Evaluating E-Business Applications Priorities: The E-Business Planning and Analysis Framework

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ABSTRACT

An e-business planning framework is proposed here which links both strategic and operations management to improve the online service quality of a manufacturing SME. A standard systems development lifecycle has been used in the overall approach. However, the initial 'systems analysis phase' of this a unique combination of analytical tools draws upon the Balanced Scorecard (BSC), Value Chain Analysis (VCA) and Quality Function Deployment (QFD) which are integrated into a new practical 'e-business analysis framework'. The paper explains the use of the framework by using a practical case study based upon a manufacturing SME based in the UK. The company realised that information technology can have a great impact on their business, especially on the potential benefits that e-business applications can offer. In light of this the company reviewed the value proposition it deliver to offered its customers and business partners; its internal resource base; its levels of process maturity and the supporting information and technological systems by using the 'E-Business Planning and Analysis Framework' (E-PAF). The result of this research gives a set of recommendations to help the company grow and become more customer focused whilst simultaneously increasing revenue and profitability principally via the deployment of new customer relationship management (CRM) technologies.

Keywords: e-business, analysis and planning framework, systems development lifecycle, manufacturing SME, customer relationship management, quality function deployment

INTRODUCTION

Since the early 1990s, much had been expected in engaging the Internet as a platform for business transactions and business management. However, it was only in the late 1990s that the terms e-business and e-manufacturing began to appear on management agendas, probably due to the phenomenal growth of 'dotcom' companies (Cross, 2000; Gromov, 2000; KPMG Consulting, 2000; Lang et al., 2001; Forrester Research, 2002; Cheung and Huang, 2003; Chen, 2003). Although SMEs realised the need to develop sustainable business models and intermediate into established business sectors to survive, many of them are not able to manage this transition effectively as it requires not only technical knowledge but also a social, economic, political and legal awareness. Whilst a successful implementation could enable the SME to create competitive advantage, a failed implementation could be fatal for the business.

The aim of the paper is to illustrate how an established manufacturing SME based in the UK has analysed and improved the quality of its online services through a structured approach. This paper will provide an in-depth account of that unique analysis framework and demonstrate how it may assist SMEs in e-business analysis. This includes an overview of the 3 existing techniques that are integrated to form the analysis framework. These 3 techniques are Quality Function Deployment (QFD) (Akao, 1972), Balanced Scorecard (BSC) (Kaplan and Norton, 1992) and Value Chain Analysis (VCA) (Porter, 1985). A case study using this approach is presented in detail in this paper based upon an established manufacturing SME based in the UK.

CHARACTERISTICS OF A GOOD BUSINESS FRAMEWORK

Wu (1992) stated that good frameworks should be able to guide managers towards a method or solution uniquely suitable to a particular situation in question. On the whole, frameworks should not be too complex to use and information interaction within the framework should be clear and concise to avoid information overload.

IDEF (U.S. Air Force, 1981) is one potential analytical framework for processes, but is often thought of as too complex and time intensive for small or rapidly developing situations. In contrast, Lee and Ko (2000) proposed a strategic framework for strategic business analysis, by integrating SWOT (strengths, weaknesses, opportunities and threats) (de Witt and Meyer, 1998), Balanced Scorecard (BSC), Quality Function Deployment (QFD) and 'Sun Tzu's the art of business management strategies' techniques. These frameworks demonstrate the value of integrating different analysis tools. Similarly, the authors use a different combination of analysis tools to produce another analysis framework, for a different purpose (i.e. e-business planning).

Whilst many analytical techniques such as the SWOT, SLEPT (political, economic, social, technical and legal) (Op. Cit.:135) and the BSC analyses can be used to identify the strategic needs of an organisation, none provide a direct mechanism to prioritise the needs and convert them into operational processes, or to then translate those processes into a specification that can be used to develop or acquire supportive software systems. In contrast, other analytical techniques such as Porter's Value Chain Analysis (VCA) (Porter, 1985) facilitates the analysis of processes within a company but does not provide an easy mechanism to link these to high level business objectives.

