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E-Commerce Infrastructure Success Factors for Small Companies in Developing Economies

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Abstract

This paper looks into the key infrastructure factors affecting the success of small companies in developing economies that are establishing B2B e-commerce ventures. The factors were identified through a literature review and a pilot study carried out in two organizations. The results of the pilot study and literature review reveal five factors that contribute to the success of B2B e-commerce. These factors were later assessed for importance using a survey. The outcome of our analysis reveals that workers' skills, client interface, and technical infrastructure are the most important factors to the success of a B2B e-commerce relationship.

Keywords: e-commerce, developing countries, success factors, SMEs, B2B, B2C, infrastructure

1. Introduction

Information and Communication Technology, ICT, can provide a small enterprise an opportunity to conduct business anywhere. Use of the Internet allows small businesses to project virtual storefronts to the world as well as conduct business with other organizations. Heeks and Duncombe [23] discuss how IT can be used in developing countries to build businesses. Domaracki [16] discusses how the technology gap between small and large businesses is closing and evening the playing field, making B2B and B2C e-commerce available to any business with access to computers, web browsers, and telecommunication links. This paper discusses how small startup companies can use ICT to establish e-commerce applications within developing economies where the infrastructure is not classified as "high-technology."

E-commerce is the process of buying, selling, or exchanging products, services, and information using computer networks including the Internet [Turban et al., 42]. Kalakota and Whinston [27] define e-commerce using the perspectives of network communications, automated business processes, automated services, and online buying and selling. Turban et al. [42] add perspectives on collaboration and community. Deise et al. [14] describe the

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e-selling process as enabling customers through e-browsing (catalogues, what we have), e-buying (ordering, processing, invoicing, cost determination, etc.), and e-customer service (contact, etc.). Partial e-commerce occurs when the process is not totally using networks. B2C e-commerce is the electronic sale of goods, services, and content to individuals [Noyce, 33; Turban et al., 42]. B2B e-commerce is a transaction conducted electronically between businesses over the Internet, extranets, intranets, or private networks. Such transactions may be conducted between a business and its supply chain members, as well as between a business and any other business. A business refers to any organization, public or private, for profit or nonprofit [Turban et al., 42, p. 217; Noyce, 33; Palvia and Vemuri, 35]. Initially, B2B was used almost exclusively by large organizations to buy and sell industrial outputs and/or inputs. More recently B2B has expanded to small and medium sized enterprises, SMEs, who can buy and/or sell products/services directly [Mayer-Guell, 29]. B2B transactions tend to be larger in value, more complex, and longer term when compared to B2C transactions with the average B2B transaction being worth $75,000.00 while the average B2C transaction is worth $75.00 [Freeman, 18]. Typical B2B transactions involve order management, credit management and the establishment of trade terms, product delivery and billing, invoice approval, payment, and the management of information for the entire process [Domaracki, 16]. Noyce [33] discusses collaboration as the underlying principle for B2B. The companies chosen as mini-cases for this study meet the basic definition of B2B as both are selling services over the Internet to other business organizations. Additionally, both provide quotes and the ability to negotiate pricing over the Internet and both are attempting to establish relationships with their buyers.

This paper proposes a set of five infrastructure success factors for SMEs that are starting e-commerce ventures. Tetteh and Burn [41] define SMEs as firms with less than 500 employees. This is further broken down into micro companies, those with less than 5 employees, small companies, those with from 5 to 20 employees, and medium companies, those between 20 and 500 employees. Infrastructure is the underlying foundation of networks, hardware, software, skills, processes, and resources that must exist before an organization can build e-commerce applications. Infrastructure may be internal and/or external to the organization.

These factors were determined through detailed study of two successful startup SMEs and a review of the literature. Inhibitors and obstacles to success are used to identify what is needed for infrastructure to support successful implementation of e-commerce ventures. Literature pertaining to developing countries was used to ensure the infrastructure success factors are relevant to conditions in those countries.

The paper first presents the literature review used to build the research model. The model is then presented followed by the methodology and the case studies used to generate the research model of infrastructure success factors and their attributes. This is followed by the results of the survey used to determine the importance of the attributes of these factors. The paper concludes with discussions on conclusions, limitations on the research, and future areas of research.

2. Literature review

2.1. Success factors for e-commerce

Several studies have been done looking at success factors, issues, and requirements for e-commerce. Palvia and Vemuri [35] discuss obstacles and critical success factors for global e-commerce. Obstacles include e-tailers not shipping overseas due to complexities and issues with customs, tariffs, currency exchange, and shipping. Other key obstacles include a lack of trust between transacting parties, lack of access to computers and the Internet, and limited electronic payment capability. They list as critical success factors the ability to maintain a personal touch while using a web site for business; localizing the web site to fit local customer requirements including recognizing culture, local regulations, pricing constraints, and language; keeping automated processes simple and fast due to low attention spans of customers and less reliable connections in developing countries; foster trusting relationships between customers or organizations involved in a B2B relationship; focus on processes that improve convenience, information, intermediation, and pricing; have the site found near the top of the search engine results; evolve the site as technology changes and capabilities expand, and plan for mobile connectivity. Sairamesh et al. [38] also discuss the importance of search and navigation but focuses on these features within the e-commerce site.

Gattiker, Perlusz, and Bohmann [19] discuss the importance of economic and cultural factors. Global economic factors include the cost of connecting and having disposable income for shopping online. Global cultural factors include differences in work habits and language. It has been found that simply translating documents does not ensure the translation will contain the same cultural meaning as the original. Hall [20] expands on cultural issues by discussing the importance of localization. Kang and Corbitt [28] discuss cultural issues with respect to the use of graphics and graphical components. Finally, Mayer-Guell [29] discusses the importance of organizational culture of the organization implementing an e-commerce strategy and finds that e-commerce initiatives will not reach their full potential if the organization's workers cannot adapt to the changes in processes caused by e-commerce.

Sairamesh et al. [38] discuss the importance of contracts. Freeman [18] discusses contract and other legal risks including intellectual property protection, conflict and dispute resolution, fulfillment of contracts, use of patented business processes, and trademark and copyright issues. The success factor from these risks is having legal consultation available for review of documents, processes, and contracts.

