Preface

Emerging web technologies and e-business models are changing the ways we do businesses in the global economy. The technology-driven changes are complex and pervasive and are taking place in all parts of our society, ranging from the corporate competition, globalization, education, life style, entertainment, customer relationship, to technological innovations. To stay ahead of the competition and to seize opportunities, firms need to assess the potentials and limitations of these web technologies and develop the business models that fit corporate strategies. This paper reviews emerging e-business concepts and technologies, discusses relevant issues and implications, and stimulates future research efforts.

INTRODUCTION

Since the dot.com bust in the early 2000, e-business field has experienced rapid business restructuring internally and externally. At the same time, web technologies have advanced at an unprecedented rate. The growth of e-business has been phenomenal in terms of sales volume and the number of corporate and individual adopters. For several years before 2006, growth rates exceeded 25% each year. Forrester forecasted that online sales will continue to grow to $204 billion in 2008 (BuzReport, 2008). It is expected that in 2009 online sales will reach $235 billion, by 2010 it will reach $267 billion, and by 2012 online sales are expected to reach $334 billion. Though still growing faster than that of offline sales, the growth rate is declining as the market becomes more saturated with online shoppers. Obstacles to online retail sales growth include trust, security, and product availability.

As hyper-competition and new technologies pose new opportunities and challenges, firms face increased pressures from stakeholders to create e-business values. They are trying to assess how innovations in the e-business will affect existing business processes and competition in order to develop new business models and applications that will take advantage of the new technologies. For example, advancements of wireless technologies have extended the reach of e-business to mobile business environments. As a growing number of customers utilize mobile devices to exchange information and to conduct business transactions, firms are competing to provide the most value-added, innovative, convenient mobile services for their customers.

Although a large volume of literature exists in the area of e-business, further research is critical as firms are challenged by newly emerging concepts and technologies. The purposes of this study are: (1) to survey literature on emerging e-business concepts and technologies for sustainable business practices and applications, and (2) to discuss implications for e-business practices and future research direction.

EMERGING CONCEPTS AND THEORIES IN E-BUSINESS

In this section, emerging theories and concepts in B2B, B2C, and m-commerce areas will be discussed.

Business-to-Consumer (B2C) E-Commerce

B2B technologies create different business value for firms depending on how firms utilize them (Lee et al., 2003). "Basic B2B e-commerce" is used primarily for the inter-firm exchange of electronic documents. In contrast, "collaborative B2B e-commerce" is used to create new inter-firm collaborations with business partners. A survey result from a grocery industry showed that the real source of performance improvement in the B2B e-commerce comes not from the basic B2B e-commerce, but from the collaborative B2B e-commerce. Current B2B e-marketplaces actively embrace inter-firm collaborations and supply chain integration among partners as well as electronic business transactions and data interchange.

B2B e-commerce was also investigated from a global perspective (Raisinghani et al, 2005; Unhelkar, 2005). As the economic activities are more globalized, existing international information systems have been embracing web-based e-business technologies. Global B2B e-commerce provides potential to reduce global business transaction costs, to lower entry barriers to a global market, and to enhance global business collaborations. Gibbs et al. (2003) observed that B2B e-commerce is likely to be driven by global forces, whereas B2C seems to be more of a local phenomenon. The difference is attributable to the fact that B2B e-commerce is driven by global economy and multinational companies that push the adoption of B2B e-commerce to their global suppliers, customers, and subsidiaries. On the other hand, the expansion of B2C to global markets encountered many obstacles such as language barriers, national law, accounting practices, and cultural differences.

As e-business business models and technologies develop, the supply chain dimension of e-business, called e-supply chain, has become one of the most discussed topics in the various industries (Kim et al, 2005; Nath & Angeles, 2005). E-supply chain emerged as a promising alternative to traditional supply chain and dramatically changed the way procurement is conducted. E-supply chain also opens up new opportunities for small and medium-sized enterprises (SMEs), considering the traditional proprietary EDI technology was not available for most SMEs. A study of organizational barriers to e-supply chain integration revealed that (1) internal barriers impeded e-integration more than either upstream supplier barriers or downstream customer barriers and (2) e-integration has a positive effect on the performance (Frohlich, 2002). These barriers to implementation and organizational issues need to be addressed to realize potential benefits.

