Examining the Impacts of Relevant Contextual Influences on the Extent of Use of E-business Technologies: Perspectives from Atlantic Canada’s SMEs

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Abstract— The spread of internet and e-business technologies (IEBT) globally is attracting the attention of both practitioners and researchers. Needless to say, IEBT have enabled businesses (both large and small) to improve their reach and enhance productivity. The literature has shown that the acceptance of such technologies lags behind in small- and medium-sized enterprises (SMEs). This present study is designed to enrich our knowledge with regard to the impacts of relevant contextual factors on extent of IEBT use among SMEs. For illustrative purposes, this study uses a survey to sample opinions in one region of Canada. The contextual factors considered in the study include management support, technology characteristics, pressures from sources external to the business, and government support. These are among the cited factors that influence the acceptance of IEBT and e-business in SMEs. A research model was developed, and relevant hypotheses tested. Data analysis was performed using the partial least squares (PLS) approach. The results revealed that aforementioned factors positively impact the extent of IEBT use in participating SMEs. The implications of the findings for research and practice are discussed.

Keywords - management support, technology characteristics, competition, suppliers’ pressures, customers’ pressures, government support, e-business technology, the Internet; Canada

I. INTRODUCTION

Both small and large businesses around the world continue to appreciate the relevance and usefulness of e-business initiatives in their operations [2, 7-11, 13, 35-37, 44]. Accordingly, information systems (IS) researchers have paid attention to the factors affecting the adoption and use of internet and e-business technologies (IEBT) in organizations [1, 34, 40-45]. IEBT enable business businesses to create a web presence, reduce operational costs, and improve capabilities, among other objectives [1, 4, 36]. The phrase “Internet and e-business technologies” has been borrowed from a study conducted by Davis and Vladica [7] in the same region as this study’s, wherein technologies such as email, the Internet, and websites were used as examples.

IEBT are related, useful technologies for e-commerce and e-business engagements, and in fact Sadowski et al. [35, p.76] note that “in establishing a new connection to the Internet, new users are required to adopt a series of related new technologies.” Emphasis in the extant IS literature tends to be focused on the adoption patterns and barriers to adoption of IEBT by SMEs [8, 19, 20, 24, 44]. Very little has been written about how such technologies have helped to improve small business operations. The paucity of research in this area is the motivation for this study. This study’s focus will be on the determinants of extent of IEBT use in Canadian SMEs. For the purposes of this research, extent of use refers to the degree to which such technologies have enabled business transactions as well as their frequency of use in adopting organizations.

Gibbs and Kraemer [9] suggest that the diffusion of internet and e-business technologies among business organizations is an uneven process. Studies and reports show that factors influencing the use of internet and e-business technologies vary by enterprise size and location [4, 30, 31]. That is, businesses in some countries tend to do better than others with regard to their use and adoption of IEBT. Also, larger businesses appear to have more favorable indicators in this arena [6, 9, 10, 42]. The focus of this study will not be on cross-country and cross-enterprise analyses, as others have already published such themes (e.g. [6, 9, 13, 30, 45]). Rather, the focus of this research will be on factors influencing the extent of IEBT use in SMEs based in one country, Canada. This approach is important for two reasons. First, it is appropriate to pay attention to SMEs, given the universal knowledge that they serve as engines for employment generation and national economic growth [6, 30]. Statistics Canada [39] generally defines SMEs as firms with fewer than 500 employees. According to the Net Impact Study Canada [30, p.2], “Canadian SMEs deliver 60% of Canada’s economic output, generate 80% of national employment and 85% of new jobs.”

Recognizing the differences existing between small and large businesses with respect to how each accepts technological innovations; researchers tend to distinguish realities in both worlds [17, 43]. To ensure constituency, larger firms are excluded from this study. The literature indeed suggests that SMEs differ from larger enterprises in their IEBT adoption patterns [6, 28]. Furthermore, the Net Impact Study Canada [31, p.1] sounded a note of caution to policy makers and industry leaders in Canada by stating that: “a lukewarm SME response to IBS [Internet business solutions] adoption may weaken any national strategy to bolster Canada’s international
competitiveness.” Arguably, much can be achieved by focusing attention on the uneven pattern of IEBT acceptance in small-sized organizations in Canada. A study of contextual influences on IEBT use could shed more light in the area.

