domain. From the case studies it has been found that respondents have a small customer base and most of the marketing activities are through personal visits, trade fairs and recommendations from word of mouth. This may be the most probable reason why the respondents have not gained some of the benefits of CRM system.

**Local e-Gov (2006)**

Apart from ‘Achieving purchasing best practice’ and ‘Management information can be used to improve terms of trade’, respondent organisations have accrued all the benefits cited in the literature. Most of the benefits cited in the literature have been abstracted to a higher level to enable ease of understanding. For example Pre-spend approval is a business process that should be accomplished for achieving better control over purchasing. Thus it can be proposed that the benefit framework is comprehensive in nature and ES impact the entire organisation. For testing its comprehensiveness, a quantitative study will be conducted which will be the next stage of the research.

**ENTERPRISE SYSTEM BENEFIT FRAMEWORK FOR MEDIUM SIZED MANUFACTURING ENTERPRISES**

| ORGANISATIONAL BENEFITS | |
|---|---|
| **BENEFIT CATEGORIES** | **BENEFIT METRICS** |
| Change of corporate culture | Improved information quality |
| Increased revenues | Time reduction in information retrieval |
| Better quality reports | Improved productivity |
| Improved competitive advantage | Cost reduction in printing and postage |
| | Increased sales |
| | Improved decision making |
| | Improved communication amongst employees |

| FUNCTION | BENEFIT CATEGORIES | BENEFIT METRICS |
|---|---|---|
| **Procurement and forecasting** | Cost reduction in procurement related activities | Time reduction in Information Exchange (EDI, e-Mail & Web Integrated system etc) |
| | Time reduction in purchase order cycle | Streamlined procurement process |
| | Improved supplier relationship | Improved forecasting |
| | Better control over purchasing | Implement new procurement processes (B2B market place, web integrated systems) |
| **Manufacturing and Logistics** | Cost reduction due to manufacturing process optimisation | Improved scheduling |
| | | Capture of product defects & complaints |
| | Time reduction in manufacturing life cycle | On-time deliveries |
| | | Ability to locate goods easily |
| | Improved product quality | Optimum warehouse space utilisation |
| | | Reduction in inventory |
| | Better control over inventory | Improved visibility of manufacturing process |
| | | Reduction in wastage |
| **Marketing / Sales and Customer service** | Cost reduction in sales and marketing expenditure | Personalised customer service |
| | | Accurate invoicing |
| | Time reduction in sales order cycle | Time reduction in generating quotes |
| | | Improved visibility of sales order cycle |
| | Increased customer relationship | Time reduction in answering a query |
| | | Time reduction in running marketing campaigns |
| **IT infrastructure** | IT cost reduction | Elimination of legacy systems |
| | | Reduction in maintenance costs |
| | Improved quality of the system | Improved performance |
| | | Ease of Integration |
| | Time reduction in future upgrades and implementations | Ease of customisation |
| | | Easy to train |
| | | Robust (Fewer number of crashes; more secure against virus) |

**Fig 3: Enterprise System Benefit Framework for Enterprise Systems**

## 9. Conclusion

SMEs which contribute significantly to the UK economy are faced with various issues in the adoption of Enterprise Systems. Although many solutions have been proposed to overcome the problems, literature suggests that a clear understanding of the benefits can help in boosting the adoption rate and maximising the value of the system. Hence a comprehensive benefit framework has been proposed wherein benefits are expressed in terms of cost reduction, time reduction and quality improvement. Also benefits have been classified based on the business function that has been impacted rather than at the organisational level. The proposed framework can act as a starting point for benefits evaluation prior to implementation and it can also help in post implementation audits. Since the framework classifies the benefits based on the business function that is impacted it can be converted to an actionable model easily.

## 10. Further Research

A survey will be conducted to validate the proposed framework and also to identify the extent to which survey respondents have accrued the identified benefits.

## 11. Research Limitations

No research is without limitation and this research is no exception. The following limitations were identified after the research was conducted.

### 11.1 Sample size & Location

This study concentrated only on medium sized manufacturing enterprises. So it would be difficult to generalise the findings to micro SMEs and larger organisations as there is no empirical data to support its applicability to them.

### 11.2 Data Collection

Data for conducting this research was collected by interviewing and collecting the views of IT Managers / Directors. The research would have been more rigorous if data had been collected by interviewing the managers of all departments such as Procurement, Marketing, Production, IT etc. However, this route was not followed because the IT managers had an in-depth knowledge of the entire business process and it would be an expensive and time consuming venture for the organisation to interview all section managers.

## 12. Theoretical and Practical Contributions

There is a constant urge in academic literature for a simple easy to use framework to evaluate the benefits of Information Systems. Most conferences or journals on Information Systems / e-Business are published including investment evaluation / benefits quantification / Return on Investment as a core topic. Thus it can be argued that there is a knowledge gap in this area. In the case of SMEs, it is even more profound. The paucity of research on SMEs and Information Technologies is acknowledged by many scholars (Cragg, 2002; Irani *et al., 2005;* Wainwright *et al.*, 2006). Following contributions have been made by this work.

### 12.1 QCT Benefit Model

A critical review of literature reveals a variety of benefit frameworks that classifies benefits in a way that the quantification process is made more complex. To make the quantification process more understandable, a framework has been developed that depicts how Enterprise Systems impact upon an organisation's core business processes in procurement, forecasting, manufacturing, logistics, sales, marketing, customer services & IT infrastructure. Moreover the benefits have been expressed in terms of Cost Reduction, Time Reduction and Quality Improvement. The development of the model and the classification of the benefits make an important contribution to the academic literature.

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