The Evolution of e-Commerce Strategy and Supply Chain Management Practices in the Steel Manufacturing Industry

A Longitudinal Case Study of BHP Steel (Aust)

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Abstract: A central concern of businesses who seek to be successful in e-commerce environments is: “How are companies both old and new moving from traditional applications to the new breed of integrated, e-business application architectures?” (Kalakota and Robinson, 2000). A recent study undertaken at BHP Billiton Steel (Aust) explores how companies evolve from a traditional supply chain philosophy to one that utilises technologies such as the Internet and Web, adding non-traditional business practices that incorporate an end consumer link.

Although a number of areas within the supply chain are affected by e-commerce, the BHP Billiton Steel study deals with an emerging area for manufacturing industries, the incorporation of a business to customer link (Anderson, 2001; Bryant, 2001; Miller, 2001). The BHP Billiton Steel (Aust) study provides insights into new, emerging B2B models on the sell-side of the supply chain. Currently, there are limited models of business to customer interaction in B2B e-commerce applications, particularly in more traditional industries such as manufacturing, as documented in the extant e-commerce literature. This issue is addressed through the exploration of developments in e-commerce applications (specifically, the integration of Internet technology in supply chain management practices) within the Steel Manufacturing industry that have occurred over the past 4 years (1997-2001) at BHP Steel. A framework for business interaction with the end customer, for firms in the Steel Manufacturing industry, is also developed and presented.

Keywords: supply chain management, electronic commerce, business-to-business models, manufacturing industry

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1. INTRODUCTION

In order to leverage on existing e-commerce investments, firms in the Steel Manufacturing industry, like many other industries, are faced with the challenge of being able to align their e-commerce strategies with the effective use of technology. To this end, manufacturing firms are changing their focus from a simple product-focus, to a more customer-focused approach, achieved through the development of more viable, longer-term relationships with their customers (Panizzon, 1999; Anderson 2001). Many firms in this industry sector have realised that the Internet is an effective tool that can be used to build these relationships. This is achieved by adding value to the services a firm offers to its customers (Kalakota and Robinson, 2000). The result of this approach, is a shift in supply chain management practices, whereby, a business to consumer link is added in the supply chain, typically at the distribution end (Anderson, 2001), facilitated through the integration of Internet technologies into the supply chain.

According to Williams (1999 in Colkin), metals and natural resources companies are looking to Information Technology to improve their competitive stance. Similarly, Trudell (1999) agrees that the Internet is an effective method of differentiating services to attract and sustain a customer base. Trudell suggests that “ [new] ways to reduce costs and retain and enhance levels of service to our customers” (in Colkin, 2000), need to be explored. For example, US Steel is currently exploring the viability of the Internet to support its online strategy. In April 1999, US Steel developed an extensive extranet that connects customers to the company, enabling customers to track progress of their order from placement to delivery (Colkin, 2000). US Steel is also migrating as much of their business processes as possible, to the Internet, to make data available to a significant portion of its business. The company has also implemented a sophisticated supply chain technology, so that they are ready when “EDI –loyal customers embrace supply chain processes” (Colkin, 1999).

2. INDUSTRY ISSUES ANALYSIS

As the hype surrounding the Internet begins to settle, businesses in this industry sector are realising that traditional business models can be successfully aligned with Internet strategies to create effective business to business and more recently, business to consumer e-commerce (Barnette, 1999). Further, the Internet is emerging as an effective tool to develop customer relationships and differentiated services. The new customer focus, within the manufacturing industry sector, is leading to disintermediation and the expansion of the less traditional business to consumer e-commerce

relationship into industries such as the steel manufacturing industry (Lyons, 2000; Panizzon, 1999).

2.1 Emerging Strategies

Industry representative, Don Carroll (2000 in O’Keeffe), vice president of e-commerce at BHP Billiton Steel (Aust), believes that in the past, the steel industry placed too much emphasis on the production side of steel manufacture. Instead of taking a holistic view of the supply chain, steel manufacturing companies have concentrated on the products they sell. Cutler (2000 in O’Keeffe) supports this notion, asserting that a customer-centric approach is vital to the success of businesses in this industry sector. According to O’Keeffe (2000) value adding and differentiation can be achieved through better management of knowledge across the whole supply chain and integration of the end customer, which he admits is a highly complex task (O’Keeffe, 2000). In the future, the development and use of tools that facilitate more dynamic management of customer relationships will be widespread.

