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Organizational Characteristics of B2B Adopters in the Canadian Manufacturing Sector

Vinod Kumar, Michel Fuksa, and Uma Kumar

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Abstract

This paper presents selected preliminary results from a study of B2B e-commerce adoption by Canadian manufacturing firms. The goal of the broad research project is to describe the behaviour of Canadian manufacturers with respect to adoption of B2B technologies and to identify factors which distinguish adopters from non-adopters of B2B. The study focuses on the organizational characteristics of adopters of B2B e-commerce technologies and attempts to outline the features which differentiate them from non-adopters. Preliminary analysis shows the existence of three distinct B2B adopter types: non-adopters, partial-adopters and full-adopters. Leadership related variables appear to be the most important determinants of adoption.

About the authors

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ORGANIZATIONAL CHARACTERISTICS OF B2B ADOPTERS IN THE CANADIAN MANUFACTURING SECTOR

Introduction

B2B e-commerce (B2Bec) is a methodology for transacting goods and services over electronic networks and forms an integral part of electronic procurement systems (Dai and Kaufman, 2006). The adoption of B2B technologies is fraught with difficulties (Dai and Kaufman, 2002) and represents a major effort on behalf of organizations. In order to facilitate adoption of B2B, it is necessary to study the prevailing adoption behaviours in organizations in order to isolate the features and characteristics which distinguish adopters of the technology from non-adopters and to identify the factors which inhibit firms from adopting B2B. Ultimately, this knowledge can then be used to help companies improve performance, by reducing the obstacles associated with this process.

In Canada, recent studies show that adoption of B2B e-commerce among Canadian firms lags behind the United States and Europe (Fast Forward 5.0, Net Impact IV). The Canadian context thus provides a strong motivation for examining the factors which impact on the adoption of B2Bec.

The paper presents preliminary results from a study designed to identify the factors which influence Canadian manufacturing firms to adopt B2B e-commerce, and, in particular, aims to analyze the impact of organizational characteristics on the adoption of B2B in this sector.

The research strives to answer a number of limitations found in the adoption literature: first, the literature does not explain in a satisfactory manner the decision to adopt and suffers from the lack of a complete model of B2Bec adoption; second, the literature does not explicitly study adoption among manufacturing firms, but, in general, examines disparate groups of industries without particular focus. This study further distinguishes itself in that it examines Canadian evidence from manufacturing firms.

While there have been several studies of the Canadian B2B landscape (Venkat, 2000, Archer, 2003), and also several studies by the Canadian E-Business Initiative (CEBI, 2004), they display several weaknesses related to their descriptive rather than analytical treatment of the phenomenon of interest and in their lack of focus on the manufacturing sector. Finally, it is important to note that, for several years, Statistics Canada has been examining B2B e-commerce in Canada in its annual Survey of Electronic Commerce and Technology (Statistics Canada, 2005). This data, while containing interesting information about the state of B2Bec, does not in itself convey knowledge as to B2Bec adoption drivers and practices.

The paper is organized as follows: first, a brief outline of the literature on the subject of B2B adoption is presented, next is introduced a formal model to explain the B2Bec adoption decision in a firm, then the survey methodology and data analysis are unveiled, and, finally, the last section discusses the results and compares them with the literature.

Adoption Literature

Canadian context

In Canada, two principal studies of B2Bec adoption provide a descriptive overview of the Canadian context: Archer *et al.* (2003) and Venkat (2000). Venkat (2000) in a survey of e-purchasing, finds that a significant number of firms (over 40%) use electronic networks to purchase, but that only

3.25% of overall purchasing in value was performed over electronic networks, although for firms using B2Bec this value was 33.9%. He found that adoption is mostly tilted towards service industries than manufacturing. When it comes to adoption factors, the author discovered that top management priority and the responsiveness of the company to customers' needs have a positive relation with adoption, while cost and strong ties to existing suppliers have a negative relation to adoption. The author also discovered that while the attitude towards B2B was overtly positive, organizations did not feel they were exploiting their technology to the maximum (only 3.9% of organizations felt they were using B2B to its potential).

Archer *et al.* (2003) find that 5.3% of purchasing and 4.6% of sales by value is conducted online by Canadian SMEs. The study's respondents also believe that B2B can have a positive strategic influence on business but that the implementation stage might present problems. The businesses also believe that B2B will not reduce product prices, but only transaction costs. Additionally there is a perception that costs associated with adoption might be excessive and that the technology presents challenges without clear business benefits. Moreover, when it comes to adoption, few respondents felt any competitive pressure to adopt B2Bec, but many noted that the e-commerce infrastructure in Canada was so little developed that it made little sense to invest. Interestingly, the authors found very little difference between the opinions of adopters and non-adopters concerning the nature of benefits which B2B may provide. Non-adopters, however felt less confident about top management's understanding of benefits and believed that B2B cannot reduce transaction costs and is too complicated. Lastly, it is significant that SMEs do not make decisions themselves in the area of B2B but rather that they make them in conjunction with their trading partners.

The Canadian e-Business Initiative is another source of data on adoption of B2B technologies by Canadian business (Fast Forward and Net Impact IV, 2004). The studies report confirm the above findings on the fate of B2Bec: the volume of transactions over B2B networks in proportion to revenues is insignificant. The biggest barriers to the implementation among SMEs appear to be the cost as well as the lack of clear returns from adoption of the technology.