One analytical tool that does provide the ability to convert high level business objectives ('what' the business wants), into processes ('how' the business delivers those 'what's) is QFD, which has had these benefits discussed widely by Akao (1972), Mazur (1992) and more recently by Ko and Lee (2000); and Lee et al. (2000), However, QFD has its own weaknesses; two of these lie in the initial generation of the 'what's and 'how's. The analytical framework presented in this paper deals with the weakness of QFD directly by integrating QFD with two other complementary analytical techniques. These are to use the main strengths of the:

- BSC to generate a set of high level business objectives, targets, measures and initiatives for finance, internal operations, learning and growth and customer satisfaction. The outputs from this analysis become the 'what's in the initial QFD analysis.
- VCA to generate detail about operational processes. The outputs from this analysis become the 'how's in the initial QFD analysis.

It is through this complementary use of the existing BSC, VCA and QFD that a new successful analytical framework has been produced for analysing and designing the e-business process re-engineering of an established manufacturing SME in the UK. The analysis framework developed by the authors is now outlined within the context of the wider systems development lifecycle. Further details can be found in earlier publications by the authors (Tan et al., 2004).

THE E-BUSINESS ANALYSIS FRAMEWORK FOR MANUFACTURING SMES

An 8-step approach was developed to assist in the understanding and creation of the analysis framework as shown in Figure 1 (Tan et al., 2004). The 8 steps are identified as:

- Step 1 – Using BSC to develop the 'what's' for QFD Matrix I
- Step 2 – Using VCA to develop the 'how's' in QFD Matrix I
- Step 3 – Completing the interrelationships of QFD Matrix I
- Step 4 – Identification of critical business processes from QFD Matrix I
- Step 5 – Inputting critical business processes to the 'what's' of QFD Matrix II
- Step 6 – List of e-CRM (e-Customer Relationship Management) applications to the 'how's' of QFD Matrix II
- Step 7 – Completing the interrelationships of QFD Matrix II
- Step 8 – Identify the most suitable e-CRM solutions from QFD Matrix II inter-relationships.

The analysis framework was first presented as a prototype utilising a data set from the case study on Marshall Industries, US (Olofson, 2000). The purpose of this paper is to illustrate the use of the analysis framework for implementation in an established manufacturing SME. The paper now presents the findings from the case study company – MT Mounts (the name is a pseudonym in order to preserve the sensitive nature of the information disclosed in this paper). MT Mounts is an established manufacturing SME in the UK specialising in the manufacturing of shock and anti-vibration mounts. It should also be noted that all of this analysis is contained within the initial part of the systems development lifecycle (i.e. the 'systems analysis phase').

CASE STUDY: MT MOUNTS – A MANUFACTURING SME

The management at MT Mounts recognise the importance of I.T. to improve its business and has successfully implemented an in-house system for: order entry and processing; accounts (customer and purchasing); stock control and production planning. As a result of these systems, tasks have been improved in terms of time, cost and usability. In addition, MT Mounts had also begun to develop a