To date, only a few studies have surveyed the use and adoption of IEBT in Canadian enterprises. Lefebvre et al. [22] examined the dynamics of e-commerce adoption in manufacturing SMEs in Canada. They found the pattern of adoption was evolutionary in nature. Chwelos et al. [5] investigated the intent to adopt such technologies by Canadian firms; however, their efforts may be dated. Noce and Peters [32] examined barriers to e-commerce adoption in SMEs based in Canada. Others have investigated the business value of ICT products in SMEs [25]. Davis and Vlada [7] reported findings on the distribution and use of internet technologies and e-business solutions in Atlantic Canada. Suffice it to say that an understanding of the determinants of IEBT use in Canadian SMEs will benefit policy makers, practitioners, and researchers. Practitioners may benefit from knowing which factors to pay more attention to (at least, those considered in this research) as they use their IEBT. Useful insights related to IEBT use in SMEs are also offered to the research community. In fact, other researchers have started to investigate areas similar to this study’s topic. For example, Chong and Pervan [2] examined factors influencing the extent of deployment of electronic commerce among Australian SMEs. Chuang et al. [4] focused on impacts of such factors as organizational characteristics on the extent of e-commerce adoption in SMEs. Studies of this nature add diversity to the body of knowledge in this area.

Data for this study was collected from Atlantic Canada for practical reasons. Due to the limited resources available for this study, it would be impossible to sample views on the research’s topic across the country. Rather, a region of the country, Atlantic Canada, which apparently lags behind the rest of the country on a variety of issues including the use of the Internet for business and commerce [16] was chosen for illustrative purposes. This study draws on the Contingency Theory [21] and Roger’s diffusion of innovations theory [35]. The remainder of this paper is structured as follows: Section Two provides a review of the relevant literature. The hypotheses are formulated in Section Three. In Section Four we describe the research methodology, and Section Five presents the data analysis. The paper presents its discussions and conclusion in Section Six.

II. LITERATURE REVIEW

This study employs two theatrical frameworks: a) the contingency theory and b) the diffusion of innovations theory. In general, the contingency theory [21] posits that contextual factors and variables – internal or external – do influence organizational effectiveness. The diffusion of innovations theory [35] postulates that technological innovations can be understood through the characteristics of the technology or users’ perceptions of it. Admittedly, several factors can be used to delineate technological context; however, this study will only operationalize two of such factors i.e. Relative Advantage and Compatibility, which Chong and Pervan [2] found to be critical in enhancing the extent of deployment of e-commerce for SMEs.

Further, other relevant contextual factors that have been considered in the literature include management support [4, 15, 28, 43, 46], government support [5, 19, 20, 41, 44], and pressures from competitors, suppliers, and customers [2, 26, 38]. Research found management support to be positively related to the adoption of the Internet in small firms [4, 28]. Scupola [37] found that government support and intervention, technological characteristics, including relative advantage and compatibility are critical for the diffusion of e-business [42]. Others [e.g. 18-20, 41] have also indicated that government support is critically needed as small businesses adopt technological innovations.

Modern businesses are pursuing more and more intensive and interactive relationships with their customers, partners, and suppliers [26, 34, 38]. The use of IEBT has enabled businesses and their partners to enhance commercial transactions and relationships [2]. Even when a business entity is not ready to adopt IS, the pressures exerted by its customers, competition, and suppliers have compelled it act differently [34]. Chong and Pervan [2] found competitive pressure significantly influenced the extent of e-commerce deployment by SMEs in Australia. Based on the foregoing theoretical underpinnings and insights, the study’s research framework (Figure 1) is proposed. Relevant hypotheses from the paths are formulated and tested using a Structural Equation Modeling (SEM) technique [3]. It is hoped that the research conceptualization will add to the growing body of knowledge in this area of study.

![Figure 1. The research model](image-url)

III. HYPOTHESIS FORMULATION

Before Management support refers to the extent to which top executives in the SME provide direction, vision, authority, and resources for IEBT initiatives. Conventional wisdom suggests that when top managers support an IS project publicly, other organizational members usually interpret such moves positively and act accordingly [43, 46]. Studies have shown that where management support exists, the adoption and acceptance of technologies tend to be high compared to where such support was lacking [4, 15, 28, 43]. When top managers in SMEs understand the importance of computer technology, they tend to play a crucial role in influencing other organizational members and committing resources to the adoption of such technologies [15, 46]. Conversely, where management support is low or unavailable, it is logical to expect that the extent of use will be low. Thus, it is predicted that:
**H1:** The greater the management support for IEBT adoption, the more likely the extent of use of such technologies will be for adopting SMEs.