Statistics Canada, similarly to the US Census Bureau (US Census, 2006), in its series of SECT surveys provides an analysis of Canadian e-business developments (Statistics Canada, 2005). The findings from the surveys confirm those from the earlier studies: half of the firms do not believe that their products are suitable to internet transactions, and a third does not believe that e-commerce fits in their business model. Most importantly, ever since 2001, electronic sales, account for only 1% of all revenues. More importantly, the surveys, in their detailed map of Canadian electronic commerce, find that cultural and service industries are more likely to use e-commerce than manufacturing industries, but that some manufacturing industries use e-commerce more than others.

Organizational characteristics of adopters

A number of studies in the literature attempt to differentiate between adopters and non-adopters through a descriptive analysis of their organizational and environmental characteristics.

Min and Galle, (2003) in a survey of National Association of Purchasing Management members tested the impact of several key organizational factors on the adoption of e-purchasing. They found that firms in information intensive sectors are more likely to use e-purchasing as are firms with larger purchasing departments. Strangely, they find that the number of suppliers has no significant influence on the adoption of e-purchasing but that managerial recognition of the benefits from EDI or Internet purchasing carries weight.

In a descriptive study of B2Bec in Singapore, Teo and Ranganathan (2004), provide a detailed analysis of organizational characteristics of adopting organizations. They find that the most important

characteristic of adopters is the presence of a champion who will push the B2B idea: 60% of adopters had a champion, (and only 18% of non-adopters). Adopting firms also experience higher top management support and feature both formal plans for adoption as well as dedicated e-commerce task-forces (54% of adopters had both, and 12% either one or the other). The study also finds that supplier side applications are more prevalent than customer-side applications, and that web-based purchasing is the most popular activity.

Based on interviews of selected electronics and textile companies in Taiwan, Thatcher, Foster and Zhu (2006) find that management support is the most important organizational determinant of adoption. They find that electronics firms' managers are more educated and have more contacts with the West than their textiles colleagues, whose industry is more family-dominated and where managers do not have the same commitment to or understanding of technology. Responsiveness to the market and product leadership is the main driver of adoption for the electronics industry, and cost-cutting is the principal driver for the textiles industry. It thus appears that the not all manufacturers face the same pressures, and these depend on the nature of the industry. The authors also find that firm size appears to be a positive factor in adopting B2B and multinational firms are also more likely to adopt. The study also underlines the importance of government and cultural factors in the decision to adopt. For example, the Taiwanese government has elaborated both a formal plan and incentives for pushing B2B adoption down onto the electronics sector. This appears to have been the principal driver of adoption among electronics manufacturers.

When it comes to cultural factors, the great power of the government has enabled it to spur the electronics industry into action by setting deadlines. The collective nature of the society did not allow the researchers to identify "champions of adoption"; instead it appears that the whole electronics industry, government, companies and managers worked together on the project for the collective good. It is also notable that members of the electronics industry felt that the automation of certain tasks would allow for more personal interactions with business partners, but that the less technology intensive textile industry feared that the electronics would get in the way of human interactions.

Scupola (2002) in a survey of Italian SMEs found three triggers of adoption: just-by-chance, strategic opportunity and strategic necessity. The just by chance case depicts a situation in which a small business owner happens to learn or get acquainted with a technology and decides to use it in his business. Strategic opportunity illustrates the situation in which the leadership of the company adopts a technology for which the owner sees a use, and, where, the principal adoption cause is strategic advantage. In the case of strategic necessity, the organization is confronted with the adoption of the technology by others, especially competitors, and needs to adopt it in order to survive.

Boeck *et al* (2006) examine pressures that buyers exert on suppliers. The study finds that powerful buyers can exert considerable influence upon suppliers who wish to do business with them. The buyers can impose technological solutions on the suppliers in what amounts to an ultimatum. It is also found that buyers class their suppliers in several categories, each of which must adopt increasingly sophisticated applications. The buyers thus specify e-commerce requirements, and the suppliers have no choice but to comply. The buyer's motives were found to be the total control over costs.

Lefebvre *et al.* (2005) add to the pressures literature by finding that firms adopt B2B applications in stages, from the simplest to the most complex applications. The authors find that most firms, and even non-adopters, experience pressures from business partners to adopt. While some non-adopters are found to resist these pressures citing that the technology is not yet mature, or that they do not see potential benefits or payback from adoption, there is a consensus that even they will have to adopt one day. Furthermore, adopters experience pressures to adopt ever more sophisticated technologies. It is found, in

other words, that the pressure from the environment, be it suppliers, customers, or competition, is so overwhelming that all firms believe that B2B will be implemented one day.

Incidentally, contrary to this, Chau (2001) finds that non-adopting SMEs in Hong Kong do not feel pressure from outside to adopt B2Bec. He speculates that because of their size, the SMEs are overlooked by major players and the industry as a whole, and therefore are not pressured by the environment.

In his investigation of 460 non-adopters of EDI in Hong Kong, Chau (2001) further examined common inhibitors of adoption among SMEs. He found the three most critical factors to be the lack of knowledge about EDI, lack of technological competence and a perceived lack of need or fear to adopt the new technology. On the other hand, SMEs do appear to understand the benefits from the use of the technology. The principal finding is that companies either do not feel the need to adopt or do not feel they have the capacity to do so, or that, because of their small size, they cannot handle the risks associated with the project.