E-supply chain enhances supply chain flexibility much needed in times of hypercompetitive business environments, sophisticated customer preferences, and widespread use of disruptive technologies. Based on a survey result of supply chain relationships in the IT industry, Gosain, et al. (2004) proposed two e-supply chain design principles: (1) modular design of interconnected processes and structured data connectivity, and (2) deep coordination-related knowledge. They also suggested that sharing a broad range of information with partners is counterproductive to supply chain flexibility, and that organizations should instead enhance information quality.

The influence of the past experience in EDI facilitates B2B adoption (Angeles et al, 2001). Implementing B2B requires certain technological knowledge, so that the previous orientation of firms towards EDI-related systems proves to be important in its development, thanks to the generation of affinity and

the simplification of the learning process. Experience with systems such as EDI or Internet has a direct influence on the use of e-CRM and there is also a direct and positive transmission of knowledge from e-CRM to B2B (Ortega et al, 2008). The knowledge accumulated from using a technological innovation can be considered an important organizational knowledge asset, which allows firms to obtain a number of benefits as a result of deploying systems that are complementary.

A new generation of intermediaries relies on new information technologies such as the semantic web, rule-based triggers, and knowledge-based constraint maintenance systems (Orman, 2008). The author discusses in detail three types of intermediaries with respect to their use of information technologies: data-based intermediaries, trigger-based intermediaries, and constraint-based intermediaries. The interdependence and fragmentation of the intermediaries are likely to increase with the development of new web technologies such as Web services and semantic web. New intermediaries emerge on top of the existing intermediaries and create new services. Web services are likely to encourage proliferation of intermediary services, because they enable the intermediaries to share Web services using standardized information exchange formats such as web service description languages, web service directories, and ontologies, and XML (Waldfogel & Chen, 2006).

Business-to-Consumer (B2C) E-Commerce

B2C e-commerce created many successful e-commerce startups with unique business models such as eBay, Amazon.com, and expedia.com. B2C e-commerce is characterized by intense competition, low market entry barriers, and a low degree of customer loyalty which in part are the reason behind the demise of numerous B2C e-commerce startups in the late 1990s and early 2000s. Due to the rapid growth of the Internet population and online sales, most traditional retailers have been transformed into click and mortar organizations by establishing the B2C ecommerce web sites. For these B2C e-commerce organizations, understanding online consumer behavior is one of the most important tasks for their business success.

To understand online consumer behavior, a number of researchers have applied grounded theories and investigated web site characteristics, motivations, facilitators, inhibitors, trust, attitude, intention, and loyalty which underlie individual acceptance of B2C e-commerce applications (Kulviwat et al, 2006; Jih, 2007). Most of these empirical studies adapted Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), and SERVQUAL which have been widely used in IT adoption studies. These studies showed that consumer's acceptance of e-commerce is influenced by subjective norm, perceived usefulness, perceived site quality, risk, vendor quality, security, reliability, assurance, privacy, and user's web experience.

As B2C e-commerce technologies advance and consumers gain more online experience, e-services have drawn attention from researchers and practitioners (Gefen & Straub, 2003; Baida et al, 2007). E-services enhance consumers' online shopping experience, and include Internet radio, web-based decision support, personalization, e-payment, online inquiry, electronic document sharing, and e-product support services. One of the major drawbacks of e-services is that e-services frequently lack the social presence. Findings of a free simulation experiment showed the positive influence of social presence on trust and its ultimate contribution to online purchase intentions of e-services (Gefen & Straub, 2003). Another study indicated service convenience, web site service quality, and risk are significant factors affecting consumers' satisfaction level, which in turn affects intention to use e-services (Zhang & Prybutok, 2005).