Technology characteristics affect both the acceptance as well as the extent to which technological innovations are used [4, 35]. As indicated above, this construct can be discussed from a variety of approaches. For simplicity purposes, this study will consider two sub-items: Relative advantage and Compatibility. Relative Advantage refers to the perceived benefits of IEBT relative to existing practices and systems. It is reasonable to suggest that the extent of IEBT use in SMEs will be higher where the impacts of such technologies are seen to have some advantages and benefits over existing systems. Chong and Pervan [2] found that Relative Advantage is significantly related to the extent of deployment of e-commerce in SMEs. Compatibility refers to how well IEBT fits the processes and operations of the adopting SME. In fact, the study by Tan and Teo [40] showed that internet (and related technologies) diffuses more freely where such applications appear to match the adopter’s business processes. It is hypothesized that:

**H2:** The characteristics of IEBT will positively impact the extent of use of such technologies in SMEs.

Modern businesses are pursuing more and more intensive and interactive relationships with their customers, partners, and suppliers using technologies [11, 26, 34, 36, 38]. Raymond [34] comments that the use of IEBT has enabled businesses and their partners to enhance commercial transactions and relationships. Grover and Malhotra [11] assert that internet technologies have become pervasive in the co-ordination and integration of business partners. Similarly, businesses including SMEs respond to competitive pressures by adopting IEBT and related technologies. More importantly, Chong and Pervan [2] found competitive pressure significantly influenced the extent of e-commerce deployment by SMEs in Australia. The foregoing discussion permits the development of the next hypothesis.

**H3:** The greater the pressure to adopt and use IEBT from external sources, the more likely the extent of such technologies’ use will be for adopting SMEs.

Government support encompasses the various assistance that SMEs receive from the authority when accepting or integrating technologies use in their operations. In general, it has been shown that government support, encouragement and intervention are vitally important to business when contemplating IT systems acceptance [17, 18]. With regard to e-business adoption, researchers [18, 44] have provided empirical evidence related to the pertinence of government support in the discourse of technologies acceptance by SMEs. Wolfe [44] highlights regarding government support for e-business in Canada’s businesses. Martin and Milway [25] wrote about the nexus between small business’ acceptance of IS and government encouragement. The recognition is that the acceptance (and the extent of use) of relevant technologies appear to be positively impacted where government support and encouragement is available. Accordingly, it is hypothesized that:

**H4:** Government support for IEBT adoption will be positively impact the extent of use of IEBT in adopting SMEs.

### IV. Research Methodology

This study sampled SMEs generated from telephone directories in the four Atlantic Provinces: Nova Scotia, Newfoundland and Labrador, Prince Edward Island, and New Brunswick. Two research assistants used the stratified sampling method to select participating SMEs from across such industries as auto dealerships, insurance, manufacturing, retail, and so forth. Organizational informants including owners and presidents were contacted. Each received a packet consisting of a cover letter, a questionnaire, and a self-addressed, stamped envelope. In all, one thousand and eight hundred (1800) questionnaires were mailed in November, 2007 and responses were collected until February, 2008.

Participation in the study was voluntary. Respondents were assured that their individual responses would be treated as confidential. A part of the questionnaire is provided (see Appendix). To ensure data validity and reliability, sixteen knowledgeable individuals (four faculty members, two top managers from local SMEs, and ten university students) completed the initial draft of the questionnaire. Comments received from this group improved the quality of the questionnaire mailed to participants. The majority of the measures used were taken from previously validated sources (e.g. [4, 10, 15, 40, 46]) and were anchored on a six-point Likert scale, ranging from Strongly Disagree (1) to Strongly Agree (6). Participants were asked to indicate an appropriate choice. This study did not employ Use (Usage) as its main construct as the utilization of this measure has come under criticism (see Legris et al. [23] for more detailed information). The Appendix shows items included in the questionnaire, and their reliability scores. The Cronbach alpha for each dimension is above the 0.7 limit recommended by Nunnally [33] indicating reasonably high reliability of the research measures and constructs.

A total of 174 responses were received, of which, 162 were considered valid. The excluded twelve (12) responses were either not filled out properly or had a high number of missing entries. From the number sent out, 121 questionnaires were returned as undeliverable due to changed or incomplete addresses. Thus, the effective response rate for the survey is 10.4%, which is good for a study of this nature. The participants’ average work experience was 13.4 years. About sixty (60%) of the participants were males. 70% of the respondents have college/university qualification. The median range for the annual revenue of the participating SMEs is between $500,000 and $ 1 million (Canadian dollar). The workforce ranged from 1 to 500 employees, with a median of 5 employees.

