Chapter 2
Technologies for Cross-Border E-Commerce

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ABSTRACT

Given deregulation and advances in technology worldwide, cross-border e-commerce is the next move for any business venture regardless of its size. From corner shops to giant multinational organizations, every business venture is now addressing the online demand of customers at home and abroad. Many developed and emerging countries have already been rallying for a transparent and sustainable online business environment to achieve the full potential of cross-border e-commerce. This chapter describes the technologies that enable cross-border e-commerce.

INTRODUCTION

Cross-border e-commerce (CBEC) refers to all parties that use information technology for their digital transactions, such as marketing, services, payment, trading, and other business activities. First, this mode of trade integrates the features of international e-commerce which involves high complexity in the logistics and the capital and information flows. Second, this process involves customs, inspections, quarantines, and foreign exchange which are difficult to maintain in terms of payment, legal clearance,

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and taxes. Third, unseen risks are associated with the international economic collaboration, geo-political environment, and national policies. The above aspects are observed in all sizes of business.

Till today, small businesses are preoccupied with whether they would lose their local customers to international chains as the economy globalized. A branch of research has revealed the drawbacks to small businesses of globalization. However, those days are over now. Small businesses can no longer remain local. With the advent of e-commerce, international payment methods, and advanced supply chains, the fate of local business has flipped. With a potential worldwide customer base of more than seven billion, businesses of all sizes can operate in the global market and offer their products through CBEC.

CBEC is the latest version of globalization. As with all versions, the purpose is integration, exchange, and communication across national borders and cultures. CBEC shortens the distance between global buyers and sellers using state-of-the-art information and communication technology (ICT). Elani Chang, the president of Amazon China, says CBEC is allowing Chinese people to connect to producers from other countries and sell their own products worldwide. The United Nations reports that the average annual growth of Chinese CBEC is 33.1 percent.[1] Many countries in developed and emerging economies have reported similar growth in CBEC.[2] Studies examining countries' performances before and after the global financial crisis of 2008 and examining e-commerce during the recovery have even found that e-commerce has been more stable than before the financial recession period (Martin & Isozaki, 2013; Savrul & Kılıç, 2011).

Customers are attracted to CBEC by the wide product assortments and competitive pricing. Though the potential of CBEC has been skyrocketing, both online business-to-customer (B2C) and offline business-to-business (B2B) activities share the concern of distance factors- as such supply chain management. The advent of the internet may have threatened the "death of distance" (Cairncross, 1997). Yet cross-border distance presents challenges to online trading no less than to offline trading (Lendle, Olarreaga, Schropp, & Vézina, 2016).

For conducting CBEC, it is necessary to ensure the presence of internet as well as online service providers (Giuffrida, Mangiaracina, Perego, & Tumino, 2019; Qi, Chan, Hu, & Li, 2020). Every CBEC transaction is made over the internet (through a company's own website or a third-party online platform), so firms do not need physical presence in the host market. For example, HM.com can provide its items directly from the warehouse in London to H&M customers in Malaysia. In China, CBEC is growing exponentially (Qi et al., 2020). A 2016 report showed that China's CBEC had reached RMB 6.7 trillion, an increase of 31.6 percent compared with the previous year. At the development stage, the main purpose is to cultivate businesses along with online platforms, which is why various cross-border platforms (for example, Wish.com, Vip.com, Mia.com) build robust ecosystems with the assistance of several service providers (Xu, 2017a).

CBEC is playing a significant role in supporting online platforms and technology-oriented services that are transforming traditional trade into international trade and enhancing economies (Xu, 2017a). At the initial stage of CBEC, customers purchase overseas products via lengthy supply chains. CBEC shortens lengthy supply chains thereby reducing customer waiting times (Xu, 2017b).

DIFFERENCES BETWEEN THE OLD ECONOMY AND THE CBEC ECONOMY

CBEC differs from the old economy in many ways. Aktan and Vural (2004) note key elements of economies that may change during technological revolutions. In table 1 I take those elements and use them to portray the economy in the age of CBEC.

