

# Working Paper Series

## **Operational Factors that Influence the Successful Adoption of Internet Technology in Manufacturing**

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**OPERATIONAL FACTORS THAT INFLUENCE  
THE SUCCESSFUL ADOPTION OF INTERNET  
TECHNOLOGY IN MANUFACTURING**

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**SYNOPSIS**

Internet technology has changed the factors that have hitherto prevented smaller organisations from adopting e-commerce. This is important, as the majority of the participants in the supply chain are smaller enterprises. However, evidence suggests that these organisations, especially those engaged in manufacturing are failing to recognise the e-commerce opportunities. The factors that encourage the adoption of this technology are analysed together with the implementation approaches used and the causes of failure. Operational factors that appear to influence the technology's successful adoption and explain this phenomenon are subsequently identified.

## 1 INTRODUCTION

Internet technology is relatively inexpensive, is based on open standards and is supported by numerous applications, which can be configured to cost effectively process small transaction volumes and accommodate changes in users with ease (1). It is also a public network, which unlike e-commerce applications utilising Electronic Data Interchange (EDI) technology, is globally available to all organisations, irrespective of size. This same technology can also be used internally to improve process efficiency by managing workflows, co-ordinating activities and sharing information (2) as well as externally to improve the co-ordination of supply chain activities, and to ameliorate communications between distant functions and individuals of an organisation. Thus, Internet technology appears to offer smaller companies the opportunity to develop an e-commerce capability previously only available to larger organisations. However, there appears to be no indication that this is happening (1). Indeed, smaller businesses are generally failing to appreciate the potential benefits of adopting the technology compared with larger organisations (3).

This paper attempts to establish why this might be the case and to identify the operational factors that appear to influence the successful adoption of Internet technology. In furtherance of these objectives, Business-to-Business (B2B) and Business-to-Customer/Consumer (B2C) experiences from a diverse range of sectors are drawn upon and examined from an operations perspective.

## 2 DRIVERS AND MOTIVATING FACTORS

A report synthesising the findings from a series of sector level reports and surveys on B2B e-commerce provides an insight into the factors that appear to be influencing the adoption of Internet technology for e-commerce (1). Categorised as reactive and proactive, strategic and tactical, those factors classified as being tactical were identified as the main drivers. Of particular import is the desire on the part of organisations to reduce costs, typically, transaction processing, inventory and purchase price. However, the willingness of organisations to adopt a proactive stance appears to be by no means universal.

Empirical evidence supporting and elaborating on Hawkins & Prencipe's findings (1) is provided by a multiple sector survey of 120 international companies from the Fortune Global 500 list (4). In this survey four categories of adoption are

identified, each cluster representing approximately 25% of the companies surveyed. The best category had adjusted their business model to use the Internet to reach customers, to add value and conduct on-line purchasing. The second category recognised the potential of the technology, particularly (B2C) but had still to change their business model. The third and fourth categories had either not recognised the potential for their own business or had still to accept the permanence of the web. Regrettably, this situation has also been observed in UK manufacturing where approximately 66% of manufacturers appear to have no plans to develop any form of e-commerce capability; a condition particularly marked amongst smaller organisations, which typically do not appear to perceive the potential benefits of e-commerce (3).

Thus, whilst the effective use of Internet technology is thought to require the adoption of new business models (5) and radical change within the organisation (4), it appears that the majority of organisations either do not recognise the need to change or consider the benefits insufficient to justify the risk.

## 3 IMPLEMENTATION APPROACHES

Two levels of implementation maturity have been identified (1)(4), namely: the *experimenting phase* where an organisation uses the technology to promote products and provide added value through information and the *integrating phase* where the use of the technology is extended to include all activities of the business. Additionally, a third level has been identified (1); the *transforming phase* where organisations use e-commerce to drive their operations and business strategies, the sixth and final stage of Earl's evolutionary e-commerce model (6). Described as experiential and interpretative the model is nonetheless generally supported by the literature and in particular by the two surveys cited above. Both provide empirical evidence that the organisations have followed stages one through to three (external communications, internal communications, e-commerce), that better firms are engaged with activities described in stage four (e-business) and that exceptionally some may have reached stage six (transformation).

Perhaps more importantly, the model reflects the general view that the approach most frequently adopted, particularly amongst incumbent organisations, is both exploratory and experimental (1)(7). It also reflects the somewhat myopic view that the benefit of Internet

technology is its ability to generate sales (via improved reach) rather than facilitate operational improvements by harnessing its transformation potential. This in part may be due to the absence of appropriate guides (8) or concerns surrounding the adoption of a technology that is still evolving (5). Nonetheless, there can be little doubt that experimentation is not the most efficient means of effecting strategic organisational change. Careful flexible planning is required if market and technological developments are to be accommodated (9) and human, technological and organisational resources are to remain aligned with corporate objectives (9)(10).