Castelluccio [8] lists fourteen critical success factors. These are having adequate business processes, maintaining account information and a relationship profile, good site navigation, good use of graphics, providing decision support and communications, using shopping cart technology, monitoring post purchase delivery, acquiring and retaining customers, providing gift services, maintaining site content and continuity, providing international services and multi-channel integration. Additionally, Castelluccio [8] found several issues that detracted from success. These included dead links on sites, inaccessible call/help centers,

deceptive post-purchase spam, sites not living up to promise, and lack of convenience for potential customers who do not yet have an account.

Developing strategies to adopt and market e-business technologies and services requires an organization to make significant investments. Deciding to make the initial and ongoing investments are contingent on the organization's perception that the future benefits will outweigh the costs involved. Mitra and Chaya [30] propose that there is a need to quantify the benefits from the investments in e-business systems and that building quality e-business systems will require solid evidence of value-add to customers. The added value for customers will result in additional profit for the organization, as they are able to maintain current customer relationships and develop new ones based on the attractive offerings a new e-business presence affords.

2.2. *E-business for small companies*

Developing an e-business niche will allow an SME to provide the best possible deliverable to the customer, even if this means passing part of the deal to a competitor who specializes in another aspect of the e-business system. Bakos [4] found that ultimately all e-business systems reduce buyers' search costs and increase the efficiency of e-commerce transactions, and therefore create numerous possibilities for the strategic uses of these systems. Operating within an e-business framework offers a more cost-effective model, with feasible elimination of several steps of the traditional sales process. Powell and Dent-Micallef [36] identified an emerging trend from single-source sales channels to electronic markets, lowering coordination costs for producers and retailers and resulting in fewer distribution costs. Smaller businesses ultimately benefit from lowered sales costs and gain access to larger markets. Executives are "sold" on technology spending based upon the strategic value-add nature of the opportunities. Given an adequate availability of talent for development of e-business systems, as reported later in this paper, we feel that it is imperative for e-business applications to have strong consideration in SMEs.

Amoroso and Sutton [3] found that small organizations need to focus on providing their customers with a set of Web applications that best serve the customer, rather than using a hit-and-miss approach. They found evidence to support that the greater the degree of clarity of e-business service offerings, the more the need to have these Web-based applications developed by partner firms. The decision to outsource e-business applications is crucial to building a quality Internet presence, especially important in smaller organizations. Organizations that focus on key online applications will have a greater degree of success. These applications will need to be planned in advance in order to yield bottom-line value added results. The e-business applications found to have the greatest impact on small organization success are presented in Table 1. With the many e-business applications available to development and the careful discretion of resource allocation, these applications were found to be the most beneficial for generating downstream revenues and cost reduction for small businesses. Due to the span of components in an e-business system, many organizations find difficulty in fulfilling all customers' needs; therefore a focused strategic planning session around value-add will yield IT investment successes [Brynjolfsson and

Table 1. Value-added e-business applications/services

Applications	Percent	Services	Percent
Electronic catalogs	71.4	e-database integration	57.1
Workflow systems	71.4	Web monitoring	57.1
Online customer service	71.4	Supply chain automation	42.9
Order management	57.1	Online communities	42.9
Electronic billing systems	42.9	Sales force automation	42.9
Online auctions	28.6	Electronic marketplaces	28.6
B2B exchanges	28.6	XML solutions	28.6

Hitt, 6]. There is a strong degree of focus on e-business e-catalogs, workflow systems, and online customer services, given the data presented in Table 1.

The authors examined the factors that would lead to the success of small organization's e-business applications. Clearly, several mega-categories of e-business success factors emerged including: (1) understanding the customer base needs, (2) support of substantial e-business initiatives in an ongoing basis, (3) developing e-business applications using a proven development methodology, (4) branding the Web sites for competitive advantage, and (5) reshaping the organization's corporate culture [Amoroso, 1]. How the organization manages the knowledge gathering process for their customer base will have strong impacts on their ability to meet their needs and their needs for specific Web site features, such as multi-lingual support, click-through capabilities, and customer profiling. The degree of Internet application maturity will determine the way that customers interact with the Web sites and how integrated the applications will support customer-side requests. The development of small organization applications will depend upon acquiring development methodologies that extent the company's technical talent and enable the company to successfully manage the e-business projects. Having a set of strong e-business applications to deliver to company customers via the Web will not be successful if they are not accessible to the customer base, thus facilitating the need for strong product branding efforts. Finally, the corporate culture will need to support conducting business in a new way given new e-business initiatives and ultimately new corporate processes for promoting and delivering products and services.

Amoroso [1] found a set of corporate performance factors that small organizations need to consider and eventually quantify with respect to e-business initiatives. E-business initiatives, like other corporate investments, will need to provide the needed payback to the organizational bottom-line. Clearly, e-business applications have been found to have a greater emphasis on speed-to-market than traditional IT applications [Hart and Saunders, 21]. Corporate performance factors found in previous research found: (1) customer-focused factors, (2) corporate-financial factors, and (3) business process factors.

Corporate-focused factors include those attributes of success that enhance a customer's attraction to conduct e-business with the organization, a customer's retention to conduct business in the future, and a customer's satisfaction with current e-business products and services. Corporate-financial factors include those factors related to the incremental revenue growth provided by e-business applications, lower cost of sales to conduct business on the Internet, a tighter degree of cost control, and potentially increased market share due

to e-business. Business process factors are related to streamlining organizational processes and decreased cycle time [Amoroso, 1].

Turban et al. [42] discuss critical success factors for SMEs. Included in their SME Critical Success Factors: providing niche or specialty or information products, focusing on localized markets, having a low capital investment, maintaining little to no inventory, using secure electronic payments (when using electronic payments) and flexible payment methods, having quick and reliable logistics services, submitting the web site to directory-based search engines like Yahoo!, and having a membership in an online service or mall such as AOL or ViaWeb's Viamall. Also, the web site should follow basic good design principles, market properly, understand customers and their buying habits, price correctly, anticipate cash flow, monitor competition/technology/marketplace changes, keep growth slow and steady, delegate, develop good internal communications.

