

Electronic Commerce Issues in the Australian Manufacturing Industry

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Abstract

This paper reports on findings into the benefits, challenges and success factors of electronic commerce in the Australian manufacturing industry among the top 500 Australian publicly listed companies. The paper investigates anticipated and identified challenges, benefits and success factors of electronic commerce, and possible relationships between them. The results showed that manufacturing industry encountered similar challenges, identified similar success factors and achieved similar benefits as the other sectors of Australian economy. Although this research addresses well-established business enterprises in Australia, the nature of electronic commerce is such that it is global and the findings should be applicable to large organizations over a much wider scope. Some of the findings could as well be applicable to small and medium size businesses/organizations.

Keywords

Electronic Commerce, Manufacturing Industry, Australia

1. Introduction

Electronic commerce as a new way of doing business has significant opportunities in Australia and other parts of the world. It has potential to increase profits, expand the customer base, reduce costs, enable optimal allocation of resources, build customer loyalty and consequently gain competitive advantage (Lane, 1997; Copacino, 1997; Carr, 1997; Aberdeen group, 1997; Nouwens and Bouwman, 1999; Cameron, 1999). Electronic commerce provides companies of all sizes opportunities to increase profits by reaching customers at greater distances and improves the quality of service to clients through faster response times, etc (Cameron, 1999; Wigard and Benjamin, 1999; Riggins, 1999). The research reported in this paper was focused on identifying challenges, success factors and benefits for large organisations in the Australian manufacturing industry engaged in electronic commerce.

2. Literature Review

Electronic commerce has provided businesses with opportunities to achieve benefits by applying better knowledge management, reducing operation costs, improving customer service, gaining business efficiencies, and so forth (Fusaro, 1998; Weil and Broadbend, 1998; Leland, 2000). On the other hand, to be able to achieve the above-mentioned benefits in this growing area of business, its participants have to overcome the many challenges of electronic commerce. These are embodied in security and web site issues, new types of payments, cost of technology; and so forth (Warrington et al, 2000; McAndrews, 1999; Hannon, 1998; La Plante, 1997). Finally, and very importantly, overcoming the challenges and achieving the benefits of electronic commerce is possible by identifying the factors that are essential contributors to success in this area. The main contributors include secure transactions, forming alliances, rapid delivery and effective project leaders (McAndrews, 1999; Mahaveden, 2000; Segil, 2000; Rutter et al, 2000).

2.1 Electronic Commerce Benefits

In the transition from industrial to information age electronic commerce offers considerable benefits for new players who are ready to take advantage of it (Roel, 1997). Among the main reasons for many companies, regardless of size, to participate in any business is to be successful and to achieve benefits from it. Electronic commerce is not any different in that respect. The benefits of electronic commerce identified from the literature are presented in Table 1.

Benefits	Literature
Business efficiency	Rosen and Howard, 2000; Nouwens and Bouwman, 1999; Cameron, 1999; Freisen, 2001; Riggins, 1999; Griffin, 2000; Leland, 1999, Iacovou et al. 1996.
Increased automation of processes	Begley, 1999; Dan et al, 2001.
Transformation of traditional market chain	Wigard and Benjamin, 1999.
Retained and expanded customer base	Carr, 1997; Turban et al, 2000.
Reduced operation costs	Cameron, 1999; Drechel, 1997; Kent and Lee, 1999; Grover and Ramanlal, 2000; Nickson, 2000; Aaron et al, 1999; Nagendra, 2000; Stewert, 1998; Connolly et al, 1998; Fergusson, 1999; Wolfinger and Gilly, 2001.
Consumer loyalty	Wigard and Benjamin; Warrington et al, 2000; Hoffman et al, 1999; Coulson, 1999, Adam et al. 2000.
Competitive advantage	Kalakota et al, 1999; Cameron, 1999; Porter and Millar, 1985; Hoffman et al, 1999; Straub, 2000.
Convenient shopping	Hannon, 1988; Quinton, 1999; Winner, 1997.
Better knowledge management	Fusaro, 1998.