Figure 1. E-business analysis framework (source: Tan et al.)
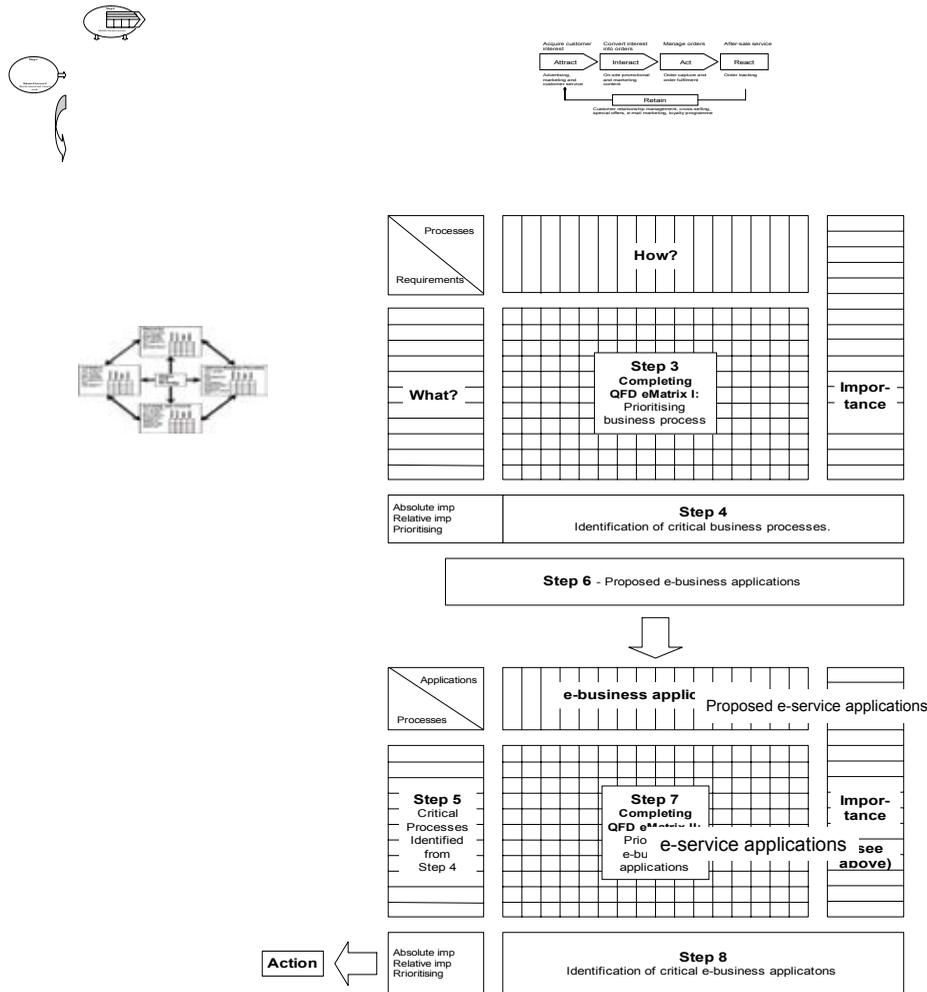
number of supporting I.T. applications to provide more functionality to the sales and marketing activities. However, at the moment the company's presence on the Web is barely visible as it is part of the MT Group's website, and is mainly only informational. The only interactive element was a downloadable form for potential customers to make enquiries. Therefore, the main driving force behind any new investment at MT Mounts is to generate more sales and interface with their customers better.

Due to the R&D culture of the MT Group, most of investments have been going towards product development and design. The challenge was therefore to convince to the MT Group management team towards investing further in online customer interfacing processes. Besides recognising the need to upgrade current e-business applications, MT Mounts also recognised that there was no available in-house resource to conduct such an analysis. Thus, the authors were approached to take up the role of expert consultants to research and create a report on applying customer interfacing processes for MT Mounts.

Generating the Balanced Score Card for MT Mounts ('what's')
The first step of the E-PAF is to establish the company's Balanced Scorecard (BSC) to generate a list of 'what's' for QFDI Matrix. The vision of MT Mounts was clearly stated as "to be the number one manufacturer and service provider of vibration, shock, and noise control products in the world". It is therefore important for the business to build sustained growth and ongoing innovation. A summary of the BSC analysis can be seen in Table 1. Expert advice from senior managers with extensive industrial experience, assisted in the ranking of these initial 'what's': the 'what's' deemed most important were awarded the highest points, and the lower scored were given to those which were felt to be of lesser importance.