2.3. Infrastructure for e-commerce in developing countries

Several studies have been done looking at basic infrastructure requirements for e-commerce in developing countries. Mukti [32] found that problems restricting the expansion of e-commerce in Malaysia include security concerns, payment issues, Internet access issues, and technical skills of workers. Sachs and Staff [37] developed a tool for countries to assess their readiness for the networked world. They look at nineteen factors distributed between network access, networked learning, networked society, networked economy, and networked policy as areas of concern. Users of the tool rate their economies and infrastructure to one of four stages. Stage 4 is fully ready for e-commerce while stage 1 needs a lot of development. The tool is designed to aid governments in planning for moving their economy to stage 4.

The Electronic Commerce Steering Group, Asia Pacific Economic Cooperation (APEC) [17] have published the E-Commerce Readiness Assessment Guide. This guide is designed to aid governments in developing policies that will support e-commerce. The guide looks at the areas of basic infrastructure and technology, technology and commercial services, current Internet usage, standards committees, people skills, and government policies and regulation.

Cloete, Courtney, and Fintz [12] discussed SME acceptance and adoption of e-commerce in South Africa. They found that e-commerce adoption is heavily influenced by factors within the organization. Lack of access to computers, software, other hardware, and telecommunications at a reasonable cost; low e-commerce use by competitors and supply chain partners; concerns with security and legal issues; low knowledge level of management and employees; and unclear benefits from e-commerce were all found to inhibit adoption.

Dedrick and Kraemer [13] discussed e-commerce in China. They found that although there is considerable interest in e-commerce, there are also significant barriers to establishing e-commerce ventures. Limited diffusion of computers, high cost of Internet access, and a lack of online payment processes directly inhibit e-commerce. Inadequate transportation and delivery networks, limited availability of banking services, and uncertain taxation rules

indirectly inhibit e-commerce. Government policies promoting IT and e-commerce and attacking software and intellectual property piracy are encouraging e-commerce. Regulation in the areas of international contracts, foreign participation, and digital signatures and encryption is needed to continue encouraging e-commerce. Additionally, growing computer manufacturing and IT services industries are creating a technical base for supporting e-commerce.

Chepaitis [11] looked at the information environment in Russia and found that the information environment can be an impediment to the development of e-commerce in emerging economies. Many developing countries do not have a culture of sharing data. The ability to pool data for statistical analyses is necessary for many business processes and organizations. The absence of shared data can result in a lack of effective information systems due to the lack of reliable and consolidated marketing, customer, and economic data. This also usually results in low data quality and trust in the data that is available. Twelve factors were identified that affect the information environment in an emerging economy. The factors focus on the business culture of the economy and will limit the emergence and scope of e-commerce in these economies. The factors include unsuccessful/intrusive government planning and regulation; formal barriers to entry and dictated pricing in distribution and supply; informal entrepreneurship such as black markets and barter; ineffective methods for managerial accounting; political fear and widespread avoidance of information sharing; unstable currency, nascent financial regulations, and a dearth of financial services; a reluctance to divulge information without compensation or reciprocity; proprietary attitudes towards data ownership; rigid, hierarchical management styles with a reluctance to share information or empower employees; communication behaviors that rely on oral tradition or more than one language; and an emphasis on price and availability to the exclusion of quality.

The Electronic Commerce Infrastructure Info-Communications Development Authority of Singapore (IDA) [Staff, 39] describes the e-commerce infrastructure in Singapore. Key components of this infrastructure include infrastructure services; a legal and regulatory framework, a set of open standards for technical services such as security, network protocols, email, and information exchange; and an incentive system of investment and tax breaks designed to encourage e-commerce development and investment. Infrastructure services include network services for linking online businesses, directory services for search and retrieval, security services for secure identification and communication, secure payment services, and solution providers for creating e-commerce systems.

Sukovskis [40] describes the IT sector in Latvia. Factors supporting e-commerce include government support for regulation encouraging e-commerce, a fairly well developed telecommunications infrastructure available for a price, and a growing cadre of IT professionals. Inhibitors to e-commerce are a relatively low use of the Internet and computers by companies, only 26.4% of companies used the Internet and 46.5% used computers in 2001; modern hardware and software is available but expensive; limited availability of investment capital; and the small number of available IT professionals (the demand for IT professionals is greater than the supply).

Figure 1. E-Commerce Infrastructure Success Factor Model.

3. E-business research model

To organize the research conducted for this study, a model was developed from the literature identifying infrastructure success factors for companies establishing e-commerce ventures. There are five main success factors: People factors, Technical Infrastructure, Client Interface, Business Infrastructure, and Regulatory Interface. Each factor has several attributes that were evaluated for importance using a survey discussed later in this paper. Figure 1 provides a model of how these factors affect the relationship between a client and provider.

The E-Commerce Infrastructure Success Factor Model shows the relationships between the five main factors and the participants in a e-commerce transaction. The model shows

that participants operate within a regulatory environment that provides the legal framework in which both entities must operate. The environment can hinder the ability of the participants to perform the transaction, or it may encourage it. India is an example of a regulatory environment that encourages business while Ukraine is an example of one that does not. Participants also operate within an external technical infrastructure comprised of the telecommunications and electrical systems of the participants' countries as well as any country geographically between them. The reliability and availability of these infrastructure components directly impact the ability of the participants to implement e-commerce.

Internal to the participants are the client interface, technical infrastructure, business infrastructure, and people factors. The client interface is the defined communications process between participants. This directly impacts the transference of requirements and knowledge and guides participants in the resolution of conflict. The business processes of the e-commerce provider determine the likelihood that the provider will remain viable for an extended partnership. The internal technical infrastructure ensures the provider has the ability to implement e-commerce initiatives. People factors ensure the provider has the ability to understand the context in which the client operates.

4. Methodology

An action research and case study approach was used to perform a detailed study of two companies. The subject companies were selected because: (1) they had ties to the authors, (2) they were newly formed, (3) they did business over the Internet, and (4) they were experiencing success. Additionally, one company was chosen from a developed economy and one from a developing economy. This was done as a check on the findings from the under developed economy to ensure that concerns observed in the under developed economy were more likely due to the under developed economy and not to being a small startup company.