Researchers in information systems and marketing have been focusing on investigating the effectiveness of Web-based decision support systems (WebDSS) in providing accurate and satisfying choices for customers (Gudigantala et al, 2008). Overwhelming evidence supports the notion that compensatory WebDSS are better than non-compensatory WebDSS in terms of decision quality, satisfaction, effort, and confidence. However, their investigation of 375 U.S. based company websites shows that though moderate levels of support exists for consumers to implement non-compensatory choice strategies, virtually no support exists for executing multi-attribute based compensatory choice strategies. The results help managers in providing more support for compensatory based decision strategies, and at the same time raise the question of the lack of popularity of compensatory WebDSS.

Developing web quality index and measuring web quality can help stakeholders understand and improve e-business web sites. A number of measurement instruments have been developed to measure the quality of web sites including WebQual, eTailQ, Sitequal, and NetQual. WebQual metrics have been developed to evaluate the quality of web sites (Barnes & Vidgen, 2002). WebQual metrics have been developed and validated through various e-business applications. Some of the dimensions include web site usability, information quality, and service interaction quality. WebQual is grounded in the perceptions of web site users, and analysis of data collected from users is used to guide web site design. eTailQ was developed by utilizing online and offline focus groups, along with a classification task and an online survey of a panel of consumers (Wolfinbarger & Gilly, 2003). The instrument consists of four factors (a) site design that includes navigation, search for information, product selection, order process, and personalization, (b) customer service including online assistance, response to customers' emails, ease of returning items, empathy, and reactivity, (c) reliability/respect for commitments refers to adequate description, presentation, and delivery of products or services ordered at the promised quality level, and (d) security/privacy reflected by security of payments and confidentiality of personal data. Sitequal consists of nine items reflecting 4 dimensions (a) ease of use and capacity to obtain information, (b) design and creativity of site with multimedia content and colors, (c) speed of the order process and reactivity to consumers' requests, and (d) security of financial and personal information (Yoo & Donthu, 2001).

NetQual includes 18 items distributed along 5 dimensions (a) quality and quantity of information available, (b) ease of site use, (c) design or aesthetic aspect of the site, (d) reliability or respect for commitment, (e) security/confidentiality of personal and financial data (Bressolles, 2006; Bressolles & Nantel, 2008). The dimensions retained refer to the functional characteristics of both the site and transaction. To compare the above-mentioned four instruments, the authors conducted a laboratory experiment involving two Canadian Websites in travel and online insurance. The results show NetQual best fits the data and offers the highest explanatory power.

Mobile Commerce (M-Commerce)

Mobile commerce (m-commerce) ushered in a new wave of e-business evolution fueled by the increasing use of mobile devices such as cell phones and handheld devices. Although m-commerce can be generally considered to be an extension of electronic commerce, it has a number of unique characteristics and business models, as it embraces many emerging technologies such as mobile or handheld computing devices and wireless technologies. During the past several years, m-commerce has significantly changed the way organizations do business, and entered into the center of the e-business research and practices. Most m-commerce adopters are individuals who play the dual roles of technology user and service consumer.

Coupled with the rapid advances in the wireless communications technologies, m-commerce has enormous potential to become a dominant form of market mechanism. However, with m-commerce still in its infancy, we still need to explore opportunities and challenges posed by m-commerce, and identify the appropriate business models and business strategies for the success of m-commerce. In addition, the wireless networking infrastructure, W3C standards, and the open and global wireless application protocol (WAP) specification need to be fully established to take advantage of m-commerce opportunities. The success of any mobile application requires a full understanding of application types, user requirements, technological constraints, and market potentials.