Table 1. Summary of the BSC analysis

	Objectives	Measures: Target	Initiatives	Weight (1 low, 5 high)
Financial	Sales growth	Turnover: Year on year growth of 10%	• New products • Improvements to existing products • New markets	5
	Product profitability	Profit margin: Average of 30% or better across whole product range	• Improvements to production processes • Involve suppliers to reduce material costs	3
	Minimise costs	Administrative costs, consumable costs, equipment costs: Reduction year on year of at least 10%	• Streamline/ automate administrative processes • Identify and reduce costly consumable use • Reduce prices of items • Improvements to existing processes • Introduce new processes	3
Customer	High retention	No. of repeat orders and new enquiries: obtain enquiries from > 90% of current customer base, and >90% orders.	• Regular contact with entire customer base through various means	5
	Customer satisfaction	Number of complaints: Zero complaints	• Ensure that requirements are fully understood and communicated throughout the company • All problems (or potential problems) to be discussed with customers before escalating	5
	Market share	Number of new customers: Growth of 20 new customers each year	• Targeting specific customers • Advertising	3
Internal Business Process	Product quality	% of rejected production: Zero %	• Improvements to production processes • Improvements to supplied materials	5
	Product cycle time	Direct labour time: Labour times to be reduced by 10%	• Improvements to production processes	3
	Production planning	Waiting time and number delays: Reduce all idle times to minimum, target at 10%	• Coordinate production stages • Improve suppliers coordination	3
	On-time delivery	Number of days late: All orders to be delivered within 5 days of customer due date	• All quoted lead times to be realistic • Improvements to internal processes to reduce lead times • Involve suppliers , reduce leadtimes	5
	Process reliability	Number of machine breakdowns, downtime due to breakdowns: No breakdowns	• Preventive maintenance routine to be set up • Operators training for correct use and routine maintenance	3
Learning and Growth	Staff training	Number of staff involved in training: 100% of all junior staff and 50% of all senior staff	• Examination of skills matrix • In-depth discussion during appraisal	3
	New products and services	Introduce more new products and services: At least five viable new products to be suggested each year	• Suggestion scheme • "Innovation" competition	3
	Employee satisfaction	Staff retention level: No staff leaving due to dissatisfaction	• Staff feedback system	3

Figure 2. Value chain analysis for MT mounts
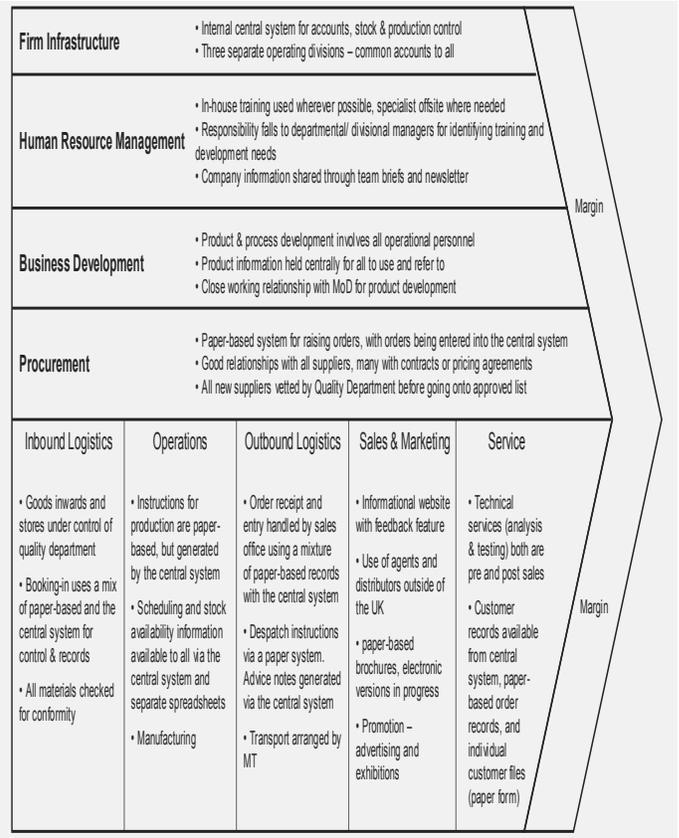
Generating the Key Business Processes of MT Mounts with the VCA ('how's')
Using the VCA, the authors are able to identify the main categories of business processes and critical customer interfacing activities within the company. The VCA for MT Mounts is shown in Figure 2.

QFDI Matrix
The list of 'what's' and 'how's' as generated in the previous steps, are entered into the QFDI Matrix. Expert insight was again sought from MT Mounts at this step to determine the strengths of the relationships between the 'what's' and "how's". Once these ratings were allocated they were keyed into the QFD/CAPTURE™ software; the software automatically prioritised each key business processes ('how's') in order of importance, according to the capability of each process to meet the requirements of the 'what's' (that were rated in importance). Therefore, the more relevant the business process was in meeting the requirements of the higher ranked 'what's', the higher the business process is prioritised.