A set of interviews of professionals and academics about the issues surrounding B2B e-commerce provides an instructive lesson about the practical aspects of B2Bec adoption (Dai and Kauffman, 2002). In the business world, B2B e-commerce is viewed as a strategic imperative which needs to answer the strategic mission of the organization. In order to fulfil its promise, it is necessary to first and foremost formulate a strategic plan for its implementation and deployment. Usually such plans have two aspects, one which examines the innovation value of e-commerce, and the other its financial value. In other words, it is necessary to conceptualize a comprehensive "core value proposition" (R. Hackney, p. 75) for B2B. In order to gain the most out of B2Bec it is crucial to view it as a strategic asset that can help the business and not just as a technological tool.

In order to achieve this strategic advantage the firm needs to formulate appropriate plans, goals and expectations (J. Ronning, p. 76). It is crucial at this stage that the goals be clearly defined and that top management support the initiative. The strategy also needs to be well communicated in order to overcome various hurdles (industry centred, organizational behavioural, A. Loder, p. 71), so that B2B may become a new way of doing business and not just a pure technological solution. The importance of communication and top management commitment are the keys to inciting the behavioural changes needed to achieve the strategic value of B2B.

Moreover, organizations do not see B2B as an abstract paradigm, but require it to produce concrete results. B2B needs to produce "tangible value with a concrete ROI, either by increasing the revenue or by decreasing the costs" and needs to do it fast "in many cases to under a year" (A. Loder, p.74).

In formulating a strategic plan it is also required to include all the possible costs associated with the technology, such as the licenses, fees, training costs --- in other words to formulate a complete plan for adoption where the real returns are concretely specified and do not remain vague. To cite one of the interviewees, it is necessary to match "expenses on the front end to the output on the back end" (J. Ronning, p. 75).

The insights provided by practitioners mirror the findings of Nohria *et al.* (2003) concerning management practices in successful organizations. Nohria *et al.* find that successful management consists primarily of four unavoidable practices: strategy, execution, culture, structure. It is evident from the interviews conducted by Dai and Kaufman (2002) that B2B engages these four practices and relies upon the managements' commitment to them for its success. For example, the emphasis on B2B becoming a

strategic asset of the firm and the stringent control on revenues and costs suggest an attachment to these principles.

Determinants of adoption

Bertschek and Fryges (2002) examined the adoption of B2Bec among German companies. They find that the most important variables explaining adoption are the share of highly skilled employees, firm size and the value of exports. Most strikingly, the authors find a surprisingly significant relation between adoption and the proportion of firms in the same industry using the technology. There appears to be therefore a noticeable imitation/bandwagon effect in some cases.

In a study of Swiss firms Hollenstein and Worter (2004) attempt to separately explain the adoption of e-purchasing and e-selling. They find that the decision to adopt e-selling is negatively influenced by security and organizational constraints but very strongly correlated with the suitability of the products to e-selling and a firm's innovativeness and electronic infrastructure. The decision is also made easier if a firm sells on a national level. There is also evidence of a weak competition/bandwagon effect: the more competitors in the same industry adopt e-selling the more likely a firm is to follow.

The factors which affect the decision to adopt e-purchasing appear to be significantly different: adoption is positively affected by the sophistication of the firm's existing computer systems and firms in low barriers to entry markets are more likely to adopt e-purchasing, as are firms who have introduced new products in the last two years.

Contrary to e-selling, static firm characteristics appear to have great importance for the adoption of e-purchasing. First, adoption is strongly negatively related to firm size, and positively related to firm age, and, second, foreign owned firms have smaller adoption rates.

It is clear from past adoption studies, that firms which attempt to follow the successful management strategies as identified by Nohria *et al.* appear to be more apt to adopt B2B e-commerce. The literature reveals that B2B adopters are characterized by top management recognition of the strategic value of e-commerce. These firms do not see B2B as a simple technological issue, but rather attempt to define its strategic value. Thus firms which are innovative and are in high-value industries are more willing to adopt B2B because they are better able to grasp its significance for their operations. It is interesting to note that the issue of costs does not appear to enter the equation when it comes to adoption, except in the case of non-adopters. It is also significant to note that adopters for most have good technological knowledge, and, in contrast to non-adopters, appear to be at ease with technology. The lack of clear e-commerce strategy and the lack of understanding of the opportunities presented by B2B seem to be the greatest inhibitors of adoption.

When it comes to the culture and structure, literature also finds that the companies which are able to communicate clearly the goals of the e-commerce strategy and are not afraid to change the organizational structure of the organization are more likely to adopt.

Lee, Pak and Lee (2003) add that it is the firms which are able to understand the benefits that B2B offers beyond the simple transactional framework, and which are able to use its collaborative possibilities which gain the most benefits from their investment. This evidence is corroborated by Elia *et al.* (2004), where it is found that firms with the most sophisticated B2B applications gain the most benefits from B2B.

A Model of Adoption

The decision of a firm to adopt B2Bec needs to be considered in its entirety. The study proposes a model which explains adoption in terms of a set of four influences: characteristics internal to the firm, the relationship of the firm with its immediate trading partners (its clients and suppliers), the influence of industry, and finally, the general pressure of the environment to adopt B2B. Each of these sources of influence plays its own part in the decision to adopt, either by exerting a pressure or by enabling and facilitating adoption. Figure 1 features a graphical representation of the proposed model.

The goal of the study is to discern from among this universe of potential factors those which contribute the most significantly to the decision to adopt B2B e-commerce. By considering the broader business framework, the study wishes to strengthen the literature on adoption which usually concentrates on a small aspect of the adoption decision, and does not attempt to explain adoption comprehensively as a resultant of the characteristics of the firm and the forces that act on it.