Increased sales	Weil and Broadbent, 1998; Leland, 2000.
Acquisition of a niche market	Riggins, 1999.

Table 1. Benefits of electronic commerce found in the literature

2.2 Electronic Commerce Challenges

To position them to be successful and benefit from electronic commerce, it is important for businesses to overcome its inhibitors and challenges. Electronic commerce challenges identified from the literature are presented in Table 2.

Challenges	Literature
Web site issues	Watson et al, 1999; Hannon, 1998; Lane, 1997.
People and organisational issues	Corbitt, 2000; Hoffman et al, 1999.
Measuring success	Hoffman et al, 1999; Abeyesekera et al, 1999.
Technology cost	La Plante, 1997,
Lack of EC infrastructure	Abeyesekera et al, 1999; Hoffman et al, 1999.
Software installation	Hoffman et al, 1999; Abeyesekera et al, 1999.
Lack of EC infrastructure	Abeyesekera et al, 1999; Hoffman et al, 1999.
Customer service	Primoff, 1998; Whinston et al, 1997; Alter, 1999;
Obtaining senior management support	Poje, 1998, Guariono and Wilemon, 1990.
Customers' old habits	Hoffman et al, 1999; Schwartz, 1999.
Making business known to people	Lowry et al, 1999.
Legal issues	Lawrence et al, 1998, Whinston et al. 1997; CEC Monash University, '99.
Security	Gray, 1999; Markey, 1997; Salnoske, 1997; Rankin and Sharp, 2000; Czerniawska and Potter, 1998; Warrington et al, 2000.

Table 2. Challenges of electronic commerce found in the literature

2.3 Electronic Commerce Success Factors

To enable businesses to maximize value from electronic commerce it is imperative to identify, evaluate and disseminate the factors that are critical for the success in this new and fast-growing area of business. Electronic commerce success factors identified from the literature are presented in Table 3.

Success Factors	Literature
Secure transactions	Liao and Tow, 2001; Primoff, 1998; Mahadevan, 2000; Warrington et al, 2000; McAndrews, 1999.
Online decision support system	Riggins, 1999.
Online catalogue	Aaron et al, 1999;Baron et al, 2000.
Payment via credit card	Panurach, 1996; McAndrews, 1999; Treese and Stewart, 1998; Maxwell et al, 1999.
Electronic payment system	Stewart, 1998; Schneider and Perry, 2001; McAndrews, 1999, Whinston et al. 1997.
Frequently asked questions	Riggins, 1999.
Integrating web site to all business processes	Ruud and Deutz, 1999; McClure, 1998; Zarowin, 1999.
Online personalised recommendations	Riggins, 1999.
Functional web site	Studt, 2000; Liu and Arnett, 2000.
Effective project leader	Folitt, 2000; Jarvenpaa et al. 1991.
Forming alliances	Segil, 2000; Riggins, 1999; Leland, 2000.
Partnership with suppliers	La Plante, 1997.
Partnership with technology providers	Coulston, 1999.
Appropriate organisational structure	Tetteh and Burn, 1999; El Sawy, 1999.
Rapid delivery	Rutter and Southerton, 2000; Castelluccio, 2000
Disintermediation	Primoff, 1998; Mahadevan, 2000; Parker, 2000.
More personalised customer service	Pituro, 1999; Mahadevan, 2000; El Sawy, 1999; 1999; Baker, 1999.
Advertising in newspapers, magazines, etc.	Zarowin, 1999.
Advertising online	Minoli and Minoli, 1997; Mahadevan, 2000.
Adequate resources	Dugan, 1999.
Being visionary	Hossain, 1999.