### V. Data Analysis

A structural equation modeling (SEM) technique i.e., PLS (Partial Least Squares) was used for data analysis. SEM has two main approaches: PLS and covariance-based SEM. The PLS approach was chosen for its capability to deal with small-sized samples and its suitability for theory testing [3]. Furthermore, PLS recognizes two components of a model: the
measurement model and the structural model. The measurement model consists of relationships among the factors of interest (the observed variables) and the measures underlying each construct. PLS demonstrates the construct validity of the research instrument (i.e. how well the instrument measures what it purports to measure). The two main dimensions are the convergent validity and the discriminant validity. The convergent validity (also known as the composite reliability) assesses the extent to which items on a scale are theoretically related. On the other hand, the structural model provides information on how well the hypothesized relationships predict the theoretical model. The R2 indicates the percentage of a construct’s variance in the model, while the path coefficients (β) indicate the strength of relationships among constructs [3].

A. Assessing the Measurement Model

PLS Graph 3.0 computed the composite reliability (convergent validity) of each construct and also showed the item loadings (see the Appendix). Item loadings and composite reliabilities greater than 0.6 and 0.7, respectively are considered adequate for an exploratory study such as this one [12]. The inter-correlations among the constructs indicate that the constructs are distinct and unidimensional (omitted here due to space limitations).

B. Assessing the Structural Model

Chin [3] notes that both the β and the R² are sufficient for analysis and β values between 0.20 and 0.30 are adequate for meaningful interpretations. The paths’ coefficients (β) and the R² were generated by PLS Graph 3.0 and are shown in Figure 3. The R² of 0.32 is adequate for an exploratory study of this nature. It suggests that the contingency factors explained 32% of the variance in the extent of IEBT use construct.

Hypothesis H2, which states that IEBT’s characteristics will positively impact the extent of use of such technologies in SMEs, is also strongly supported. This finding lends credence to observations and results in the literature suggesting that the acceptance of e-business technologies is enhanced when SMEs see the relative advantage of such technologies [42]. Furthermore, the compatibility of such applications to business operations augurs well for adoption and use [27, 37, 40, 41, 42]. The data analysis provides a support for hypothesis (H3), which states that the greater the pressure to adopt and use IEBT from external sources, the more likely the extent of such technologies’ use will be for adopting SMEs. In the context of this present study, it is easy to notice that this particular factor is the most important of the independent variables in the research conceptualization. Hypothesis H4 (Government support for IEBT adoption will be positively related to the extent of use of such technologies in adopting SMEs) is moderately supported. As this construct yields the least significant result in the analysis, it is not out of line to postulate that SMEs wishing to improve the extent of use of their IEBT need to view this item in the same light as technological characteristics, management support, and pressures from outside the boundary of the organization.

The findings of this study have implications for both research and practice. First, the research highlights the relevance of contextual factors in the study of IEBT use in SMEs. Second, the study brings to the forefront the assessment of extent of use of technological innovations instead of the putative Use (Usage), which has been criticized [23]. Similar efforts in the future may benefit from this endeavor. Third, the findings confirm the relevance of technological characteristics, pressures from external sources, management support, and to some degree, government support on extent of IEBT use and acceptance. Fourth, the study’s findings lend credence to findings on the determinants of IEBT use and success in SMEs [e.g., 1, 4, 6, 9, 27, 28, 34, 41].

Fifth, managers and owners of SMEs in the Maritime region are provided with information as to the nature of the importance of technological and environmental contexts in influencing the extent of IEBT use in their particular context. In this regard, the data analyses indicated that the extent of IEBT use by SMEs in the region is most likely influenced by pressures from sources external to the business, i.e. competitors, partners, and competition. In the same vein, support from the government, we found is the least relevant contextual factors that could increase the use of IEBT among SME based in the region. Sixth, policy makers in Canada may benefit from this study’s findings as efforts are geared towards increasing the adoption and use of IEBT in the country. The implication of the study’s main finding is that IEBT use in SMEs can be accelerated through business-to-business and client-to-business incentives. Policy making may benefit from this insight.