Each company was visited and their principals interviewed. Operations were observed and processes reviewed. Also, since this was action research, the researcher provided recommendations to the companies. From this data and from the literature review discussed previously, lists of attributes were generated for each factor in the E-Commerce Infrastructure Success Model, Figure 1. Table 2 maps the attributes of the success factors to the source of the attribute (the cases map to all attributes and are not listed). The list was then administered as a survey to the leaders of each company as a check on the gathered data. The completed surveys supported the initial list and the gathered data. To further develop the survey, the survey was given to the graduate classes of one of the authors. These students were selected because they: (1) were familiar with IT and e-commerce principles, (2) usually had previous business experience, and (3) were mixed international and US in origin. Results of the pilot survey were used to create the final form of the survey. The survey was then administered to personnel from outsource companies (B2B providers) and companies that use outsourcers (B2B clients). Distribution of the survey was through meetings, personal contacts of the authors, and email solicitation. One hundred and thirty-five surveys were returned. Eighty-eight surveys were from B2B providers, forty-four each

Table 2. Map of attributes to literature review and case study findings

Factor	Attribute	Source of attribute
People factors	Knowledge skills of workers	[Cloete, Courtney, and Fintz, 12; Mayer-Guell, 29; Sukovskis, 40]
	Language skills of workers	[Chepaitis, 11; Gattiker, Perlusz, and Bohmann, 19; Palvia and Vemuri, 35]
	Cultural awareness of workers	[Amoroso, 1; Chepaitis, 11; Gattiker, Perlusz, and Bohmann, 19; Hall, 20; Kang and Corbitt, 28; Mayer-Guell, 29; Palvia and Vemuri, 35]
	Project management people skills	[Chepaitis, 11; Cloete, Courtney, and Fintz, 12; Gattiker, Perlusz, and Bohmann, 19; Hall, 20; Kang and Corbitt, 28; Palvia and Vemuri, 35]
Technical infrastructure	Telecommunications infrastructure	[Cloete, Courtney, and Fintz, 12; Dedrick and Kraemer, 13; Domaracki, 16; Gattiker, Perlusz, and Bohmann, 19; Palvia and Vemuri, 35; Mukti, 32; Staff, 39; Sukovskis, 40]
	Up to date PCs, other computer hardware, and software are available	[Amoroso, 1; Cloete, Courtney, and Fintz, 12; Dedrick and Kraemer, 13; Palvia and Vemuri, 35; Sukovskis, 40]
	Technical skills of workers	[Amoroso, 1; Cloete, Courtney, and Fintz, 12; Dedrick and Kraemer, 13; Mukti, 32; Palvia and Vemuri, 35; Sairamesh et al., 38; Sukovskis, 40; Staff, 39; Turban et al., 42]
Client interface	Client contact point is knowledgeable	[Amoroso, 1]
	Trust between client and provider	[Molla and Licker, 31; Palvia and Vemuri, 35]
	Client contact can communicate in a language the provider understands	[Chepaitis, 11; Gattiker, Perlusz, and Bohmann, 19; Palvia and Vemuri, 35]
	Problem resolution process	[Freeman, 18]
Business infrastructure	Business plan	IBS; ITBS
	Business organization in place	[Amoroso, 1; Mayer-Guell, 29]
	Business processes	[Amoroso, 1; Castelluccio, 8]; IBS; ITBS; [Palvia and Vemuri, 35]
	Cost/cash control processes	[Castelluccio, 8; Dedrick and Kraemer, 13; Turban et al., 42]
	Advertising	[Amoroso, 1; Palvia and Vemuri, 35; Turban et al., 42]
	Client contact methods	[Castelluccio, 8]; IBS; ITBS; [Staff, 39]
	Payment processes	[Dedrick and Kraemer, 13]; IBS; ITBS; [Mukti, 32; Palvia and Vemuri, 35; Staff, 39; Turban et al., 42]

Table 2. (Continued)

Factor	Attribute	Source od attribute
	Legal representation/support	[Cloete, Courtney, and Fintz, 12; Dedrick and Kraemer, 13; Freeman, 18; Sairamesh et al., 38; Staff, 39]
	Cost advantage exists	[Palvia and Vemuri, 35; Turban et al., 42]
Regulatory environment	Intellectual property protection	[Dedrick and Kraemer, 13; Freeman, 18]
	Tax laws encourage B2B/e-commerce	[Dedrick and Kraemer, 13]; IBS; [Palvia and Vemuri, 35; Staff, 39; Sukovskis, 40]
	Banking/wire transfer laws support overseas/electronic payments	[Dedrick and Kraemer, 13]; IBS
	Customs laws support global e-commerce	[Dedrick and Kraemer, 13]; IBS; [Palvia and Vemuri, 35; Staff, 39; Sukovskis, 40]
	Exchange rules/rates favorable	[Palvia and Vemuri, 35]
	Telecom regulations favor business	[Dedrick and Kraemer, 13; Palvia and Vemuri, 35; Staff, 39]

from US and non-US organizations. Of the forty-four non-US surveys twenty-nine were from Asia (India, Thailand, Malaysia, Vietnam, Pakistan, Australia, Philippines, Peoples Republic of China, Taiwan, Japan, and New Zealand), seven from Europe (Ukraine, Italy, United Kingdom, and Germany), four from the Middle East (Turkey and Israel), one from Africa (Nigeria), one from South America (Brazil), and two from Canada. Surveys were analyzed with respect to the origin of the respondent and as a B2B provider or a client. Means and standard deviations were calculated with attributes that scored less than 2.0 determined to be critical success factors.

5. Case studies

5.1. International Business Solutions

International Business Solutions, IBS, is located in Kyiv Ukraine. It was formed in March 2000, by an American expatriate living in Kyiv. The company has an affiliated US company, Energy Solutions, also formed in March 2000. Energy Solutions is a Nevada based corporation. IBS is a small enterprise; in December 2001 it had three full time and five part time employees, all Ukrainian, in addition to its founder. To minimize costs and increase flexibility, IBS utilizes an extensive network of independent contractors to provide its services. IBS has three areas in which it offers/provides services over the web to other organizations: business support services in Ukraine, web development, and energy consulting.

IBS was originally formed to broker the knowledge and contacts of the founder into a business that offered business people everything they would need when doing business in Ukraine. These services are offered due to the large difference in culture, language, regulatory and business practices between Ukraine and the United States.