The technology behind m-commerce and the products and services available were examined (Frolick and Chen, 2004). They also examined the benefits and challenges of m-commerce, as well as the issues to be addressed when considering the implementation of m-commerce solutions. A number of studies addressed consumer perception and loyalty on m-commerce (Mahatanankoon et al., 2005; Mallat & Dahlberg, 2005; Jih, 2007). These studies reported that m-commerce consumer behaviors are similar to those of e-commerce, indicating that customer intention to use m-commerce is also affected by trust, habit, and customer satisfaction. Kim et al, (2007) adopted the theory of consumer choice and decision making from economics and marketing research, and developed the Value-based Adoption Model (VAM), and explained customers' m-commerce adoption from the value maximization perspective. The findings demonstrated that consumers' perception of the value of m-commerce is a principal determinant of adoption intention. Organizational issues, key attributes in developing m-commerce, and the driving and impeding forces of m-commerce were also investigated (Bai et al., 2005).

The unique characteristics of telecommunication markets along with the increasing trend for global e-business have led to a growing need for cross-national studies on m-commerce. Implications of m-commerce from a customer perspective across different countries were studied (Kim et al., 2004). Results from the online survey in the three countries yielded the following findings. First, adoption patterns for m-commerce were different across three countries. Second, customers' perceptions of the importance of the m-commerce and their willingness to pay for m-commerce services differed significantly across different countries. Finally, customers' preferred services in m-commerce also differed across the three countries.

A number of studies have examined the potential for mobile commerce to be applied to supply chain management (SCM) (Shankar & O'Driscoll, 2002; Kalakota et al., 2003; Lau et al., 2006). However, there are few empirical studies that focus on the adoption and implementation of mobile commerce in the supply chain activities of companies (Doolin & Al Haj Ali, 2008). In order to close the knowledge gap in the mobile supply chain, the authors present a multiple case study investigation of the adoption of mobile technology in the supply chain. A technology-organization-environment framework of the contextual influences on technological innovation adoption was used to analyze companies' adoption and use of mobile data solutions for sales automation, freight tracking and service support. Analysis of the three case studies found that the relative advantage of the technological innovation and the information intensity of the company were the most important factors influencing adoption. Other factors that appeared to influence adoption included the compatibility of the technology with the company's business approach, the presence of top management support, and the degree of organizational readiness.

Mobile services are an emerging m-commerce application which has evolved from mere communication oriented services (circuit-switched voice, text messaging, voice mailbox) to multimedia, content retrieval, browsing and other advanced services. Many case studies in the mobile services area have indicated that the success of mobile services is difficult to predict, because it is difficult to pinpoint the

reasons behind successes and failures as many issues affect the adoption of a particular mobile service (Verkasalo, 2008). The reasons can be categorized into two main categories: technological/business strategic and behavioral (Pedersen, 2001).

Verkasalo (2008) utilized a newly developed handset-based mobile end-user research platform and investigated the process of mobile service adoption in an attempt to understand drivers and bottlenecks for service adoption. Based on data extracted straight from handsets of 548 Finnish panelists, the author develops a path analysis model to explain mobile service adoption contingent on a given set of explanatory variables. His study finds that user intentions have a strong impact on consequent adoption of the service. Perceived hedonic benefits from the service are the strongest factor that drives user's intentions to use the service. Multimedia services are strongly driven by newer, more capable handsets and mobile Internet browsing benefits significantly from block or flat-rate (instead of usage-based) pricing plans for transmitted data.

EMERGING TECHNOLOGIES

In this section, Web services, semantic web, and ubiquitous computing technologies will be discussed.

Web Services

According to the World Wide Web Consortium (2008), "Web services provide a standard means of interoperating between different software applications, running on a variety of platforms and/or frameworks. Web services can be combined in a loosely coupled way in order to accelerates application development and integration inside and outside the enterprise (Bose & Sugumaran, 2006). Programs providing simple services can interact with each other in order to deliver sophisticated added-value services. Extensible Markup Language (XML) plays a central role in the development of Web services by providing a data interchange format that is independent of programming languages and operating systems.

The Web Services are based on a core set of enabling technologies, including XML, SOAP, WSDL, and UDDI, which reflect the work of researchers and consultants from a variety of companies and industry organizations. Web services technologies are emerging as the platform that can universally standardize the communication of applications for automating both the provider and consumer ends of e-business transactions. In order to connect systems, business partners, and customers cost-effectively, Web services let programs invoke requests to other programs over the Internet via open protocols and standards businesses.