O’Keeffe (2000) believes that one of the biggest constraints in the near future, as e-commerce becomes more developed, will be the ability to move from the ‘old mind set to a new mind set’ (O’Keeffe, 2000, pg4). For example, BHP Billiton steel (Aust) has recently launched Aurias Diamonds Online (www.aurias.com) where diamonds are sold online over the Internet. This means that BHP Billiton Steel (Aust) (a company that has traditionally not had contact with the end consumer), will now have to develop strategies to effectively integrate the Internet into their interactions with the end consumer. In order for company’s, such as BHP Billiton Steel (Aust), to succeed with e-commerce, they must have an organised, well thought out approach. Vision and direction, supply management, organization and technology strategy will have to form an integral part of the business objectives, the development of an effective strategy for e-commerce activities can improve productivity and reduce costs by targeting benefits in specific markets (Jennings, 2001). This will involve a “back to basics” approach to delivering products and services to customers: on-time, and at the right quality and cost. The fundamental approach is that which traditional businesses in business to consumers markets have been following for many years. This means, segmenting customers according to needs; customising logistics networks; integration of both demand and supply; integrating products, information and financial flows through the supply chain; and differentiating the product closer to the customer (Hintlian, 2001).

In spite of what Hintlian (2001) advises, the fact still remains that technology is no longer the prime means for gaining a competitive advantage. The ability to change; develop new kinds of customer and

supplier relationships; and implement and align new solutions will be the key differentiators. Succeeding in today's highly competitive marketplace will require an e-commerce vision, co-ordinated effort and the proper execution of online business strategy. Those companies that are able to take advantage of the benefits that e-commerce presents, through the alignment of strategies, will have a bright future (Jennings, 2001).

2.1.1 Distribution: the Business to Consumer Link

The global distribution model is being changed by e-commerce, and the challenge for business is to successfully manage the transition (Gottliebsen, 1999). The trend today, is towards disintermediation and the shortening of the supply chain (Jennings, 2001). Many manufacturing firms are trying to get closer to the customer and selling their products direct to the end consumer, eliminating the middleman. According to Gottliebsen (1999) "every company wants to own the customer". This can be achieved through strong brand name recognition and efficient delivery systems. For example Ford Motor Company are able to disseminate information regarding their products before they are available through retailers. This has allowed Ford to gather responses from customers, enabling product modification before it becomes too costly to do so (Dobrin, 2001).

2.1.2 Reorganisation of the Supply Chain

One important concept, concerning the use of the Internet, is the separation of information flows from physical flows (Sheomber, 1992). This is made possible through the innovative use of IT, allowing information regarding order status, to arrive earlier than the physical product. A repercussion of this is the ability to process information electronically and simultaneously with the dispatch of goods. This can reduce the cycle time for overall supply chain activities and improve service quality by reducing delays caused by the processing of information.

2.1.3 Cycle Time Reduction

One of the main advantages of integrating the Internet within the supply chain is the reduced product development cycle time, enabling customers to receive their products in a more timely fashion, due to quicker order response (Wetherbe and Frolick, 2000). This in turn leads to enhancement of customer service levels and assists in solidifying the relationship with the customer.

The key concept of cycle time reduction is the 3 % rule. This rule implies that “only 3% of the elapsed process is actually needed to complete the activity “ (Wetherbe and Frolick, 2000: p 3).

In the past, firms have utilised technologies such as EDI, to improve and reduce cycle times. For example, Wal-Mart's success has been mostly attributed to the effective use of EDI (Wetherbe and Frolick, 2000). However, new emerging technologies (such as Internet and Web technologies) can just as effectively support this quality management concept.