Energy consulting services are offered as the founder is a long term utility veteran and saw the opportunity to market his expertise to officials and companies in Ukraine or wanting to do business in Ukraine.

Web development services are offered at the suggestion of the author who had discovered during a Y2K risk assessment that there is a large web development talent pool available in Kyiv that is very reasonably priced and motivated to work. Given the weak business climate in Ukraine these services are targeted to the US and other developed countries. Originally IBS offered fixed fee contracts for development projects. Problems with managing projects remotely and incomplete user requirements drove IBS to switch to providing developers on an hourly basis working under direct control of the contracting client. IBS is able to offer developers at a very attractive rate, approximately $15.00 per hour United States Dollars, USD. The new approach has been more successful and IBS has several developers under contract to outside companies.

IBS markets itself through word of mouth and its web site. Word of mouth is through business gatherings in Kyiv and a good word from clients to potential client. Web marketing is through a web site that provides a good overview of IBS services, examples of the skills of the IBS web developers, and a means of contacting IBS. The sites are hosted by a US based Internet Service Provider, ISP. A US based ISP was chosen because they were considerably less expensive than Ukrainian ISPs, approximately $7.00 USD monthly versus approximately $40.00 USD monthly. Another issue was bandwidth, 48 kbps is becoming common in Kyiv while DSL is being introduced but is very expensive, greater than $100.00 USD per month. Reliability is still an issue with Ukrainian ISPs as power quality is poor and phone lines are degraded.

5.2. IT Business Solutions

IT Business Solutions, ITBS, is a micro SME located in Castle Franco, Italy. Castle Franco is in the Tuscany region approximately 20 miles south of Florence. It consists of two principals, one is a German whose parents live in Italy and who recently completed his Masters of Science in Information Systems in the US. His expertise is in database. The other is an Italian born and raised in Castle Franco. His experience is in computer aided manufacturing and web mastering and his expertise is in web interfaces. ITBS was formed in 2000 to provide web development services for vacation rentals.

ITBS got its start by building a web site for the villa resort owned by the parents of one of the principals. A US company that lists apartments, time-shares, and condominiums for rent or lease saw the site. The US based company liked the site and contracted with ITBS to build a web portal and database application. This project is succeeding and is leading to more work for ITBS.

ITBS has no formal organization, processes, or office. The principals work from their own computers on their own parts of the project. They get together personally and via the Internet to set the design framework and to integrate their portions of the system. Each principal is responsible for his computer and network connections. Local ISPs are used as costs and service are not issues. There is no central repository. One principal serves as the

main client liaison using the Internet as the communication medium and does most of the face-to-face interfacing in the US when it is required.

Ultimately, the success of ITBS is based on the expertise of its principals. ITBS does not advertise, instead relying on their work to speak for them. Both principals are technically gifted and talented professionals. Both are also young, mid twenties. The continued success of ITBS will depend upon the principals developing business savvy and building the business side of ITBS. The lead author provided several recommendations to do this.

6. Case study analysis

6.1. IBS non-IT issues

It has taken IBS over eighteen months to become operational and to make money; and IBS is still not fully up. This is primarily due to the business climate in Ukraine. Things take time to complete. Paying expedited fees is normal as it is rare to pay the standard fee and have something done. Americans pay more for everything, up to 10 times what a Ukrainian would pay. IBS avoids this by the founder living in Kyiv and by having Ukrainian directors and partners. Regulations and tax requirements are difficult to understand and comply with. Getting paid is difficult. Transfer payments are expensive with an approximate $350.00 USD fee applied, and take a long time, approximately 5 weeks. IBS is set up to accept off shore payments through a non-Ukrainian bank. This allows IBS to accept credit card payments. Since Ukraine is a cash economy, checks aren't accepted. Non-Ukrainian customers must pay in cash or via credit card. This is difficult for many customers to understand and work with. The author faced this during contract work in Ukraine. Drivers, interpreters, and translators all expected to be paid in cash at the time of the service. Invoicing and paying by check were not accepted. Receipts were informal unless written by the author. The author's parent organization, a US electric utility, did not do business in this manner and had no business process in place to support cash on delivery payments. Fortunately an acceptable method was established. IBS has the same issues with large customers.

Networking within the business community is vital. Business within Ukraine is done face to face and usually over meals or social gatherings. Reputation is important and whom you know is vital. Doing a good job supports continued business but does not get the initial job. IBS discovered this after several months. Once the founder realized this mode of business he spent a majority of his time mixing and meeting people in Kyiv.

Learning to work within the Ukrainian culture has also been difficult. Ukraine has 33 holidays compared to approximately 10 in the US. Punctuality is not a standard practice. Break times are whenever. Language has been an ongoing issue since the founder did not speak Russian when he arrived in Kyiv and still is not fluent.

6.2. *ITBS non-IT issues*

Most of the issues ITBS faces are non-IT with communication with the client as the main issue. The owner of the US based company is the point of contact for ITBS. Neither the owner nor his employees are computer literate. This lead to misunderstandings between the client and ITBS as the client does not understand software requirements and limitations and ITBS has difficulties in understanding client needs. Fortunately ITBS has a background in vacation rentals and so understood the basic business of the client. Additionally, English is not the principle language for ITBS. One principal speaks English well but has an accent. The client owner also has an accent, as he is not a native English speaker. The principals admit to several occasions where language barriers led to misunderstandings and disagreements.

The contract is another issue. ITBS did not use a lawyer to negotiate the contract. The contract provides for payment when the project is complete except that expenses; for travel, hardware, and software; are paid as they are incurred. This has required the principals to rely on sources of income outside of ITBS during the project. Cash flow has not affected the project as both principals had outside sources of income but it is not recommended that startup companies use this approach. The lead author has recommended ITBS use a lawyer on many occasions.

Project management has also been an issue. No formal project scope was established resulting in disagreements as to what should and should not be included. Additionally, scope and requirements creep have caused the project schedule to extend. Finally, a loss of version control event was observed that took the principals a day to correct. All these issues could be corrected through implementation of project management practices and techniques.