Due to the significant potential benefits, many popular Web sites such as Google and Amazon.com are boosting their traffic through Web services. Web services can drive down costs in application development by achieving automated code generation, reuse, and interoperability. Web services have shown promising results such as greater development productivity gains and easier and faster integration with trading partners. However, despite the rapid development in the Web services area, many issues including information security still remain to be resolved in the context of e-commerce (Misra et al., 2007; Yau et al., 2007).

The lack of design and development methods is an issue which received little attention from the research community (Maamar and Benslimane, 2008). To close a gap in this area, the authors develop CP4WS that stands for Context and Policy for Web Services. CP4WS is a context-based and policy-driven

method for designing and developing composite Web services. Policies manage various aspects related to Web services like participation in composition and adjustment due to changes in the environment, while context provides the necessary information that triggers the appropriate policies and regulates the interactions between Web services according to the current state of the environment. CP4WS consists of five steps: user needs identification and specification, Web services orchestration, Web services contextualization, Web services behavior specification, and Web services deployment. Each step has a specific graphical notation that facilitates the representation, description, and validation of the composition operations of Web services.

Semantic Web

The Semantic Web has drawn attention from both industry and academia (Cannoy & Iyer, 2007; Joo et al., 2007). The semantic web is an evolving extension of the World Wide Web in which information and services on the web are rendered as means for computers and people to work in cooperation (Berners-Lee et al, 2001). The semantic web comprises the standards and tools of XML, XML Schema, Resource Description Framework (RDF), RDF Schema, and Web Ontology Language (OWL). Using semantic web technologies for e-business tasks such as product search or content integration requires ontologies for products and services. Ontologies can be used to describe products and services so that agents can advertise and discover them according to a semantic specification of functionality as well as other parameters such as cost, security, etc. (Trastour et al., 2003). The semantic web can make e-commerce interactions more expressive and flexible by standardization of ontologies, message content, and message protocols (Li & Ling, 2007). .

One important semantic web application area is Web services. Evidence shows that semantic web services are mandatory components of the semantic web, primarily because entities are more willing to expose functionality than data in business settings (Hepp, 2006). Semantic web services aim to describe and implement web services so as to make them more accessible to automated agents. Semantic web services can support a service description language that can be used to enable an intelligent agent to behave more like a human user in locating suitable Web services.

One of the major problems faced by the semantic web is heterogeneity which causes interoperability among domain ontologies. This is a significant problem particularly for ontologies of similar domains. The current mediation techniques focus mainly on syntactic matching. A hybrid ontology mediation algorithm for the semantic web combines both semantic and syntactic matching technique and proves to be a better solution to this problem (Muthaiyah & Kerschberg, 2008). The authors provide empirical evidence with hypothesis tests and also provide several new measures such as relevance, reliability and precision to validate our approach.

While the development of Web services and semantic web has been impressive, numerous research opportunities exist. For example, semantic web technologies can help firms to improve internal and external data integration, knowledge discovery, knowledge management, and service-oriented architectures. To realize these benefits, research and practitioner communities need to collaborate on the standard and tool development to encourage the exploration and exploitation of the semantic web technologies, and service-oriented application development to enhance inter-firm data sharing and collaboration. Because web servers typically contain proprietary information from multiple sources, security control over server access is essential. The best security measures for this purpose are yet to be determined.

Ubiquitous Computing and U-Commerce

Ubiquitous computing is a paradigm shift where technology becomes virtually invisible in our lives. The advancement of new technologies such as radio frequency identification (RFID) and sensor networks has initiated a trend towards ubiquitous computing, which is also called "anytime, anywhere" computing (Lyytinen et al., 2004). In a ubiquitous computing environment, computing devices, applications, networks, and data will be fully integrated and merged (Junglas & Watson, 2006). Due to the "anytime, anywhere" pervasive computing, organizational activities become more nomadic. The ubiquitous computing environment will make possible new forms of organizing, communicating, working and living. However, ubiquitous computing systems create new risks to security and privacy.