#### **4 THE CAUSES OF FAILURE**

##### **4.1 Business models**

In the short-term the basis of a successful transaction is the simple economic principle that a profit is generated when a product or service is sold. However, long-term financial viability requires that the number of transactions undertaken is sufficient to reduce the fixed and variable costs to a level that will result in a sustainable market price. These basic economic principles seem unlikely to fundamentally change yet organisations appear to ignore them when developing an e-capability. Explanations for this have been provided (11) and are attributable to the need for scale; two have direct operational implications.

##### **4.1.1 Revenue growth**

Frequently used as a measure of success rather than profitability, growth strategies based on reach facilitated by the Internet are thought to be major contributors to new economy failures (12). With very few exceptions<sup>1</sup> the complexities of manufacturing and handling the variety of products that are needed to meet local requirements and the storage and transportation costs that are incurred fulfilling the orders, increase as the organisation's reach is extended. Thus, companies risk becoming insolvent before breakeven is reached or generating returns on investment that are not commensurate with the risk (11).

##### **4.4.2 Niche strategies**

Careful product positioning or the adoption of niche marketing strategies can help build credibility in a chosen market whilst minimising competitive threats. Avoiding 'customer solution' strategies also improves operational focus (12) and process efficiency. Pursuance of such

strategies also reduces the likelihood of problems arising from the reduced fit that occurs when reach strategies are used (12). However, carried to extremes the volumes that result can be insufficient to sustain overheads, which rarely shrink sufficiently to compensate for the reduced revenues (11).

##### **4.2 Competitive advantage**

In the contemporary business environment, meeting quality requirements no longer represents a sustainable source of competitive advantage (CA). This is particularly so when compared with the opportunities competing on price can provide. However, in the new economy CA based on price alone can be difficult to sustain. Theoretically, Internet technology offers opportunities to extend reach without incurring additional distribution costs. However, in practice businesses must frequently invest in warehousing and information systems to handle returns and manage customers (13). Moreover, where barriers to entry are low, price advantage can be quickly eroded; a disastrous situation in markets where alternative suppliers are only a click away (11)(14) and levels of customer loyalty are low. Thus for most organisations the ability to differentiate on service is essential to success (11). Unfortunately, a common mistake is to view the Internet as a homogenous market space, a misconception that can hinder the identification of competitive priorities (12) that can help differentiate a service offering.

##### **4.3 The benefits of e-commerce**

An important distinction must be made between those benefits bestowed on the customer and those accrued by the company as CA is derived from both. For example, convenience is clearly a transaction attribute that is a customer benefit and a potential competitive criterion. However, convenience is closely interwoven with the concepts of trust and service. Both are thought to be possibly of greater importance (11) but neither is necessarily perceived as a customer benefit. Indeed trust is clearly an attribute bestowed on a company as a consequence of past actions whilst service may not be perceived as a benefit if it facilitates convenience.

The dangers of differentiating on the basis of service criteria and the dependence such strategies have on the operational capabilities of the organisation are known. Typically, it is the efficiency with which front office and back room activities are integrated that is critical to success

<sup>1</sup> Software products such as those provided by Netscape and Shockwave can be delivered via the Internet anywhere in the world at relatively little extra cost.

(8). In the new economy these capabilities are considered the foundation of an Internet based service (15). Indeed, nothing can destroy credibility and brand loyalty as quickly as the inability to deliver on expectations (16). Unfortunately, in the B2C environment the inability to design, implement and execute operational and logistical systems capable of managing inventory, shipping and returns is a key cause of failure (13). Whilst in the B2B environment incumbent organisations, which generally have robust systems in place to satisfy the fulfilment criteria (7) do not have the systems and technology necessary to compete effectively through the exchange of information (8).

### 5 CONCLUSIONS AND RECOMMENDATIONS

From the preceding analysis the operational issues thus far identified as being factors that contribute to the successful adoption of Internet technology in general and manufacturing industry in particular are:

- 1: *Recognising that adopting Internet technology as a tactical rather than a strategic issue is unlikely to bring about the business model changes that are necessary to realise the benefits of e-commerce.*
- 2: *Recognising that developing a strategic plan to resource the transformation of the business model which is sufficiently flexible to accommodate future technological and market developments is essential.*
- 3: *Recognising that the experiential approach of focusing on revenue growth (stage one) before developing fulfilment capabilities (stage three) and management support systems (stage four) may retard the realisation of e-commerce benefits.*
- 4: *Recognising that the operational cost of servicing a business which seeks to exploit the reach and focus capabilities of the Internet is an important contributor to the failure of organisations to realise the benefits of e-commerce.*
- 5: *Recognising that in the highly competitive environment of the Internet market space, price and quality are rarely more than order qualifiers and as a consequence sustainable competitive advantage is likely to emanate from the quality of its service offering.*
- 6: *Recognising that the ability of an organisation to differentiate itself on the basis of its service*

*offering is facilitated by an operational capability that can deliver a consistent and reliable service, which can be customised to the customers needs.*

- 7: *Recognising that the creation of an operational capability to facilitate a differentiating service stems from an understanding of how the benefits bestowed on the customer and the organisation are translated into sustainable competitive advantage.*

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