ITBS has little business infrastructure. There is no formal billing or accounting system, organization, legal representation, or advertising. ITBS has no plan for growth or for what it wants to do. Its success has been due to falling into a project and relying on its technical expertise to do a good job. Doing a good job is essential, but having a marketing plan and vision as to what you want to do is essential for continued success. This tends to be the trap successful technical entrepreneurs fall into, the belief that doing a good job is all that is necessary and that the business will run itself.

A final issue that has arisen since the terrorist attack on the US on September 11, 2001, is physical access to the client. The client interface principal originally traveled to the client offices while completing his degree program and resided in the US under a student visa. Obtaining student visas has become difficult. The one principal has lived in the US for the last 2 years and has been able to interface with the client regularly. However, he cannot obtain a resident visa easily. He can obtain a business visa but this requires him to return to Italy.

6.3. *IBS IT issues*

Phone communications for calls outside Ukraine are very expensive. Calling cards are available that significantly reduce costs, to about $0.45 USD per minute, but require ac-

cessing special numbers and switches. File transfers are slow. Bandwidth is not readily available due to degraded communication lines. When lines are new or have been upgraded, bandwidth is available for a reasonable cost from a US perspective. One of the authors was able to find an Internet café that offered 128 kbps connections for a cost of about $4.00 USD per hour. It should be noted that this is considered expensive in Ukraine as confirmed by the clientele being primarily non-Ukrainians. Another negative is the poor condition of the telecommunications infrastructure. Jennex et al. [26] found no digital/IT equipment used for energy management and plant communications. Analog phone switches and equipment were normal. Telecommunication service between dispatch centers and plants or other dispatch centers were very unreliable. Ukraine has a wide area network for monitoring the power system that is based on SM1420 and SM2 computers (these are HP1000 and PDP11 clones). This system is obsolete and was observed to be frequently out of service requiring system operators to rely on voice communications for dispatch functions. These also were frequently out of service requiring system and plant operators to use analog radios or to simply load follow. Load following is a technique used for system control only when communications are out of service, it results in poor power quality with little frequency stability with the previously discussed effects on IT. Observations of phone lines in hotels catering to westerners found that dial up connections of greater than 9800 bps were difficult to impossible to sustain for more than a few minutes due to line noise and errors. Ultimately this reduces the effectiveness of internet, email, and fax processes, raising the cost for these services. Additional analysis of the telephone system from the Central Intelligence Agency's World Fact Page confirms it is antiquated.

Jennex [24] found the energy sector of Ukraine to be at a 1960s or 70s technological level. Poor reliability and power quality was observed with frequency oscillations of 0.5 Hertz or more routine and power outages common. Most critical building and hotels, as well as many residences, keep and maintain backup generators. North American standards have frequency oscillations controlled to 0.05 hertz or less. Digital equipment does not function well nor last long with the large observed frequency swings. Digital clocks in Ukraine routinely lose about twenty minutes a day. The average house or office in Ukraine has a 45-amp fuse box while the average house in Southern California has 150–200 amps. What this means is that the electrical infrastructure in Kyiv and Ukraine does not readily support a modern office's IT electrical needs. Large companies compensate by installing their own power equipment. Small companies make do with what they have with the result that they have less reliable IT.

Availability of hardware and software can be issues. Leading edge hardware such as personal computers, digital cameras, printers, and communications equipment are very expensive and hard to get. Additionally, some companies differentiate between hardware sold in Europe and that sold in the US. As an example Jennex et al. [25] took an inexpensive Epson printer to Kyiv. When the ink cartridges expired replacements were found in Kyiv, however, the printer refused to recognize the replacements even though they were the correct product per the model number. It was later learned that the coding used on the cartridge was different for models sold outside the US than for those sold in the US. Another

issue is incompatible character sets. Ukraine uses the Cyrillic alphabet. The character set used to display this alphabet on computers in Ukraine makes the generated files unreadable on computers running English character sets.

Software is readily available. The issue is the great abundance of pirated software. Virtually any software package can be purchased in the local markets for approximately $2.00 USD per compact disc, CD. Authentic software is available but costs as much or more than it would in the US. This makes buying and using authentic software unattractive. IBS uses only authentic software since it has a US affiliate and the founder and owner is a US citizen. Competing companies in Kyiv do not have this constraint so this gives IBS an unattractive cost differential. Fortunately this isn't a significant issue as IBS does not provide software to its developer contractors and only needs software for its own business use. Software costs can be a significant issue to other companies in Ukraine, especially if they are trying to use "legal" versions and the competition does not care.

Jennex [24] reported an adequate availability of technical talent in Ukraine. Olearchyk [34] in the Kyiv Post English language newspaper reports that there is a growing shortage of talent. It is stated that approximately 2500 IT specialists are leaving Ukraine each year. Additionally, the schools are not producing usable IT professionals due to their focus on theory and not practical education. The net impact is that Ukrainian software developers are turning down contracts due to lack of work force. Two issues exist. The first is that IBS will not be able to keep web developers under contract for potential work, other companies offering steady work will get them first. This is mitigated by IBS being willing to offer part time work to developers to do in their spare time. Given the low wages there may be an adequate number of developers willing to do this. The second issue is the upward pressure on wages. As developers become shorter in supply, companies will have to pay more to retain them. This will force IBS to pay more for developer services and will result in higher prices that IBS must charge. This may make IBS a less competitive player in the global market.

6.4. ITBS IT issues

ITBS has no IT issues. Italy has a well-developed telecommunications infrastructure and adequate bandwidth and connections are readily available for a price. Telecommunication services are more expensive than comparable services in the US but not to the point that it is an issue. Hardware and software are also readily available at reasonable costs.

Surprisingly, the only IT issues that existed were with the client. The client did not have adequate connections and bandwidth requiring ITBS to upgrade the client to a T1 connection. Additionally, the client did not have IT literate employees. ITBS assisted the client in hiring and training an IT specialist. Both of these issues were critical as ITBS needed to have adequate support within the client for maintaining and managing the new system.