This motivates the use of a comprehensive model in order to explain the adoption decision because only a global analysis of the problem will enable for a better understanding of the adoption process. By combining insights from the literature, the proposed model attempts to build a comprehensive view of the adoption decision which, in its very nature is a result of a multitude of interactions from within and without the organization. The proposed model is vast in scope because it strives to include variables which have been found to be significant in previous studies and builds upon past research by incorporating new insights as to how firms arrive at the adoption decision. Table 1 presents a list of factors of interest for the present paper together with selected results from analysis. The paragraphs below briefly describe the various parts of the complete model.

Figure 1 --- Adoption model

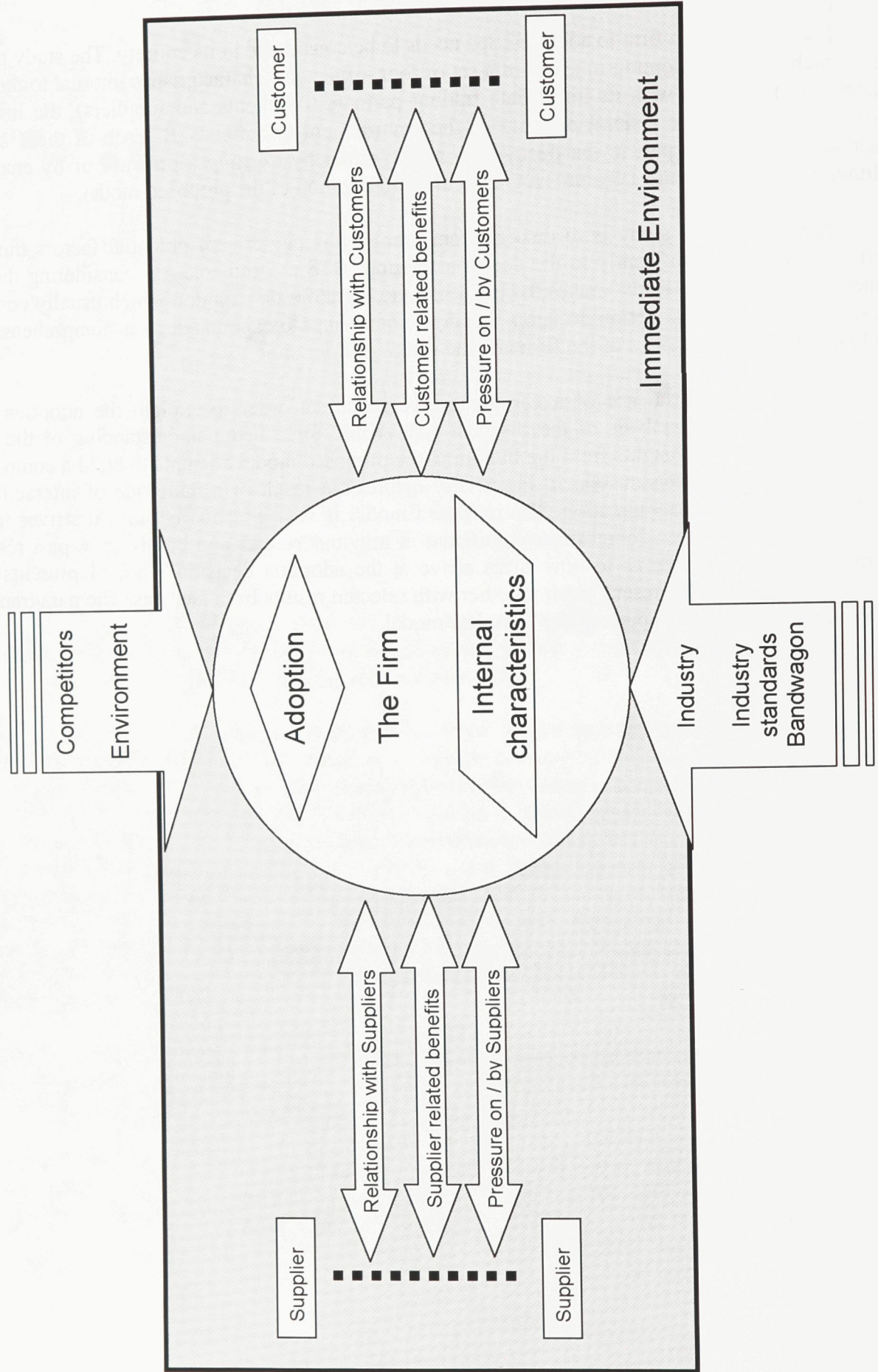


Table 1

Summary of adopter group characteristics across measured factors.