Table 1. Differences between old economy and CBEC economy

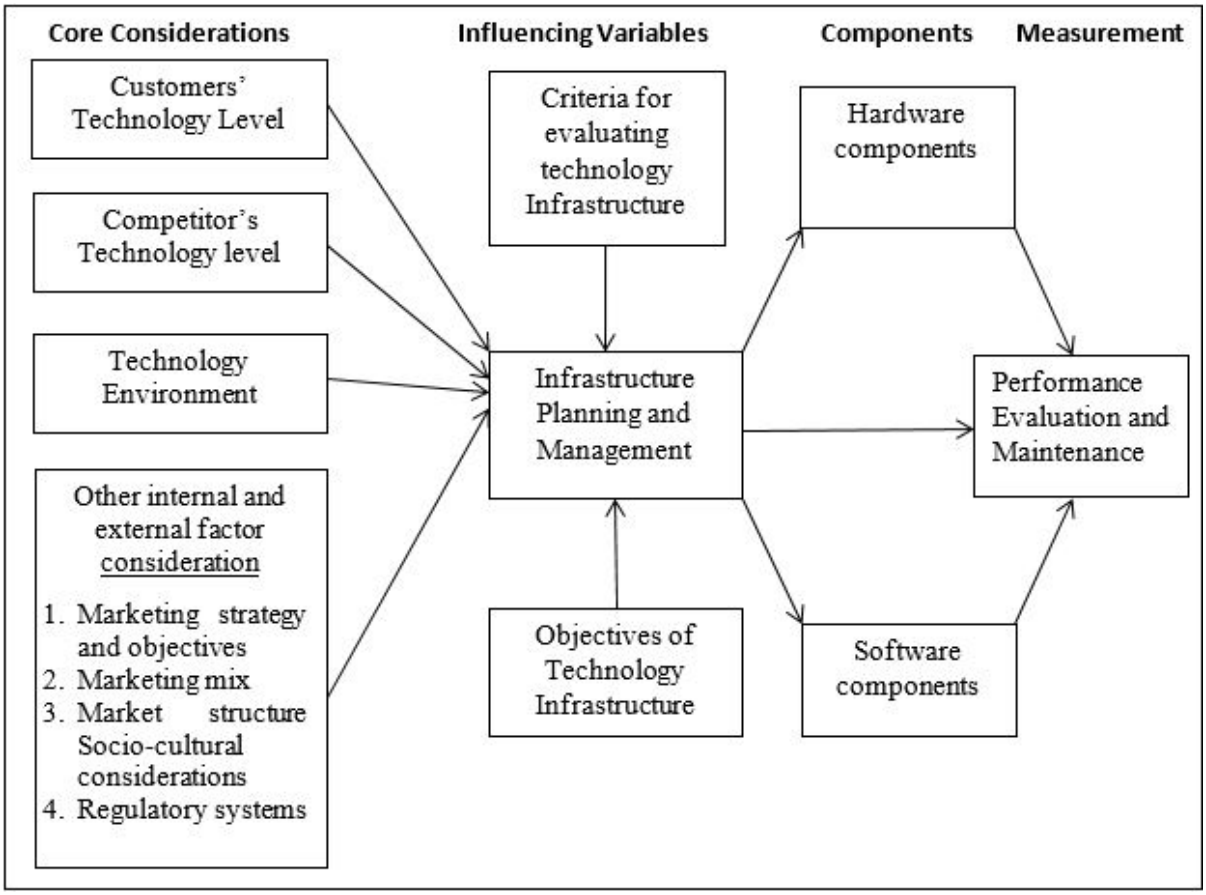
Element of change (Aktan & Vural, 2004)	Economy (Aktan & Vural, 2004)	Economy with CBEC (authors' comment)
Production and competition	Nationally mass production	Flexible and global support
Organizational structure	Bureaucratic	Supportive networking
Growth factor	Land, labor, and capital	Apart from these, innovation, and information
Technology factor	Mechanization	Information and Technology management
Research and development	Low, economics of scale	Highly sensitive to innovation
Industry relation and integration	Acting along	Very competitive but professionally supportive with non-industry peers
Country regulation	Highly regulated	Free trades are welcome and less regulation
Employment nature	Stable and non-expert to any knowledge	Very unstable and required an expert knowledge
Industry structure	Agriculture and industry focus for mass production	High-tech involvement in any sector

Four types of parties are involved in CBEC operations: organizations, customers, citizens, and governments (Chaffey, Hemphill, & Edmundson-Bird, 2019; Savrul & Kılıç, 2011). These parties often integrate to attain various benefits. There are several types of CBEC business models: B2B, B2C, consumer-to-consumer (C2C), business-to-government, consumer-to-business, peer-to-peer, and others (Chaffey et al., 2019).