6.5. IBS B2B e-commerce issues

The web sites used by IBS are distinctive, sophisticated, interactive sites. They provide audio and image information as well as text information. They work best with high-speed connections and higher end personal computers. Technically the sites are very good. They appear easy to use and navigate although this is the authors' impression and not verified through any usability testing. These issues in context of the success factors discussed earlier, also discussed in an earlier research by Jennex and Amoroso [25] include:

Understanding customer base needs: The sites constantly play music. While the music changes with the different sites, there are no controls other than the user's computer's audio controls for turning it off. After a few minutes this can get annoying for visitors to the site. Also, needing to scroll down through information, Molla and Licker [31] consider scrolling a detriment to content quality.

Support of substantial e-business initiatives: There is no indication that IBS has an ongoing planning process for e-business applications.

Developing the Web site: Testing the sites on multiple computers yielded various results. When accessed with a new, top end personal computer connected to a high-speed network the site worked fine. When accessed using a mid level personal computer with a 115 kbps dial up connection using America Online, AOL, as the ISP, the music did not work with the audio controls at full volume and the introduction screen partially failed while loading very slowly, approximately 1 minute. After that, the site worked well with all sites loading within 10 seconds although the music never did work. A low end computer or connecting at 56 kbps was not tested but are not expected to work well.

Branding the Web site: Finding the sits is difficult. Searches were conducted using the AOL, MSN, and Yahoo search engines. Searching on "Ukraine" did not locate the sites in the first 100 hits. Searching on "IBS" did not locate the sites in the first 100 hits. Searching on "Ukraine" AND "IBS" found the site with the first hit on Yahoo but did not locate the sites in the first 100 hits of AOL or MSN. However, the first hit, Estate2000, an apartment-renting firm, contained a link to the sites. This indicates the sites are not registered well with search engines. Further evidence of this is in the site visit count observed by the author. The author was visitor 1345 to the business services site and 1109 to the web development site, counts that are less than expected.

Reshaping the organization's corporate culture: Evidence to support a budgeting process in future years toward e-business initiatives was not present. Even though it was found that a technical staff was available for development, no formal e-business planning process was observed.

Ultimately the value of the site is in the business it generates. By IBS's own admission, the sites have generated many inquiries but little to no business. While Molla and Licker [31] do not include organizational impact in their modification of DeLone and McLean's [15] IS Success Model, this analysis considers a lack of organizational impact in the form of sales a key indicator that the sites are not successful. Molla and Licker [31] do include customer trust and return visits as indicators of success. The sites do use secure transactions for credit cards and their state on the site that they respect the privacy of their clients.

However, no statement is made on the privacy of client information collected on the sites and the site counter indicated the author was visitor number 1300, this indicates potential issues with regard to trust and return visits by clients.

6.6. ITBS B2B e-commerce issues

ITBS uses B2B e-commerce to communicate with clients. They do not have a site of their own and rely on sites they have created for advertising. The main e-commerce applications used by ITBS are email and remote monitoring and maintenance of the applications ITBS maintains for their clients. This is inadequate for a long-term B2B enterprise. ITBS needs to, as a minimum, establish a web presence that advertises its business and allows for potential client contact. Additional processes that should be considered are a electronic payment system and links to the sites they've built and maintained for use as an online catalog of capabilities.

7. Results

The finding of this study is a list of infrastructure success factors for companies establishing B2B e-commerce ventures. There are five main success factors: people factors, technical infrastructure, client interface, business infrastructure, and regulatory interface. Each factor has several attributes. These attributes were assessed for importance using a survey. The survey was distributed to both clients and providers. Provider respondents were asked to rate the importance of the attribute with respect to success of their organization. Client respondents were asked to assume they were evaluating potential partner organizations and were to rate the attributes with respect to importance of selecting a partner. The scale used for the survey was 1—Critical, 2—Very Important, 3—Important, 4—Useful, and 5—Not Important.

Attributes that scored less than 2.0 were considered critical success factors. Attributes that scored 4.5 or greater were dropped, however, no attribute achieved this score so none were dropped. Respondents were given the option to add attributes, however, none were added. Tables 3–7 list the factors and their attributes, and importance means with standard deviations.

7.1. People factors

People factors ensure the provider organization has adequate human resources to meet the demands of its clients. This involves having knowledgeable workers that understand the culture and language of the client. Worker knowledge skills are considered critical by all groups of respondents. Project management skills were considered critical by all but non-US providers. Language skills was considered critical by non-US providers, who probably speak English as a second language, but only very important by the US respondents. All respondents considered cultural awareness very important but not critical. See Table 3.

Table 3. Importance of people factors attributes

Attribute	Total		Providers						Clients	
			Total		US		Non-US			
	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev
Knowledge skills of workers	1.68	0.69	1.61	0.67	1.68	0.69	1.50	0.63	1.75	0.72
Language skills of workers	2.21	0.96	2.13	0.99	2.24	1.05	1.93	0.88	2.30	0.93
Cultural awareness of workers	2.59	1.03	2.56	0.98	2.68	1.03	2.38	0.89	2.61	1.08
Project management skills	1.96	0.83	1.98	0.80	1.92	0.81	2.07	0.80	1.95	0.86

Table 4. Importance of technical infrastructure attributes

Attribute	Total		Providers						Clients	
			Total		US		Non-US			
	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev
Telecom infrastructure	2.04	0.88	2.02	0.96	1.68	0.69	2.56	1.09	2.05	0.81
Up to date PCs, other computer hardware, and software are available	2.32	0.93	2.33	1.07	2.13	1.08	2.63	1.02	2.32	0.80
Technical skills of workers	1.69	0.76	1.63	0.77	1.64	0.70	1.63	0.89	1.75	0.75

7.2. Technical infrastructure

Technical infrastructure ensures that the underlying networks, hardware/software, and technical exist so that organizations can create the applications and web sites necessary for organizations to implement and sustain e-commerce ventures. Technical infrastructure exists for clients and providers and for the geographical areas between them. Only the worker technical skills attribute was considered critical, all other attributes were considered very important. This is considered indicative that organizations recognize that e-commerce requires more than technical ability and solutions. See Table 4.

7.3. Client interface

This factor establishes and maintains the relationship between participants in B2B e-commerce. This factor has three critical attributes and is the most critical of the five factors. Trust in the relationship, knowledgeable client contacts, and contacts that can speak the provider's language are critical. Having a problem resolution process is very important. See Table 5.