Size	Size: in general firms less than \$50M in revenue and less than 400 employees
Industry membership	Leaders: larger companies by revenue, plant size Planners: smallest businesses
Age	Followers: slightly smaller than laggards by revenue, plant size Average age is 25.
E-commerce experience	Leaders are more mature, have more experience in e-commerce Followers: similar e-commerce experience to Leaders
Market size	Leaders and Laggards: more customers than Followers Leaders and Followers: less than 5 products in general Laggards: often more than 5 products
Export statistics	Most export to US only Laggards: import from more than 2 countries, and more than 2 continents, export to one or three continents Followers: import from less than 2 countries and only 1 continent, export mainly to North America
Internet visibility	Leaders and Followers: their websites are more visited Leaders: websites are often more linked-to Followers and Planners: younger internet presence
B2B fit	Leaders: B2B fits well with business/industry Laggards: more likely to adopt when others do - no bandwagon effect
Competitive attitude	Leaders and followers: - stress improved image, role of positive example in adopting - ready to accept organizational change - more likely to invest in B2B Laggards and leaders: - eager to try new technology All: - B2B systems easy to learn/operate
B2B impact perceptions	Non-adopters/Partial-adopters: Positive view of B2B – it won't disrupt current practices Laggards: B2B may not suit organizational culture, prefer to deal face to face, consider current business model satisfactory, consider B2B as expensive, tend to lack technological know-how
Leadership	Leaders: more likelihood of: champion, formal adoption plans, multidisciplinary adoption task-forces, strong management support, ROI analysis of potential benefits

Significant distinction between leaders and followers on many factors

Firm characteristics.

The model proposes that a firm's decision to adopt B2Bec is, among others, influenced by its internal characteristics. The "firm characteristics" construct describes the firm's distinctive internal features which may have an impact on the decision to adopt B2Bec. The factors which the study analyzes fall under the following headings: demographic characteristics (size, age, exporter, etc.), leadership

characteristics (presence of champion, task-forces, management support, and analysis of benefits) and the organizational ability to accept change (attitude towards technology in general, readiness to accept change required by B2B, etc.).

Inter-organizational relationships

The organization does not live in a vacuum: it is bound by commercial and non-commercial relationships which constrain it and influence its actions. The model proposes that one of the most important relationships is that between the firm and its immediate trading partners: the clients and suppliers. The nature of these relationships influences the daily operation of the firm and therefore must also influence its more important decisions such as whether to adopt B2B. Two kinds of inter-organizational influences are recognized: those resulting from the nature of the relationships and those engendered by pressures exerted in the relationship.

External drivers

The importance of the environment and the industry on the firm's decision to adopt cannot be underestimated. Industry characteristics such as the existence of an industry bandwagon effect or standards may be important factors influencing diffusion of B2B. The study measures several industry and environment related factors which may influence the decision to adopt or not. More precisely, the model asks questions regarding the fit of B2B in the industry, the existence of a bandwagon effect, and the manner in which trading partners and competitors exert influence on the adoption decision.

Other factors

In addition to the above factors, the survey also aims at understanding the reasons for which some firms have not adopted B2B. The study allows non-adopters to express their views on the subject and provide reasons for not adopting. It is hoped that this information will allow for a better characterization of non-adopter behaviour by directly examining the reasons behind their decision.

Methodology

The survey described in this study examines the adoption of B2B e-commerce among Canadian manufacturing firms. The Scottsinfo.com database was the primary data source for the survey followed by the Industry Canada STRATEGIS website and Alexa.com. A sample of 2500 potential respondents was selected at random from the Scottsinfo.com database of companies and was composed manufacturers featuring more than 20 employees and an email address. The surveys were administered to selected company executives based on data provided by Scottsinfo.com. This paper presents a preliminary analysis based on a first batch of 70 usable responses. All questions in the survey were measured on a 7-point scale.

The dependent variable

As in other adoption studies, the dependent variable measures the state or level of adoption of B2B e-commerce technologies in a particular firm. The study uses a 5 level scale to identify the sophistication of B2B adoption within an organization, a methodology which is consistent with the literature (Teo *et al*, 2006). Table 2 displays the breakdown of respondents across the 5 adopter group categories. Respondents describe themselves mostly as either non-adopters or partial-adopters of B2B e-commerce; there are also a small number of respondents (8) who are planning to adopt B2B and 2 are already testing the technology. It is also important to note the presence of respondents who say that they have fully implemented B2B. For the purpose of analysis, respondents are usually clustered into three

groups: leaders, followers and laggards, composed, respectively of full-adopters, partial-adopters and non-adopters. The “testing” category was mostly dropped from analysis, and, the “planner” category will be discussed in the text as need arises.

Table 2

The dependent variable – response counts across adopter groups

	Non Adopter	Planning to Adopt	Pilot Testing	Partial Adopter	Full Adopter
Count	26	8	2	22	8
Largest sales rank	8 (\$5-10M)	5 (\$1-5M)	---	9 (\$1-5M)	4 (\$10-25M)
Employment	77	140 (!)	---	41	73
Plant size sq.ft.	49,836	21,940	---	33,834	43,166
N. customers (mean)	302	355	---	263	1047
N. suppliers (mean)	83	132	---	70	181
WWW link-in count	8	---	---	16	67

Demographic information

The corporations responding to the survey can be identified as SMEs --- generally speaking, the firms have less than 400 employees and less than 50\$ million in revenues. There appears to be little difference on revenue between partial and non-adopter groups. Cautious interpretation of the data, however, leads one to believe that the partial-adopter group is composed of slightly smaller companies than the non-adopter group; leaders in adoption (full adopters), however, appear to be larger (Table 2 presents the count of companies in the most populous sales rank for the given adopter groups together with the corresponding sales range). Companies planning adoption, mostly belong to the first size group (smallest companies), those with less than \$5M in revenue. Plant size data indicate that partial and full adopters have larger plants than non-adopters: adoption leaders have slightly larger plants than followers, but the laggards’ average plant is significantly smaller. Employment, another size indicator, shows that most companies in the sample are small companies which employ less than 150 people. There is some evidence that full-adopters may have more employees, but lack of data doesn’t allow a firm conclusion.