Table 3. Success factors of electronic commerce found in the literature

3. Research Question

The purpose of this research was to identify challenges, success factors and benefits for large organisations in the Australian manufacturing industry engaged in electronic commerce. The specific aims of this research were to:

- Identify the challenges of electronic commerce that inhibit its successful operation;
- Identify the success factors that help businesses to overcome e-commerce challenges encountered;

- Identify the benefits of electronic commerce; and
- Identify which challenges, success factors and benefits of electronic commerce Australian organisations have anticipated, as well as which challenges they have actually encountered, which success factors they have actually identified and which benefits they have actually achieved in the electronic commerce field (the basic idea behind this was to assess the ability of Australian companies to anticipate the challenges of electronic commerce that lay ahead, foresee the factors that would influence their electronic commerce success, and estimate the benefits of electronic commerce they would achieve).

4. Research Method

This research, as a part of a survey of top 500 Australian publicly listed companies identified from the web site www.connect4.com.au, was accomplished via postal questionnaires. The participants were asked to circle one response for each item in both anticipated and experienced part of the question, on a Likert scale. The answers on the Likert scale, ranged from 0 indicating no impact to 5 indicating the greatest impact.

The compiled data from the survey were analysed using SPSS, PC-based statistical package in a Windows environment. In accordance with the collated data, appropriate statistical analyses such as the Sign test and the Kruskal-Wallis test were conducted. The Sign test was performed to find out if there was a significant difference between the anticipated and identified enablers, inhibitors and benefits of electronic commerce in the various participating organisations. In order to determine the differences between enablers, inhibitors and benefits of electronic commerce in Manufacturing industry and the entire sample, the Kruskal-Wallis test was performed.

5. Findings

Of the 500 companies surveyed, 101 useable responses were returned (21.96%). Of the 101 responses, 20 responses from the manufacturing industry were returned (19.8%). Table 4 details the breakdown of respondents by industry.

Industry	Number responded	Percent
Finance/Banking	24	23.9%
Manufacturing	20	19.8%
Communications	12	11.9%
Wholesale and retail trade	11	10.9%
Other	34	33.5%
Total	101	21.96%

Table 4. Survey responses by industry

The challenges of electronic commerce in manufacturing industry are presented in Table 5.

Rank	Challenges	Median	No of cases	Sign T. Signif.
1	Lack of e-commerce knowledge	3.0000	19	.250
	Technology cost	3.0000	19	1.000
	Lack of e-commerce infrastructure	3.0000	19	1.000
	Making business known to users	3.0000	19	.021
	Security	3.0000	19	.754
	Acquiring IT skilled people	3.0000	19	1.000
	Managing change	3.0000	19	.180
	Customer service	3.0000	19	1.000
	Budget	3.0000	19	.267
	Internet service provider reliability	3.0000	19	.227
10	Integrating front-end EC to back-end system	3.0000	18	1.000
	Software compatibility	3.0000	18	.727
	Reliable technology vendor	3.0000	18	.109
	Web site issues	3.0000	18	1.000
15	Measuring success	2.0000	19	.453
	Obtaining senior managers support	2.0000	19	.021
	Dealing with intermediaries	2.0000	19	1.000
	Employee resistance towards e-commerce	2.0000	19	1.000
19	Reaching customers in rural and regional areas	2.0000	17	.125
20	Current e-commerce legislation	1.0000	16	.125

Table 5. Rank order and results of the sign test for challenges of electronic commerce in the manufacturing industry

From Table 5 it can be concluded that among the most frequent challenges encountered in the manufacturing industry is a lack of e-commerce knowledge followed by technology cost, lack of e-commerce infrastructure, making business known to users, security, etc. The result of the Sign test indicated that only two challenges were not correctly anticipated (shaded).

Electronic commerce success factors in this industry are presented in Table 6.