CBEC INFRASTRUCTURE PLANNING AND MANAGEMENT

The widespread diffusion of advanced technology fueled by ongoing globalization has created opportunities for e-commerce marketers to tap into international markets by reducing marketing and administration overhead. The combination of internet connections, electronic data interchange (EDI), automated data-collection systems, social media, and mobile devices has fueled the growth of CBEC. CBEC infrastructure comprises two types of platforms: trading platforms and information-services platforms. To develop effective technology infrastructures for CBEC, marketers need to consider customers' and competitors' level of technology, the level of technology available in the market, and other internal and external factors such as marketing strategy and objectives. The evaluation criteria and objectives of the technology infrastructure influence the infrastructure planning and management. Finally, companies select and incorporate required hardware and software components into the technology infrastructure

Figure 1. Infrastructure planning and management model



and measure the performance of the adopted technology in order to support future maintenance and renovation. Figure 1 portrays the components of CBEC infrastructure planning and management.

Objectives for E-commerce Technology Infrastructure

CBEC has become the magic word in the era of web development and internet-driven innovations. It crosses the boundaries between countries and accelerates global economic growth. To ensure efficient and effective operationalization of e-commerce business ventures, companies need to be concerned about how to develop e-commerce infrastructure and why. Companies develop e-commerce infrastructure with three critical objectives:

1. **Building scalable infrastructure:** Companies are always focused on efficiently operationalizing themselves. In comparison to brick-and-mortar businesses, CBEC companies face a thousand times more competitors. A scalable business model that has open, distributed, and safe infrastructure ensures provisions for future goods.

2. **Customer-oriented value creation:** Correctly chosen CBEC infrastructure creates customer value and increases the efficiency of the delivery of content and market offerings to customers. The prudent selection of infrastructure framework eventually enables companies to execute strategies for fulfilling customers' demands efficiently and for increasing their revenue.
3. **Ensuring the venture's sustainability:** The technology environment is very volatile. Companies need to define the right business model to ensure that they, in tandem with the information technology infrastructure, are sustainable. A correctly chosen technology framework strengthens multilateral economic cooperation and helps ensure optimal use of allocated resources and, in turn, efficient business operations and customer loyalty.

Criteria for Selecting a Technology

Companies need to choose the right technology infrastructure to efficiently operationalize their business model and to maximize their revenue. Some criteria are available for selecting the right technology for a CBEC business model:

1. **Flexibility:** Flexibility means the e-commerce environment should be easy for all users to manage and should quickly respond to changing customer requirements. Companies must be able to adapt new technologies to larger scale.
2. **Usability and reliability:** Consistency in product delivery and service provision is another important evaluation parameter when choosing a technology infrastructure. Customers using e-commerce platforms seek uniform service provision. When any service fails, it frustrates them and causes them to trust the company less. The adopted technology should be consistent with customers' technology level to ensure it is usable.
3. **Scalability:** The CBEC technology infrastructure should be scalable not only technologically but also in terms of traffic and human resource (HR) management. The system must not collapse or slow down when companies provide additional services or at peak turnover time. To ensure scalability, companies need to stay up-to-date by adding new technologies and services.
4. **Security and compliance:** E-commerce technology infrastructure is vulnerable to hackers, malware, security attacks, and more. It must allow firewalls and paid security services to protect from those attacks. Moreover, the technology structure needs to comply with industry- and firm-specific regulations. The privacy of customers should also be considered.
5. **Scope, performance, and management:** Companies selecting a technology framework for their CBEC ventures also need to consider factors such as how to control, monitor, and individualize different web interfaces. They also need to consider how to fulfill specific requirements and skills of company personnel and customers.
6. **Costs:** Developing and maintaining CBEC technology infrastructure incurs several costs—from hardware, software, and license acquisition to server maintenance. Companies should consider those costs and CBEC infrastructure policies before adopting a technology.

Hardware and Software Requirements

CBEC adapts technologies to ensure the overall efficiency of an organization. The infrastructure of a business venture makes that business stand out in this highly competitive market. The CBEC infrastructure

identifies some hardware and software components along with their functionalities. Table 3 highlights the hardware and software components required for a CBEC venture.

Hardware Components

Hardware allows companies and customers to connect to the network and access the outside world. With it, they can store data and use it or retrieve it when needed. Three types of hardware components are required to operationalize CBEC infrastructure: information repositories, information security, and devices.

Information Repository

An information repository comprises three kinds of components: servers, proxy servers, and load-balancing systems. A server is a computer program or device that stores and delivers content and other information to another connected device over the internet. For a web server, three components are required: the hardware device, operating system, and web-server software. The server's space requirement depends on purpose of the company undertaking e-commerce and, on the business's operational needs. A dedicated server helps a company get the best results. However, the server can also be a virtual server, Structured Query Language (SQL) server, cloud-hosted server, or local-network server.