In addition to the study’s positive outcomes, there are also inherent limitations to it. Personal bias may have been an issue, as only the views of a single respondent were used per firm. The measures for some of the constructs could be improved. This study presents the viewpoint of SMEs in Atlantic Canada; it is difficult to say whether the findings can be replicated in

VI. DISCUSSIONS AND CONCLUSION

The objective of this study was to examine the influence of contextual factors on the extent of use of IEBT by SMEs based in the Maritime region of Canada. For the most part, the findings of the study strongly support the hypothesized relationships in the research model. As predicted, hypothesis H1, which states that the greater the management support for IEBT adoption, the more likely the extent of use of such technologies will be for adopting SMEs, is strongly supported. This finding is consistent with comparable studies in the literature [10, 28, 41, 46].
other regions of the country. The research did not control for the types of internet/e-business technologies in use by the SMEs. The study lumped together the various internet/e-business technologies such as email, website ownership, the Internet, and so forth. It is possible that by not distinguishing between technologies in the study, findings may have been amplified or downplayed. The $R^2$ obtained in this study suggests that other factors could be added to research model to increase insight. There are also concerns about common method variance in this study. Managerial support scores highly in the empirical test, perhaps due to the fact that most respondents were senior organization members or players.

Studies in the future could investigate the views of lower level workers in SMEs. Future studies examining a similar theme could incorporate the impact of relevant inter- and intra-organizational factors, including organizational readiness and competence. Lastly, this present study could be replicated in other Canadian regions. When results from such endeavors begin to emerge, will we be able understand why Canadian businesses, especially smaller ones, appear to lag behind in accepting IEBT. Additionally, studies are needed to affirm or reject the findings of this study. The acceptance of e-business technologies in both large and SMEs could be compared. Cross-national comparative studies in this area are expected.

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Appendix: The measures in the questionnaires and their reliability scores

<table>
<thead>
<tr>
<th>TECHNOLGY CHARACTERISTICS</th>
<th>Item loading</th>
<th>Cronbach alpha</th>
<th>Composite reliability</th>
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<tbody>
<tr>
<td><strong>Relative Advantage</strong></td>
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<tr>
<td>Internet/e-business technologies allow our firm to manage its operations efficiently. 0.7968</td>
<td>0.934</td>
<td>0.788</td>
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<tr>
<td>Internet/e-business technologies improve the quality of our operations. 0.6728</td>
<td>0.7895</td>
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<tr>
<td>Internet/e-business technologies enhance the effectiveness of our firm’s operations.</td>
<td>0.7043</td>
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<tr>
<td><strong>Compatibility</strong></td>
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<tr>
<td>Use of internet/e-business technologies is compatible with all aspects of our business operations. 0.7352</td>
<td>0.901</td>
<td>0.813</td>
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<tr>
<td>Use of internet/e-business technologies is completely compatible with our current business operations. 0.7400</td>
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<tr>
<td><strong>MANAGEMENT SUPPORT</strong></td>
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<td>Management is interested in the use of internet/e-business technologies in our operations. 0.7210</td>
<td>0.943</td>
<td>0.819</td>
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<tr>
<td>Management is supportive of the use of internet/e-business technologies in our operations. 0.7783</td>
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<td>Our business has a clear vision regarding the use of internet/e-business technologies. 0.7249</td>
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<td>Management communicates the need for internet/e-business technologies usage in the firm. 0.6998</td>
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<tr>
<td><strong>PRESSURES FROM EXTERNAL SOURCES</strong></td>
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<td>Our firm is under pressure from competitors to adopt internet/e-business technologies. 0.6516</td>
<td>0.879</td>
<td>0.827</td>
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<tr>
<td>Some of our competitors have already started using internet/e-business technologies. 0.7261</td>
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<tr>
<td>We know our customers are ready to do business over the Internet. 0.7140</td>
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<td>Our firm is under pressure from customers to adopt internet/e-business technologies. 0.7477</td>
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<tr>
<td>We know our suppliers and partners are ready to do business over the Internet. 0.7576</td>
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<tr>
<td>Our firm is under pressure from suppliers and partners to adopt IEBT. 0.6483</td>
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<td><strong>EXTENT OF USE IEBT (internet and e-business technologies) use</strong></td>
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<tr>
<td>Our company makes use of IEBT, very often. 0.7669</td>
<td>0.823</td>
<td>0.778</td>
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<tr>
<td>Our company uses IEB e-commerce/e-payment, at all times, for its transactions 0.7073</td>
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<tr>
<td>Our company uses IEB its critical operations 0.6859</td>
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<tr>
<td>The number of business operations and activities in my company that requires IEBT is high 0.7736</td>
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