Rank	Success factors	Median	No of cases	Sign T. Signif.
1	Effective project leader	5.0000	19	.500
2	Excelling in communication with customers	5.0000	15	1.000
3	Functional and user-friendly web site	4.0000	19	.375
	Rapid delivery	4.0000	19	.727

	Secure transactions	4.0000	19	1.000
	Top management support	4.0000	19	1.000
	The use of new technology	4.0000	19	1.000
	Forming alliances with new partners	4.0000	19	.500
	Regular update of the content of the Web site	4.0000	19	1.000
	Adequate resources (finance & people)	4.0000	19	.424
	Partnership with technology providers	4.0000	19	.250
	Responsive and flexible to the market	4.0000	19	1.000
	Advertising in newspapers, magazines, RTV	4.0000	19	1.000
14	Being visionary	4.0000	18	1.000
	Cross-functional project team	4.0000	18	.375
	Active role of IT department in organization	4.0000	18	1.000
	Responsive and flexible to new strategies	4.0000	18	.375
	Integrating web site to all business processes	4.0000	18	1.000
19	More personalized customer service	4.0000	17	.688
	Online tracking facilities	4.0000	17	1.000
	Allowing FAQ on Web site	4.0000	17	1.000
22	Partnership with service providers	3.0000	19	.625
	Partnership with suppliers	3.0000	19	1.000
	Payment via credit card	3.0000	19	1.000
	Appropriate Organization structure	3.0000	19	1.000
	Online catalogue	3.0000	19	1.000
27	Electronic payment system	3.0000	18	.727
	Online personalized recommendations	3.0000	18	1.000
	Providing online decision support	3.0000	18	.354
	Advertising online	3.0000	18	.016
	Appropriate metrics to measure success	3.0000	18	1.000
32	Web site listed on critical search engines	3.0000	17	.250
33	Appropriate packaging	3.0000	16	.219
	Availability of new intermediaries for EC	3.0000	16	.625
35	Disintermediation	3.0000	15	.219
36	Comprehensive e-commerce legislation	2.0000	17	.125
37	Appropriate Sociotechnical policy	2.0000	16	.250

Table 6. Rank order and results of the sign test for success factors of electronic commerce in the manufacturing industry

Table 6 indicates that the most commonly identified success factors in the manufacturing industry include an effective project leader, excelling in communication with customers, a functional and user-friendly web site, rapid delivery and secure transactions. The result of the Sign test indicated that only one success factor was not correctly anticipated (shaded).

Benefits of electronic commerce in this industry are presented in Table 7.

Rank	Benefits	Median	No of cases	Sign T. Signif.
1	Competitive advantage	4.0000	17	.625
	Increased automation of processes	4.0000	17	.453
3	Improved image	4.0000	16	1.000
4	Retained and expanded customer base	3.5000	18	.035
5	Increased sales	3.0000	18	.180
	Business efficiency	3.0000	18	.006
	Extended application of new technology	3.0000	18	.180
	Reduced operation costs	3.0000	18	.006
9	Acquisition of a niche market	3.0000	17	1.000
10	Secure EC environment	2.0000	17	.109
	Enhanced skills of employees	3.0000	17	.289
12	Customer loyalty	3.0000	16	.016
	Reduced inventories	3.0000	16	.016
14	Better knowledge management	1.0000	16	.688

Table 7. Rank order and results of the sign test for benefits of electronic commerce in the manufacturing industry

Table 7 indicates that among the most achieved benefits in manufacturing industry are competitive advantage followed by increased automation of processes, improved image, retained and expanded customer base and increased sales. The result of the Sign test indicated that the anticipating companies did not correctly anticipate 5 out of 14 benefits (shaded). The participating companies anticipated achieving more than they actually achieved in practice with regard to these 5 benefits.

5.1 Kruskal-Wallis Test

In order to find out whether the differences for the challenges, success factors and benefits in manufacturing industry, when compared with the challenges, success factors and benefits in the entire sample, were statistically significant, the Kruskal-Wallis test was performed. The results of the test suggested that all of the variations in the industry when compared with the

entire sample were of the kind to be expected among samples from the same population. This coincided with the findings from the semi-structured interviews that the majority of participants were at the same stage of electronic commerce and therefore encountered the same dilemmas.