2.1.4 Evolving Business Models

Most industries are being affected by developments in e-commerce, which enable both business-to-business and business to consumer markets to enhance their strategies to gain competitive advantage. As the Internet becomes more widespread, the advantages that IT can provide, in terms of supply chain integration and management, are becoming increasingly realised. The result being the development of enhanced business models that leverage more on the benefits presented by e-commerce, such as supply webs, integrated value chains and more recently, the addition of the business to consumer link in the supply chain (Panizzon, 1999; Accord, 2001; Kumar and Christiaanse, 2000). In this rapidly changing business climate, business models must change in order for businesses to stay competitive. Despite the challenge involved, many companies are making changes to their ‘core strategies’ to continue to create value in the face of increased competition. As evidenced, e-commerce is affecting all sectors of the business world, including the steel industry (Larue, 2001). Larue (2001) believes that in this industry sector, the Internet can be used ‘effortlessly to expand [the] customer base’. She further suggests that the merging of steel companies to form exchanges can be effective. Further, these exchanges are creating a mechanism that allows closer collaboration between steel companies and consumers, by bringing the manufacturer closer to the end customer.

The Internet has increased the competitive nature of the Steel industry by enabling companies that were previously not able to compete, to become aggressors in these niche markets. Where once niche producers enjoyed a competitive advantage, derived from a sales organisation that understood its customers and their service needs, the Internet is a tool that allows most companies in this industry sector to improve overall supply chain management. In order to remain competitive and enhance long-term success, firms in this industry sector will be faced with having to constantly review their e-commerce and supply chain strategies in order to differentiate themselves from the competition (Ackerman, 2000).

3. RESEARCH METHODOLOGY

A longitudinal case study methodology is utilised. Earlier research (Smart, 1997) that centred on a study of the BHP Billiton Steel Group Supply Division at Port Kembla, identified the opportunities that the Internet had to offer in terms of integration within the supply chain and the strategy that BHP Steel would pursue in order to leverage on the opportunities presented. The primary focus of the 2001 study (that seeks to further Smart's 1997 research) is on how BHP Billiton Steel (Aust) have progressed their 1997 strategy to integrate the Internet into the distribution end of the supply chain. The study also investigates what changes have occurred within the organisation in order to facilitate this process. A number of existing conceptual frameworks (detailed below) were utilised in the study.

The Internet Expansion Framework (1997) (see Figure 1) was used to determine how BHP Billiton Steel (Aust) is now using the Internet to interact with their end customers (for example, the use of the Internet to distribute services and products and to execute transactions). This framework also provides a basis for determining how the changing use of technology within the supply chain has impacted on business process change in the organisation.

Figure 1: Internet Expansion Model (Source: 'Four Domains Of Internet Expansion', Angreher and Meyer, 1997).

The e-commerce benefits framework proposed by Poon and Swatman (1997) was used to determine the short and long-term benefits derived from Smart's 1997 study identified the expectations BHP had of the business opportunities presented by the Internet in 1997, while the current study,

explores how, or if, these expectations have been met. The short-term benefits are derived from the 1997 study, while the longer-term benefits are extrapolated from the analysis of the 2001 study.

Previous	Current	Indirect Benefits
Previous	Current	Direct benefits

Short-term goals Long-term goals

Figure 2: Benefits Framework

(Source: Poon and Swatman, 1997).

Leavitt's (1964) Diamond of Change (Figure 3) is then used for the purpose of integrating the strategy and technology dimensions of the study. These dimensions were utilised in the earlier study by Smart (1997) and are used in the current study to provide consistency between the two studies. Leavitt's (1964) framework is utilised to determine how changes in supply chain management processes have impacted both technological and business environments at BHP Steel (Aust).

Figure 3: Diamond of Change

(Source: Leavitt, 1964)

3.1 Research Sample

The research sample comprised employees of BHP Steel (Aust) who are key players in the development of the organisation's e-commerce strategy and whose area of responsibility includes the development and ongoing maintenance of the customer web site. These employees are senior

personnel, comprising managers from the Marketing and Steel Group (Supply) Divisions. The same sample was used in Smart's (1997) study. Interviewing the same sample group aided in the connection of outcomes from the earlier study with developments in the current environment.