The fact that the QFDI matrix showed manufacturing to be the most important process is not surprising since the business is built around producing products and these processes are currently well supported. However, the next four processes are all related to customers in a sales and marketing capacity, the technical services are also tied into sales both before and after a sale has been made.

QFDII Matrix
The 'what's' inputted into the QFDII matrix were transferred from the results of QFDI matrix. The important point to note is that the prioritised scorings of the business processes from QFDI matrix were entered as the rating scores for the business processes (as the business processes are now serving the function of 'what's' in QFDII Matrix).

Figure 3. MT mounts QFDII matrix
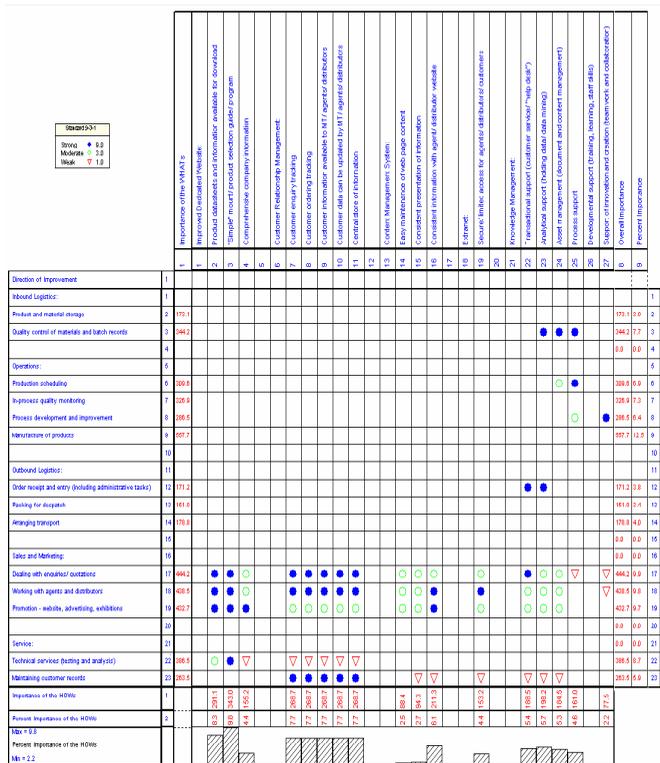
The results of this analysis found the following e-business support application to be the most important:

1. Manufacturing of products with a score of 557.7.
2. Dealing with enquiries/ quotations with a score of 444.2.
3. Working with agents/ distributors with a score of 438.5.
4. Promotion (advertising, website, exhibitions) with a score of 432.7.
5. Technical services (testing and analysis) with a score of 386.5

These scores are obtained for each e-business support application by the following formula:

$\sum$ (importance weight of the business objectives x prioritisation score given in QFDII x prioritisation given in QFDII).

Since MT Mounts is not cash rich, it was only practical to focus on one or two e-business implementations. These results indicate that the use of a dedicated and improved website, together with better Customer Relationship Management would be the most important and most suitable (non direct manufacturing) e-business applications to apply in order to achieve the overall company vision. The provision of simple product selection tools and product data availability came in first and second respectively, while all aspects of a CRM system came in jointly third. The QFDII matrix can be seen in Figure 3.

The findings gained by applying this planning and analysis framework were numerous. A dedicated website would allow MT Mounts to showcase their products and services offered to provide a clearer identity, separating them from other divisions of the MT Group that are not related to shock and vibration equipment. Providing data on the web for immediate download after registration will enable customers to review information immediately, before deciding whether or not to make further enquiries. Gathering customer registrations will in turn provide MT Mounts with new market intelligence, customer profiles and increased response rates.

Having technical information available freely also encourages equipment designers to incorporate MT's products into their designs. An improved website will also help to speed up the enquiry process by providing simple mounting selection tools, though this will only be appropriate for very simple selection and more detailed analysis has to be referred back to MT Mounts. A more detailed "technical form" can also speed up the enquiry process by making the customer think about their application before contacting MT Mounts.