7.4. Business infrastructure

Business infrastructure ensures the viability of the B2B provider and allows for the establishment of long-term business relationships. This factor ensures that business and payment processes are in place, that legal advice is available for contracts and other needs,

Table 5. Importance of client interface attributes

Attribute	Total		Providers						Clients	
			Total		US		Non-US			
	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev
Client contact is knowledgeable	1.79	0.88	1.68	0.76	1.60	0.65	1.81	0.91	1.89	0.98
Trust between client and provider	1.75	0.89	1.56	0.74	1.56	0.65	1.56	0.89	1.93	0.97
Client contact can communicate in a language the provider company understands	1.98	0.77	1.95	0.74	2.08	0.70	1.75	0.77	2.00	0.81
Problem resolution process	2.28	0.86	2.00	0.83	1.92	0.76	2.14	0.95	2.52	0.82

Table 6. Importance of business infrastructure attributes

Attribute	Total		Providers						Clients	
			Total		US		Non-US			
	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev
Business plan	2.40	0.94	2.44	0.92	2.24	0.83	2.75	1.00	2.36	0.96
Business organization in place	2.48	0.97	2.37	0.92	2.28	0.89	2.50	0.97	2.59	1.02
Business processes	2.40	1.00	2.29	0.98	2.08	1.00	2.63	0.89	2.50	1.02
Cost/cash control processes	2.62	1.05	2.44	1.00	2.28	0.84	2.69	1.20	2.80	1.07
Advertising	2.96	1.03	2.59	0.92	2.68	0.89	2.44	0.81	3.32	1.01
Client contact methods	2.02	0.89	1.88	0.84	1.88	0.88	1.88	0.81	2.16	0.91
Payment processes	2.35	0.83	2.22	0.79	2.20	0.82	2.25	0.77	2.48	0.85
Legal representation/support	2.48	1.14	2.44	1.00	2.32	1.03	2.63	0.96	2.52	1.27
Costs advantage exists	2.58	0.83	2.61	0.92	2.60	0.87	2.63	1.02	2.56	0.76

that communication and advertising is available and effective, and that sufficient funds are available to support the B2B provider. All attributes are considered very important but none are considered critical except that providers consider potential client contact methods critical. An interesting observation is that cost, while considered very important, was not critical. This is a very important finding as it indicates that providers and clients recognize that there is more to a B2B relationship than just cost. See Table 6.

7.5. Regulatory environment

The regulatory environment sets the rules for how e-commerce will be conducted. In a global marketplace differences between regulatory environments can make or break e-commerce ventures. India and Singapore are examples of countries encouraging global e-commerce, Ukraine is a country that does not. All attributes are considered very important but not critical. Additionally, these attributes had the least degree of agreement between respondents. This is because these attributes are very country specific. The lack

Table 7. Importance of regulatory interface attributes

Attribute	Total		Providers						Clients	
			Total		US		Non-US			
	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev	Mean	SDev
Intellectual property protection	2.14	1.15	2.05	1.05	1.96	1.06	2.19	1.05	2.23	1.24
Tax laws encourage B2B/ e-commerce	2.48	1.14	2.35	1.14	2.38	1.21	2.31	1.08	2.60	1.14
Banking/wire transfer laws support overseas/electronic payments	2.47	0.99	2.45	0.99	2.54	1.10	2.31	0.79	2.49	1.01
Customs laws support global e-commerce	2.36	1.12	2.35	1.06	2.50	1.18	2.13	0.89	2.38	1.17
Exchange rules/rates favorable	2.75	1.06	2.60	1.03	2.75	1.07	2.38	0.96	2.88	1.12
Telecom regulations favor business	2.50	1.02	2.33	1.13	2.39	1.16	2.25	1.13	2.65	0.90

of agreement between respondents is not considered an issue; rather, it indicates the global applicability of the survey, as the list is not tailored to specific countries or regions. See Table 7.

8. Conclusions

The list of e-commerce infrastructure success factors and attributes presented in this paper are a reasonable indicator of potential success for startup B2B e-commerce ventures in a developing economy when used to measure the readiness of that country's infrastructure to support e-commerce, particularly B2B. The list of attributes is considered to be reasonably independent of regional or country biases. Companies from Eastern and Western Europe were looked at while studies from several developing economies were used. The strength of these success factors is their incorporation of published studies, action research with actual B2B e-commerce ventures, and validation by a mix of US/Non-US and client/provider respondents. The only potentially missing attribute is security. The original companies did not mention security during interviews nor did any of the respondents. However, security is built into some of the attributes, being able to accept payments, up to date technical skills, trust, and reliable telecommunications all assumed a base level of security. It is concluded that the list of attributes as is has security implied.

As expected worker's skills, communications, and the client interface including trust were the most critical factors. Almost as critical are telecommunications and project management skills. This also was expected. Finally, the strong ratings for the regulatory environment show awareness of the impact governments have on business. A mild surprise is the strong showing of protection for intellectual property. This can be taken as an indicator that there is more global awareness with respect to the issues of software piracy and knowledge capital. Another mild surprise was the relatively low rating for cost. This is

indicative of e-commerce participants recognizing that there are other more critical factors to establishing a e-commerce relationship.

Ultimately, the value of this list is to startup companies as it provides a good listing of what it will take to build a successful company. There is also value to companies that are clients to B2B e-commerce as it provides a listing of criteria that should be looked at when selecting a partner for B2B e-commerce. Another benefit is this list is easier to use than the instruments generated for government use.

8.1. Limitations

The main limitation to this research is the relatively small sample size for the survey and the selection process for choosing respondents. However, given that the respondents are all involved in e-commerce and represent many different countries and organizations and were selected because of their attendance at conferences or other academic functions, the selection threat is considered acceptable. The small size of the sample has limited the statistical analysis of the data but is adequate for looking at means.

8.2. Implications for future research

The first area for future research is to continue gathering data from providers and clients, inside and outside of the US. After a larger sample has been collected the results can be statistically analyzed for differences between groups and significance of attributes.

The second area for future research is looking at the regulatory environment factor and its attributes. This factor impacts global e-commerce but is not as well understood as the technical infrastructure, people factors, client interface, and business infrastructure.

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