3.2 Data Collection

The research utilised in-depth interviews as the primary method of data collection. Secondary methods include examination of documented and archived data, and observation. The interview method provided depth to the study, as well as the qualitative data utilised in the study.

Documentary and archived data at BHP Billiton Steel (Aust) comprising reports outlining e-commerce strategies, objectives and project developments provides a historical perspective on e-commerce developments in the organisation. BHP Billiton Steel (Aust)'s www.steelconnect.com.au web site was analysed in order to identify the online interaction processes that take place between BHP Billiton Steel (Aust) and their customers.

The involvement of the researcher as an observer at relevant meetings and formal site visits assisted in gaining further insight into supply chain processes and the organisation's current and future e-commerce proposals. Data gathered through informal discussions with participants was used to follow up on issues (raised and discussed during the interviews and meetings) requiring further clarification.

4. DISCUSSION

In 1997, Smart found that whilst BHP had identified that opportunities existed for customers to track shipments and orders using web-based systems at the distribution end of the supply chain, there was no evidence of implementation of a Virtual Distribution Space (VDS) within the context of the supply chain at BHP Billiton Steel (Aust). Smart also found that while the organisation had implemented a strategy for Online Transaction Processing (Virtual Transaction Space), this was used primarily for low value, low risk transactions. The Internet was viewed more as a lower-cost transport medium for EDI messages.

4.1 MAJOR FINDINGS

4.1.1 Strategy

1. The Internet can be incorporated in to the distribution end of the supply chain to support a Virtual Transaction Presence and a Virtual Distribution Presence

In 1997 BHP Billiton Steel (Aust) saw that opportunities existed with the use of the Internet to transact with customers and distribute services. It took five years for the business to integrate Internet technologies in to the supply chain, allowing the development of a Virtual Transaction Presence and Virtual Distribution Presence. In this five-year time frame BHP Billiton Steel (Aust) have been able to create a business- to- business online environment, which supports all interactions made with the customers. The web site provides a single point of access to both the Virtual Transaction Presence and Virtual Distribution Presence.

The outcome of the study indicates that the process of integrating the Internet in to the supply chain has been quite lengthy with significant work being done with EDI technologies pre 1997. Thus even with the knowledge gained between 1988 and 1997 in EDI it still took five years to develop an e-commerce presence to its current state of sophistication. Furthermore, the e-commerce strategy needs to be viewed as an evolving strategy that will constantly enhance the organisation's use of technology and allow them to remain constant with changing market and customer needs.

2. A flexible strategy is vital for a mature industry, such as the Steel Manufacturing Industry, to operate within a dynamic industry, involving rapidly evolving technologies and business models.

Rather than setting static goals BHP Billiton Steel (Aust) have set the direction of their e-commerce initiatives and have developed a strategy that is flexible and can maintain a competitive stand- point in differing market states. For example, the organisation does not know whether a private market place will continue to flourish or whether a public model will become a more successful mode of operating. Thus instead of setting specific end states for the web site to reach they have implemented a flexible model that allows them to adapt the site and technologies to suit the changing market needs.

This flexible approach has created a paradigm shift within BHP Billiton Steel (Aust) who once thought that a specific technology would provide a 'one stop' solution to a problem. Hence in 1997 the organisation viewed the Internet as being a technology that would provide a solution to a business problem by being a support technology to EDI and transacting low value and

low risk transactions. In 2001 the organisation realised that the business problem is most important and the technology needs to provide an adequate solution to specific business problems. BHP Billiton Steel (Aust) found they needed to support a number of technologies so that the customers could choose which technology was most suitable for them. The Internet has provided them with the means to implement this type of flexible system architecture and supports EDI over the Internet; XML, PDF and Excel formats; e-mail; and WAP. VANS are still available for use by some of the large customers.

3. For an e-commerce presence to exist within the supply chain, and maximum benefits, both the marketing and e-commerce strategies need to be carefully aligned with the overall business goals.