Central to a CRM system is a single database that stores all of the customer information collected together from the various communication channels. This database provides complete visibility of customers to employees. Web-log activities can therefore be collected from the website to allow MT Mounts to track the frequency of the items being looked at, the patterns on which the products are viewed and then enquired. This information can thus also be used for further development to improve the website. A centralised CRM system will also allow all relevant staff within MT Mounts and its overseas agents and distributors access to information with increased speed and accuracy. This will reduce duplication of activities such as MT Mounts and their agents responding to the same customer enquiry, saving both time and effort, and increasing professionalism.

A CRM system can also allow MT Mounts to get more information and feedback on the activities of its agents, which has been lacking and may be one of the contributing factors to relatively poor performance by agents in certain areas. Greater visibility will allow MT Mounts to identify and address trends where quotes have been unsuccessful, perhaps through a price reviews or by offering further technical assistance. With an increasingly global marketplace, a CRM system can help to minimise instances where MT Mounts spends money to 'compete' with its own agents to get first contact, which may be counter-productive. For that reason, records contained within CRM could provide the necessary evidence for making the decision process easier.

However, there are many CRM vendor solutions from about 18 different leading companies currently available on the market. Therefore, in order to assist MT Mounts further in choosing the right vendor solution, there is a need to provide more in-depth analysis in order to highlight the differences between the software on the three pre-determined features that are significant to MT Mount on its needs to employ a CRM system. These features are divided into customer acquiring, customer enhancing and customer retaining (Table 2). The methodology used to analyse the vendor solution's strength on the feature being looked at are determined to be (a) 2 ticks for a particular feature that is a present and highly sought after; (b) 1 tick for a particular feature present in the vendor solution regarded as desirable; and (c) no tick means the feature is not present in the evaluated vendor solution. Thus, from Table 2, it can be seen that further study may still be required to determine the right CRM vendor solution for MT Mounts.

CONCLUSION AND FUTURE WORKS

The academic contribution that this paper has made has been to select and implement three complementary tools, the Balanced Scorecard (BSC), the Value Chain Analysis (VCA) and Quality Function Deployment (QFD) to provide a comprehensive approach to analysing a business from both a strategic and operational point of view which can define and prioritise actions for process development and the implementation of candidate software solutions to support them. The strengths of the BSC allowed the generation of 'what's' for the initial QFDI matrix. The strengths of the VCA enable the initial 'how's' for the QFD to be generated. An interesting observation was that coupled with the measurement functions typical of any BSC, the QFD becomes more robust by incorporating the 'voice of customer' generated from the BSC. This can eliminate the need for customer surveys, which are mostly vague in their findings, since these 'voices' can now be constructed by using the BSC framework. The QFD can therefore provide integration between top-level objectives and operational-level activities, a major deficiency in the typical BSC approach, by making it possible for managers to prioritise needs while taking into account the business processes, ultimately providing a blueprint for e-business planning. QFD can also facilitate planning at the lowest level of implementation through the deployment of multi-level matrices as deemed necessary by the company for the specific e-business planning.

By using the balanced scorecard technique both internal and external 'what's' for QFDI Matrix were collected. The value chain analysis provided an analysis of the business processes of the company and gave the foundations for the generation of 'how's'. By entering the data through the balanced scorecard and the value

Table 2. Summary of vendor e-business solutions analysis

chain analysis into the quality function deployment matrices managers were able to prioritise the business processes according to the ability of the process to meet both internal and external needs. Once this is achieved, the potential e-business applications can be identified.

The practical contribution that this research has made to MT Mount has been to highlight the internal resource based factors of the company and the industrial scenario in which it is currently operating. The research has also given direction to future developments that the company should take if it is to stay competitive and continue to grow amidst competition. For example, the research has highlighted 'what' is important from the customers' point of view and 'what' is important from a business' point of view for the future, and then 'how' those issues should be delivered through new processes, new software application types and even to propose specific candidate solutions.

Future work planned by MT Mounts will be the implementation of these solutions after approval has been given by MT Group management. Further academic work will continue to deploy this framework in other industrial scenarios to increase its robustness and generic applicability.

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