One important technology for ubiquitous computing is radio frequency identification (RFID) technology. Like other IT value measures, RFID business value includes lead time reduction, productivity improvement, cost reduction, increased revenue, customer satisfaction, competitive advantage, inventory reduction, and other metrics of performance (Michael and McCathie, 2005; Angeles, 2007; Veeramani et al., 2008). A recent survey shows that the cost of the tags and hardware, and the availability of these components are the main issues hampering the widespread adoption of the technology by suppliers (Vijayaraman and Osyk, 2006). Many organizations take a "wait and see" stance and hope to learn more from the early adopters, since the suggested benefits of RFID are still uncertain while RFID technology requires significant up-front investment (Reyes and Jaska, 2007).

Supply chain RFID is an emerging application that has attracted a lot of attention from researchers and practitioners in the U.S., Europe, and Asia (Soon and Gutiérrez, 2008). RFID allows automatic identification and data capture using radio waves, a tag, and a reader. The tag can store more product data than traditional barcodes (Jones et al, 2004). The tag contains product data in the form of Electronic Product Code (EPC), a global RFID-based item identification system developed by the Auto-ID Center. Product data the RFID tag stores include product ID, production location, production date, and shipping container ID. RFID technology enables supply chains to easily and inexpensively collect and share information, thus enhancing supply chain visibility. The enhanced supply chain visibility leads to reduced stock-out, lower labor costs, reduced transaction costs, and improved inventory management in their supply chains (Twist, 2005).

In addition to data storage and information sharing capability, RFID improves information quality significantly. Managers may not use information provided from supply chain partners if they do not have confidence in information quality, and furthermore will not share their own information with their partners. While RFID technology is known to provide more accurate, current, and reliable information to supply chain partners than the traditional barcode technology, which leads to a better collaboration among supply chain partners, challenges such as false read, data overload, real-time acquisition of data, data security, and privacy must be dealt with (Bose & Lam, 2008).

Ubiquitous computing has enabled a new paradigm of commerce which goes beyond any traditional commerce (Junglas & Watson, 2006). This type of commerce is called "ubiquitous commerce", or simply "u-commerce", and is expected to have a great impact on the businesses. Despite the promising future of ubiquitous computing and the tremendous benefits it can bring to customers, customers' privacy concerns appear to be the biggest obstacle and social issue (Asif & Mandviwalla, 2005). The advancement of technologies embedded and used in the u-commerce environment raises concerns of customers because their personal information can not only be constantly accessed and continuously tracked, but can also be easily disseminated and possibly used in ways unknown to them (Gunther & Spiekermann,

2005). From the technical point of view, research need to address the technical features of successful ubiquitous computing applications. From organizational and behavioral point of view, user interface design, perceptions, satisfaction, and privacy issues need to be addressed.

CONCLUSION

Business organizations are in the midst of the turbulent global economy, and face unprecedented challenges and opportunities. For some firms, the new technologies will enable them to increase competitive advantage if they successfully align their business strategies with the new technology-enabled business models. Other firms, which cannot see the opportunities, may suffer significantly from the missed opportunities and eroded competitive advantage.

Emerging e-business concepts and technologies for sustainable business practices and applications which are to be drawn from the recent studies include: (1) previous orientation of some firms towards EDI-related systems proves to be important in the B2B development; (2) m-commerce has enormous potential to become a dominant form of market mechanism; (3) perceived hedonic benefits from the mobile service are the strongest factor that drives user's intentions to use the service; (4) Web services have shown promising results such as greater development productivity gains and easier and faster integration with trading partners. However, despite the rapid development in the Web services area, many issues including information security still remain to be resolved in the context of e-commerce; (5) supply chain RFID is an emerging application that has attracted a lot of attention from researchers and practitioners. These observations should be taken into account in the design of sustainable business practices and applications

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