In 1997 the technology was the focus of BHP Billiton Steel (Aust's) e-commerce strategy. BHP Steel knew the technology would provide an advantage but were not sure what the specific benefits would be. Through the development of their various Internet applications, the organisation realised that a customer centric approach was necessary. The Marketing department knew the problems that the customers were experiencing as well as the needs and goals of the business. By aligning the marketing and e-commerce strategies the organisation was able to provide a more relevant solution that added value for both BHP Billiton Steel (Aust) and their customers.

If BHP steel had developed their e-commerce strategies independently of their marketing strategies their e-commerce web sites would not have been as successful. They may have provided value for BHP Steel but the customers would not have been able to clearly see the value proposition of using the site and would not have supported its use.

4. A credible value proposition needs to be clear to the customers before they will adopt a certain technology or e-commerce environment.

BHP Billiton Steel (Aust) introduced the test certificate and order status applications first because they provided the best value proposition for the customers. BHP Steel improved their customer relationships because they quickly realised the added value that BHP Billiton Steel (Aust) was providing them through the use of Internet technologies. For example the cost of test certificates was reduced from between \$4.50-\$2.50 to .20-.30 cents. Also customers can track their order through the supply chain allowing them to more effectively manage their own supply chains and inventories. The creation of a stronger customer relationship meant that the organisation was in a better position to then influence the customers to order online, a process that provided the most value for the organisation.

5. Real value can only be gained within the distribution end of the supply chain if the technology has provision for supply chain integration. Deep supply chain integration reduces costs due to entry errors; creates a more controllable inventory system; and creates value to the customer by providing services, such as order forecasting.

To gain a real competitive advantage over the competition and use of previous technologies, such as EDI, all parties in the supply chain need to consider supply chain integration. The organisation's Electronic Trading Manager and E-commerce Manager, as well as E-Steel's Professional Services Manager support this view. Internet technologies have made it easier for BHP Steel's customers to integrate information in to their existing systems. For example, at BHP Billiton Steel (Aust) the customers can download data from the web site in to user- friendly formats such as Excel. This allows the customers to reduce data entry and automate their inventories. This provides a competitive advantage for both the organisation and their customers who save costs resulting from high inventory levels and data entry errors.

6. The success of an e-commerce strategy, such as the integration of the Internet in to the distribution end of the supply chain, depends on the deep commitment from those people involved in close relationships with the customers, who have extensive knowledge of both business and customer problems. Eventual support is also needed from upper management who have the power to drive an overall organization approach.

Throughout the development of BHP Billiton Steel (Aust's) e-commerce initiatives, lower levels of management have been significant drivers for change. BHP Billiton Steel (Aust) employees, who were close to the customers and had developed influential relationships, were the biggest drivers of change, such as the Electronic Trading Manager. These employees played significant roles in the development of Internet applications between 1997 and 2001 and provided the initial evidence to upper levels of management at the organisation and their customers who needed to demonstrate that the Internet could provide value and a competitive advantage.

4.1.2 Technology

1. Internet technologies can be incorporated into the supply chain, alongside existing technologies such as EDI

BHP Billiton Steel (Aust) has realised that it is strategically necessary to implement a system architecture that is supported by a number of technologies. This allows the customers to choose the technology most

appropriate for them. For example, smaller customers cannot afford the costs of EDI and find EDI over the Internet a more viable solution. BHP Billiton Steel (Aust) now offers a suite of technologies including:

- EDI over the Internet supported by IDX/WDX
- E-mail
- XML, PDF, Excel formats for data integration
- WAP
- Telephone and Fax
- EDI using Edifact AnsiX12

These technologies co-exist, empowering the customer to use the technology, which is most advantageous for them. The Internet has allowed the organisation to offer a more affordable and flexible solution to its customers, than what was previously available with the sole use of EDI.

2. Internet technologies can be used to support an e-commerce environment and a web site provides a viable point of access to conduct business- to- business e-commerce.

The Internet at present supports the majority of customer transactions at BHP Billiton Steel (Aust) and whilst the VANS still exist BHP Steel is migrating the majority of its customers to EDI over the Internet. Furthermore, the web site bhpsteelconnect.com is being used as the point of access to the various applications available. The web site has empowered customers who can access it 24 × 7 and has reduced the costs of customers enquiries for the organisation.