The average firm belongs to 3 industry groups, based on the count of NAICS industrial categories. Both, partial and non-adopters belong mostly to three industries, but there is more variation among non-adopters.

The average firm age is around 25 years of age. Full adopters have at least 5 years of e-commerce experience, while partial-adopters and planners can have less --- in both these cases however, the mass of companies has more than 5 years of experience. For full and partial adopters, the data suggests a bimodal distribution with companies having either 10 or 5 years of experience.

Full-adopters tend to have the most customers of all adopter groups, and non-adopters have numbers similar to partial adopters (planners however appear to have more than these two groups). Full adopters and planners also have the most suppliers (please see Table 2). It appears that it is therefore full adopters who have the largest number of trading-partner links, together with adoption planners.

Companies tend to have less than 5 products in the market, but partial adopters sometimes have more than 5. In contrast, around half of non-adopters sell more than 5 products. There are no distinctions (based on the few observations available) in the number of brands by adopter group.

Almost all companies in the sample are exporters and almost all export to the US. Partial-adopters export mostly to one country, the US, while half of non-adopters export to more locales (furthermore, there is also some evidence that partial adopters export to fewer US states than non-adopters). There are some important outliers in this variable with some firms exporting to more than 20 countries, but these cases are not confined to any particular adopter group. When it comes to the provenance of imports, non-adopters import from on average 2 or more countries, while full, partial and planning adopters tend to import from less than 2 countries. This distinction is further reflected in the number of continents companies export to: non-adopters export to either one or three continents, while partial-adopters export mostly to one continent: North America. Non-adopters tend to import from on average two continents, while adopters deal with one continent for most part. As an aside, no firm imports from more than 3 continents.

Data from Industry Canada, although very sparse, allows for a short characterization of export sales amounts. There appear to be no striking distinctions between partial and non-adopters when it comes to the amount of export sales: more than half of firms in these two categories sell abroad more than \$500 000 per year. There are not enough data points to allow for any conclusion on other adopter categories.

Internet traffic data was collected from the www.Alexa.com website for all respondents with websites. Based on the few data points available, full and partial adopters are found to be more visited (based on traffic rank) than other category groups. The count of web pages linking in to a given respondents' page is also a function of the level of adoption and full-adopters are the most linked-to by other sites, followed by partial adopters and non-adopters (please see Table 2).

Data also shows that partial-adopters and adoption-planners have a younger online presence than either full-adopters or non-adopters: full and non-adopters have all at least 5 years of online experience. The average number of years online is around 9, and some adopters appear to have been online forever. There appears to be no relationship between firm age, size, and the length of online presence.

Does B2B fit with your business?

The survey asked the respondents to rate the appropriateness of B2B to their business and industry. Respondents' answers provide a first sign of distinction between leaders and laggards in adoption. Leaders, tend to view B2B in a more positive light and indicate with force that B2B is an excellent fit with their business and industry. Laggards, on the other hand, indicate that they do not really see an application of B2B in their organization or industry. Partial adopters express views in between these two extremes.

Participants agree that the industry bandwagon effect is weak in the case of adoption; however a certain portion of partial and full adopters appears to have experienced it. Non-adopters indicate they would be willing to adopt if either technology became standard or if trading partners or competitors adopted it. Full-adopters on the other hand feel that they would not wait for anyone else to adopt before doing so themselves; partial adopters lag slightly behind. This suggests that full-adopters are clearly more dynamic than other groups, followed by partial-adopters. Non-adopters can clearly be labelled as laggards, in that they will not move first, but will instead wait for others to take the initial risks. Table 3 panel 1 provides descriptive statistics for these factors.

Table 3

Organizational readiness to adopt

		Non Adopter	Planning	Partial Adopter	Full Adopter
1 B2B fit with business	B2B fits with our business	3.07	3.29	4.36	6.14
	B2B fits with our industry	3.71	4.14	4.27	6.29
	Industry bandwagon present	1.50	2.14	2.43	3.57
	When becomes standard	4.14	3.63	2.64	2.83
	When trading partners adopt	4.27	4.38	3.95	2.83
	When competitors adopt	3.68	4.00	3.43	2.50
2 Competitive attitude	Gain technological advantage	4.31	4.57	4.32	4.57
	B2B will improve image	4.31	4.57	5.00	4.86
	Positive example of success	3.17	4.83	3.62	4.71
	Willing to accept org. change	4.85	5.00	5.14	6.14
	Willing to try new tech.	5.80	4.86	5.14	6.29
	Willing to invest in IT projects	4.10	3.86	4.10	4.86
	B2B is best IT investment	3.73	2.43	4.19	4.71
3 Laggard-follower perceptions	B2B will disrupt practices	2.90	3.13	3.13	
	B2B won't suit org. culture	3.78	3.63	2.25	
	Prefer business face-to-face	4.56	3.63	3.86	
	Current bus. model preferable	4.46	3.50	2.88	
	Lack of tech. know-how	3.59	3.25	2.88	
	B2B is too expensive	3.75	3.38	3.00	

Competitive attitude

Both leaders and followers agree that B2B e-commerce can help them gain competitive advantage as well as improve their image with trading partners. Laggards are less clear on these issues, and do not express a uniform opinion. More importantly, full and partial adopters stress the role of a positive example in their decision to adopt B2B and organizations which are planning to adopt, appear to have been similarly influenced as well.