A proxy server also stores information, but it also acts as an intermediary between the client and the resource server when the client requests a service. The request from the customers goes to the proxy server first, which evaluates the request, thus reducing the complexity of the resource servers. A proxy server may or may not reside on the user's PC. Proxy servers may be open proxy servers or reverse proxy servers. An open proxy server, open termed a forwarding proxy server, can be accessed by any internet user. A reverse proxy server performs load balancing and decryption. Finally, load-balancing systems distribute workloads among multiple computing devices to improve CBEC operation. They increase scalability by directing traffic among servers and minimizing response latency. Various algorithms can be used for load balancing, among them round robin, least connections, and source IP hash.

Information Security

Information security comprises three kinds of components: firewalls, encryption devices, and interactive voice response (IVR) units. A firewall protects a CBEC infrastructure network from outside attackers. It works like the gatekeepers in a shopping center. It screens the traffic, determining who may enter the system. It can also scrutinize data entering and leaving the server. There are three types of firewall: picket-filter firewalls, circuit-level firewalls, and application-gateway firewalls. Picket-filter firewalls use a set of predetermined rules to decide whether particular packages of data are allowed to pass. Circuit-level firewalls also use predetermined rules but have greater functionality as they work in the layer of Open Systems Interconnection (OSI). Finally, the application-gateway firewall works in the application layer of the OSI model.

The success of CBEC depends to some extent on encryption devices because it secures data transmissions and controls data access. Encryption refers to encoding of data using a special algorithm so that it becomes incomprehensible if its transmission is intercepted. It ensures integrity of both company and customer data, and it enhances the reliability of CBEC. Two methods of encryption are widely used in CBEC: Secure Sockets Layer (SSL) and Secure Hypertext Transfer Protocol (S-HTTP). SSL is used at the computer level and S-HTTP at the internet level.

Finally, IVR technology allows computers and customers to interact with each other using voice and dual-tone multi-frequency signaling (DTMF) tones with the help of keypads. It helps operationalize CBEC by handling high call volume and providing services 24/7. Three types of IVR are used in CBEC infrastructure: IVR for self-service, hosted IVR, and agent assisted IVR.

Devices

Devices comprise two types of components: computers and supporting devices. Companies need to choose and install devices according to their financial capability and operational requirements. For CBEC infrastructure to function well, companies need to adopt state-of-the-art devices and continuously renovate and upgrade those devices to keep up with the changing technological landscape. Estimating the number of required devices depends upon the following questions:

- Does the webshop experience high traffic or low traffic?
- How many persons visit the website per day?
- What is the maximum number of simultaneous visitors?
- What is the maximum number of simultaneous orders?
- How complex is the product catalog, and how many products does it offer?
- What is the size of the database?
- What is the number of search queries?

Answers to those questions inform decisions regarding requirements for computers and other devices. A simple CBEC infrastructure with very low traffic and few products may require a CPU of 1.6 GHz, a 4x1.6 GHz database, 4 GB RAM, and 10 GB of database space. According to Appedology, for up to 7,500 users, 200 GB disk space, 8 CPU cores, and 16 GB RAM is enough.

Software Components

Software components of CBEC help companies to streamline business processes relevant to selling products internationally. Choosing the right software improves international sales strategies, increases operational efficiency, and lowers trade risks. Companies must integrate CBEC software with payment gateways and shipping software to complete the business process. Generally, logistics managers are responsible for implementing CBEC software because they manage almost all aspects of a global business including global payments and shipping. For successful implementation of CBEC, three kinds of software are needed: software modules, standards, and web analytics.

Software Modules

Software modules such as content management systems (CMS), application programming interfaces (APIs), database management systems (DBS), and middleware are required for developing and maintaining CBEC websites. To develop a CBEC website, a business needs a domain, a platform, an integrated payment system, and initial capital. CMS create and manage digital website content. Web content management systems are included in the category. Some of the best CMS include Magento, WooCommerce, Shopify, Prestashop, and OpenCart. APIs are used to share data between applications. They are tools