5.2 Correlation Analysis

To establish whether the relationships between the benefits, challenges and success factors existed, a correlation analysis was conducted. The correlation analysis indicated that a number of variables were correlated as well as statistically significant. As the size of the data set was 20, only reasonably high correlations of 0.5 or better were used (Bryman and Cramer, 1992). In Tables 8 and 9 only statistically significant logical correlations are presented, these include factors whose relations were also indicated to exist from the interviews with senior managers in charge of e-commerce in large Australian organizations.

Success Factors	Challenges	Significance
Adequate resources	Customer service	.029
Top management support	Acquiring IT skilled people	.022
Appropriate organization structure	Obtaining senior management support	.015
Appropriate metrics to measure success	Customer service	.032
Cross functional project team	Dealing with intermediaries	.033
Responsive and flexible to the market	Dealing with intermediaries	.031
Forming alliances	Reliability of technology vendor	.021
Partnerships with service providers	Reaching customers in rural and regional areas	.037
Online personal recommendations	Reaching customers in rural and regional areas	.037
Electronic payment system	Software compatibility	.039
Credit card payments	Reaching customers in rural and regional areas	.014
More personalized customer service	Reaching customers in rural and regional areas	.022

Table 8. Correlation between success factors and challenges

Table 8 indicates a number of strong relationships between the success factors and challenges, such as: top management support and acquiring IT skilled people; forming alliances and reliability of technology vendor; etc.

Success Factors	Benefits	Sig.
Top management support	Secure EC environment	.040
	Increased sale	.015
Cross functional project team	Acquisition of a niche market	.012
	Competitive advantage	.034
Credit card payments	Improved image	.011
More personalized customer service	Acquisition of a niche market	.030
Partnerships with suppliers	Reduced inventories	.039
Integrating web site in all business	Improved image	.037
Functional and user-friendly web site	Business efficiency	.023
	Competitive advantage	.011
Web site listed on critical search engines	Retaining and expanding customer base	.027
	Customer loyalty	.045
FAQ	Increased sale	.034
	Acquisition of a niche market	.028

Table 9. Correlation between success factors and benefits

Table 9 indicates a number of strong relationships between the success factors and benefits, such as: cross-functional project team and competitive advantage; partnership with suppliers and reduced inventories; etc.

6. Discussion

This paper argues that businesses involved in electronic commerce have to be aware of impediments, benefits and success factors in order to be successful and maximize their chances of not only surviving but also thriving in this new area of business. The main findings from this research include:

- The major challenges of electronic commerce encountered in the Australian manufacturing industry are: lack of e-commerce knowledge, technology cost, lack of e-commerce infrastructure, making business known to users, security, etc.
- The major benefits of e-commerce achieved in the Australian manufacturing industry are: competitive advantage, increased automation of processes, improved image, retained and expanded customer base, increased sales, etc.
- The major success factor of e-commerce identified in the Australian manufacturing industry are: effective project leader, excelling in communication with customers, functional and user-friendly web site, rapid delivery, secure transactions, etc.

- The manufacturing industry in Australia has encountered similar challenges, achieved similar benefits and identified similar success factors compared with the rest of the industries present among the top 500 Australian companies.

7. Conclusion

The research undertaken in this paper has identified benefits, challenges and success factors important from the Australian manufacturing industry point of view, in order to be successful in the field of electronic commerce today. The findings from this research can be used as a guide in successful adoption and implementation of electronic commerce in companies that are starting to engage in this new way of conducting their businesses. Although this research addresses well-established business enterprises in Australia, the nature of electronic commerce is such that it is global and the findings should be applicable to large organizations over a much wider scope. Some of the findings could as well be applicable to small and medium size businesses/organizations.

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