Non-adopters on the other hand, even though they appear to recognize (very weakly) the competitive benefits of B2B, do not appear to have seen other organizations succeed with B2B, and thus know of no situations to which they could relate. Refer to Table 3 panel 2 for details.

All adopters appear to believe that B2B systems are relatively easy to learn, with laggards being slightly more optimistic and, when it comes to ease of use of B2B technologies, the perceptions of all classes of adopters are sensibly positive.

The survey further asked respondents on their readiness to accept the organizational changes required to implement B2B technologies. Leaders and followers demonstrate a noted readiness to accept change, as do those planning adoption. Non-adopters appear more cautious on the issue. This indicates that planners, while still in the early stages of adoption have already made their minds as to the need to implement organizational changes that are necessary for a successful adoption. Surprisingly when it comes to trying out new technologies, with which the organization is not familiar, it's the non-adopters who are more aggressive than planners or partial-adopters --- leaders, also, rate much higher on this item than others.

Queried on the willingness to commit large investments into IT projects, respondents across all groups provided lukewarm answers. Full and partial-adopters expressed more willingness to invest into B2B, and underscored their beliefs that B2B is the best investment choice over other IT projects.

Laggard-follower perceptions of B2B impact

One of the features of the survey was to enable non-adopters to explain their reasons for not-adopting B2B. A considerable number of partial and non-adopters provided answers which made possible to contrast their opinions. These responses present a very intriguing picture of the differences between these adopter groups. Table 3 panel 3 presents sample statistics for these variables.

First, neither, non-adopters, planners or partial adopters believe that B2Bec will disrupt their current practices, but non-adopters are the most convinced that it will not.

Partial adopters are the least likely to say that B2B will not suit their organizational culture --- they already have the concrete proof that it does. Other adopter groups are more cautious and believe that there is a chance B2B will not suit their firm. Non-adopters indicate a marked preference for dealing face to face with their business partners and complementing this belief, they are also content with their current business model. These two factors joined together may be powerful barriers to the adoption of B2B technologies. For partial adopters, the need to do business face-to-face is much diminished, and for planners it is even less (this may be due to their willingness to implement changes required by B2B). Partial adopters, on the other hand, are the most likely to think their current business model is not optimal.

Non-adopters are the most likely to believe that B2B is expensive and indicate that they do not have the technological sophistication needed to handle B2B technologies. This fear is less expressed by partial adopters, for whom the most crucial adoption stages may already be behind.

Leadership

The data reveals significant differences in leadership capabilities across adopter groups accompanied by a clear evolution of that behaviour in function of adoption sophistication. Companies which are the most B2B aware have significantly better leadership characteristics than others: champions tend to be more prevalent among full-adopters, next, among partial-adopters, and planners and laggards have the least likelihood of featuring a champion. A similar pattern re-emerges regarding formal B2B adoption plans and task forces dedicated to B2B adoption: leaders are more likely to have used a multidisciplinary adoption task-force than followers, etc. Management support is also seen to be increasing with adoption leadership with leading organizations sporting the highest top, and, functional management support. The same is again observed in the case of Return on Investment analysis, with leaders being the most likely to perform such an analysis prior to adoption.

These behaviour trends do not tell the whole story however --- the values of the ratings show that although recognition of the importance of leadership factors increases with adoption levels, only adoption leaders fully recognize their importance (ratings above 4, the neutral level). This strengthens the above findings: only full-adopters tend to have management practices which are truly supportive of B2B implementation and other groups do not appear to approach the adoption process with the same intensity.

While it is self-evident that laggards would not have identical capabilities to leading adopters, it is interesting to note that there appears to be a large and significant difference between leaders and followers on many variables. The last column of Table 4 shows p-values (in parentheses) for the mean differences in relevant factors between full and partial-adopters. Full adopters dominate across all leadership factors and differences between leaders and followers point to variables which are crucial for the full adoption of B2B: leaders differ with other adopters of B2B in that they have strong top and functional management

support for the project, and in that the project is guided by a strong champion who is aided by an interdisciplinary task-force.

Table 4

Leadership

	Non Adopter	Planning	Partial Adopter	Full Adopter
Presence of excellent champion	2.27	3.57	4.05	6.14 (.010)
Formal plan	1.58	2.80	3.36	4.43 (.245)
Formal adoption task-force	1.31	2.00	2.52	4.00 (.137)
Interdisciplinary task-force	1.42	2.80	3.10	5.50 (.024)
Top mgmt. recognizes potential	3.25	4.86	4.95	6.71 (.000)
Top mgmt. supports B2B plan	3.07	3.50	4.71	6.57 (.001)
Functnl mgmt recogs. Potential	3.13	3.67	4.38	6.43 (.001)
Functnl mgmt recogs. Benefits	3.25	4.17	4.33	6.43 (.001)
Comprehensive ROI analysis	2.09	1.67	2.81	3.86 (.191)
ROI analysis was easy	2.22	2.00	3.11	4.00 (.533)
Comprehensive benefit analysis	2.22	1.80	3.20	3.71 (.560)

Lastly, one must note that ROI analysis need not necessarily occur. This may be related to the absence of a need for formal adoption planning. It could be further suggested that because a champion is likely to direct a project, he does not need to conduct a formal ROI analysis since he has faith in his vision and managements' full support. Another possibility is that the adopters have been forced into adoption and have no choice in the matter. This anomaly in results necessitates further investigation.