3. Technology must support the business case and business problems. Direct interaction is needed with the customers to determine whether a particular technology will meet their needs

It is important to mention that the customers were closely involved with the development of both the bhpsteelconnect and bhpsteel web sites. The sites directly affect the way BHP Steel's customers conduct their business and it was extremely important to develop the sites inline with the customers' needs. A customer centric approach was taken with continual testing and research being undertaken. These factors played an important role regarding the web site being a suitable and successful point of access for transactions and the distribution of services. If the sites did not meet the expectations of the customers they would not use them in their daily business.

4. Internet technologies and standards have become more sophisticated allowing the Internet be a secure enough technology to be used for high value and high- risk transactions.

In 1997 BHP Steel believed that the Internet provided opportunities for low value and low risk transactions only. In 2001 with developments in Internet standards, such as XML, BHP Steel can now use the Internet to support e-commerce transactions. The security model has given the customers the confidence to transact large orders over the Internet. This was something that BHP steel did not expect in 1997.

The evolution of Internet technology further highlights the need for a flexible approach rather than static goal setting. BHP Steel now realise that to keep up with the dynamic technology industry they need a strategy that can cope with changes in technology. This is why they have developed a three- model approach, which will allow BHP steel to stay competitive by staying at the forefront of e-commerce.

5. Involvement of those with technical expertise is a major factor affecting the success of creating a sustainable e-commerce presence.

Between 1997 and 2000 BHP Steel developed their e-commerce presence to a point defined by their technical capabilities. However to gain a full competitive advantage from the use of Internet technologies BHP Steel needed to recruit the skills of someone with technical expertise in the use of the Internet and e-commerce. BHP Steel formed a relationship with a technology provider, which could provide them with better technical solutions faster than they could develop alone. This approach helped BHP Steel to implement more flexible strategies because they now have the expertise to dynamically cope with change. Hence they will be able to sustain a competitive advantage by constantly implementing enhanced technical solutions constant with changing market needs.

5. CONCLUSION

The outcome of the study clearly illustrates that BHP Billiton Steel's e-commerce strategy has evolved over time, with a shift in emphasis to the distribution end of the supply chain, where Internet technologies are being leveraged to embrace and enhance customer interactions. The changes occurring in BHP Billiton Steel's (Aust) e-commerce strategy and supply chain management practices are clearly aligned with changes that have occurred in the steel market state globally and business environment at the time. In 1988, when BHP Billiton Steel (Aust) first embraced EDI, developments were driven by a single technology. At this time, the business case for adopting emerging technologies was not clear, leading the organisation to conduct a number of pilot studies which resulted in an "incremental" approach to implementation of e-commerce systems. Over time, the organisation became increasingly aware that a single set of

technologies was not the answer. For example, while EDI provided value to the organisation and its larger customers, it did not provide value for the smaller customer. Additionally, although EDI worked well on the supply side, a more innovative approach was required on the sell side. Changes that have taken place at BHP Billiton Steel (Aust) over the past five years have resulted in a paradigm shift at the organisation. In 1997, the organisation's e-commerce strategy centred on using the Internet for low-value, low-risk transactions, primarily for reducing the cost of transportation of EDI messages. Five years down the track, their strategy has evolved to one where a strong "value proposition" is imperative. Internet technologies have been leveraged to provide high value to both the organisation and its customers. Customer information can now be accessed deeper into the supply chain, enabling the organisation to further differentiate their services and forge stronger relationships with customers.

In 2000, a partnership with E-Steel was forged in order to develop higher – level, more sophisticated applications by leveraging on the expertise of the technology company. The organisation realised that their e-commerce strategy and supply chain management practices could not be approached from a static standpoint, but instead must be viewed as an evolving process. This approach has enabled the organisation to move from a generic Internet presence in 1997 to a highly sophisticated customised presence. This goal took five years to realise. The focus for the next 3-5 years is on a strategy that is flexible and has scope to extend into the future and continues to provide value in a changing e-commerce environment. The organisation's approach to e-commerce strategy is one of total integration, a vision for the future where e-commerce is seen as a way of doing business, a total business solution, not just a technology solution that supports the sale of their products.

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