Discussion

The most important finding in the study is the discovery of several categories of adopters of B2B technology. Three principal categories of adopters are identified: non-adopters, partial adopters and full-adopters. Non-adopters are companies with lower levels of technological sophistication, who do not see or do not believe in the need to adopt B2B e-commerce. While they do not necessarily shy away from new technologies, they are not willing to try them first, and will instead prefer to wait for them to become universally available. By their behaviour they can be labelled as laggards.

Full adopters are companies who believe that B2B is an ideal fit with both their business and industry and who are using B2B systems to their full extent. They believe that B2B is a good investment and are comfortable with new technologies. Most importantly, they have a management determined to pursue the B2B project as well as an organizational structure capable of supporting the B2B adoption process. Finally, full adopters expect high returns from the adoption of B2B.

Partial adopters represent the third major group. They are close on many factors to full adopters, but do not display the same determination and drive in pursuing adoption. In addition to these three groups, the research identified two other subgroups: companies planning to adopt and companies testing adoption. The few data points available on testers do not allow a statistical analysis. The behaviour of planners, however, is very similar to non-adopters, but distinguishes itself in some enthusiasm for adoption.

Correlation analysis of the data uncovers high, positive and significant correlation between many leadership factors: the analysis shows that the presence of a champion is highly correlated with formal

adoption planning, the presence of an interdisciplinary adoption taskforce, and both functional and top management support. Champion presence however does not appear to be related to ROI or benefits analysis. The data shows that if there is a formal plan, there is also likely to be a multidisciplinary task force for its implementation. Moreover, functional management is more likely to understand the potential of the B2B project when there is a multidisciplinary adoption task force and top management recognizes the need for B2B. There is some evidence that ROI analysis are carried out when an interdisciplinary taskforce is present but the correlation between these factors is weak (0.4). Formal benefits are however more likely to be examined when the full array of leadership is present (champion, multidisciplinary task forces, top and functional management support etc).

A factor analysis of leadership variables shows two dimensions to the data explaining 75% of the variance (see Table 5, Appendix 1). The first factor is composed of leadership variables, such as the presence of a champion, management support and the presence of a task force. The second factor represents variables which describe the level of organization of the adoption process, or more precisely, the level of formalism in the analysis of the adoption project. Factor 1 can be labelled as “management leadership” and factor two as “level of organization”. From these two factors, the first one explains 60% of variance, and the second only 15%.

Discriminant analysis of the data using the two factors found above finds that the two factors can classify 75% of adopters and non-adopters (Wilks $\lambda=0.78$). A caveat of this analysis is that it was performed only on a sample of 28 firms, due to data completeness reasons.

Further analysis of organizational variables reveals significant findings. There is a positive correlation between select technological factors and leadership variables. Firms where top management recognizes the potential of B2B and where there are interdisciplinary adoption task-forces display a better appreciation of the potential of technology: B2B is believed to be the best IT investment, and it is believed that it can both produce a competitive advantage and an improvement in the image of the firm. It is to note that the belief that B2B is the best tech investment is highly correlated with all leadership variables. Also, companies who have interdisciplinary task forces are more likely to have seen positive examples of B2B success. Significantly, the propensity of a firm to invest heavily in technology is positively related to a favourable ROI and benefits analysis.

The companies which signal that their business fits well with B2Bec and that their industry has a good degree of fit with this technology are the ones who have strong leadership. Interestingly, firms with strong leadership are also unlikely to wait for their trading partners to adopt B2B or for B2B to become industry standard (highly significant negative correlation between variables).

On a final note, perceptions of laggards and followers of B2B e-commerce yield another insight into leadership behaviour of adopting firms. There is a strong negative relationship between leadership variables and impediments to adoption displayed in Table 3 panel 3. This suggests that, as can be expected, firms with better leadership capabilities face lower adoption impediments, or are more able to overcome them as they arise. This finding emphasizes the necessity of good leadership in the B2B adoption process.

Table 5

Factor structure for leadership variables

Dimensions and Components	1	2
Presence of excellent champion	.758	.297
Formal plan	.495	.606
Formal adoption task-force	.720	.465
Interdisciplinary task-force	.775	.388
Top mgmt. recognizes potential	.901	.137
Top mgmt. supports B2B plan	.854	.123
Functnl mgmt recog. Potential	.910	.193
Functnl mgmt recog. Benefits	.896	.157
Comprehensive ROI analysis	.266	.896
ROI analysis was easy	-.037	.812
Comprehensive benefit analysis	.395	.795

Conclusion

The relatively few data points available in this study yield a surprisingly high level of detail and insight about the adoption behaviour of manufacturing firms. Two principal findings arise from the analysis of the data. First, there are multiple groups of adopters within the population of firms. These groups have different characteristics, but their characteristics lie on a continuum between those of non-adopters and full-adopters of B2B e-commerce.

The second finding is that the most important organizational characteristic when it comes to B2B adoption is leadership. Leadership has multiple aspects, be it management understanding or the presence of a champion, but is characterized by a coherent and well organized engagement towards the success of the B2B project. Leadership is also the most important factor in explaining adoption.

In order to explain adoption, and distinguish adopters from non-adopters, it is found that the leadership variable plays a significant role. Leadership in the adoption project, together with formal organization is able to correctly classify 75% of adopters and non-adopters of B2B e-commerce. It is suggested therefore that leadership factors, because they are active and not static descriptors of the firm are the most important organizational characteristics when it comes to differentiating between adopters and non-adopters of B2B e-commerce.

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