Table 2. Hardware and software components for CBEC

Infrastructure overview	Main classifications	Components	Tools
Software components	Software modules	CMS	Magento WooCommerce Shopify Prestashop OpenCart
		API	Amazon API Shopify API ebay API WooCommerce API Magento
		DMS	Oracle Database MS SQL MY SQL IBM BD2 IBM Informix
		Middleware	Database middleware Application-server middleware Message-oriented middleware Web middleware Transaction-processing monitors
	Analytics	Web analytics	Google Analytics Spring Metrics Woopra Clicky Mint Chartbeat
		Text analytics	QDA Miner WordStat SimStat
		Big data	Big-data analytics
	Standards	Object oriented	COBRA
		Communication protocols	https, messaging
		Database	Open database connectivity (ODBC)
		Application specific	Common gateway interface (CGI)
Hardware components	Information repository	Servers	Virtual server SQL server Cloud-hosted server Local-network server
		Proxy servers	Open proxies Reverse proxies Web-proxy servers SOCKS proxy Transparent proxy CGI proxy Suffix proxy I2P anonymous proxy
		Load-balancing systems	Round robin Least connections Source IP hash
	Information security	Firewalls	Packet-filtering firewall Circuit-level gateway Stateful-inspection firewall Application-level gateway (proxy firewall) Next-generation firewall (NGFW)
		Encryption devices	SSL Transport Layer Security (TLS) S-HTTP
		IVR units	IVR for self-service Hosted IVR Agent-assisted IVR
	Devices	Computers	PC, laptop, pump top
		Others	Hubs, routers, data centers

for building software applications. APIs specify how different software components interact with each other. Among APIs used for CBEC, Amazon API, Shopify API, and eBay API are noteworthy.

That is why companies should focus on designing different databases that can be used in CBEC website development. Some commonly used database designs are Oracle Database, MS SQL, MY SQL, and IBM Informix. Middleware is an intermediate system between the clients and the service providers. It includes communication protocols, data access, specialized servers, or a mix of all of those components. Two computer systems are connected by it. It allows those computer systems to send data from one side to the other. Some commonly used types of middleware are database middleware, application-server middleware, message-oriented middleware, web middleware, and transaction-processing monitors.

Analytics

The environment for CBEC is very competitive as barriers for new entrants are very low. To succeed in the market, companies must analyze their capabilities and capacities. Doing so can improve their overall systems. Analytics tools help companies to assess the real condition of e-commerce sites. They generate reports that are quite similar to business reports with purchasing activity and transaction details. Companies can analyze average order value, order data, transaction data, purchase time, and so on. Companies can make decisions about how to attract more visitors and how to retain existing customers. Three kinds of analytics are commonly used for CBEC: web analytics, text analytics, and big data. Web analytics enables a company to analyze transactions and data on purchases completed through the website. Various tools are used for analyzing web traffic. Among them, Google Analytics, Spring Metrics, Clicky, and Mint are commonly used in CBEC. Text analytics is commonly known as text data mining. It is used for analyzing written communication. Some of the tools that are considered best for analyzing written communication for CBEC are QDA Miner, WordStat, and SimStat. Finally, big-data technology can help a company by predicting the latent trends in the CBEC sector. The greatest advantage of big-data technology is that it can simultaneously analyze structured, unstructured, and semistructured data and provides an integrated result. With the help of big-data technology, a company can understand the purchasing behavior of customers in the context of existing market trends.

Standards

Standards for CBEC may be specific to the object, communication, database, or application. The benefit of object-oriented standards is reusability. Another type of standard is communication protocols. Communication protocols set some kinds of rules that every communication end-point must use to exchange information. Email, internet, EDI software, and other web technologies together with communication protocols enable companies to do business in an e-commerce environment. Such technologies and protocols specify the common packet format for all nodes connected to e-commerce sites. Two commonly used communication protocols are messaging and https. Standards are also required for e-commerce databases. One example of such a database is open database connectivity (ODBC). It allows a business to access all heterogeneous SQL databases using a common interface. It is based on SQL. The main benefit of this database is that it provides maximum interoperability with a common code. Finally, application-specific standards such as common gateway interface (CGI) provide an interface for web servers executing application programs which dynamically generate web pages for different CBEC companies.

A Technology Framework for CBEC

A technology framework for CBEC is a means of synthesizing various resources such as data repository, DBS, computer languages, security layers, communication protocols, and so on in an integrated platform to help operationalize a business venture according to prespecified objectives. Figure 4 visualizes the technology framework of a CBEC venture. Normally, the technology framework for an e-commerce business venture begins with user interfaces, which pass though web servers, application servers, and security layers to reach a database or data repository. The data repository contains different kinds of data, including customer data, order data, transaction data, and product data. Web analytics enhances the volume of real-time data stored on a database. In all the layers of CBEC technology, framework security is strictly maintained. Almost all CBEC architectural frameworks consist of six layers of functionality:

1. Application services
2. Data-transcription and data-management services
3. Interface and support layers
4. Security layers
5. Middleware and document interchange
6. Communication service and network infrastructure

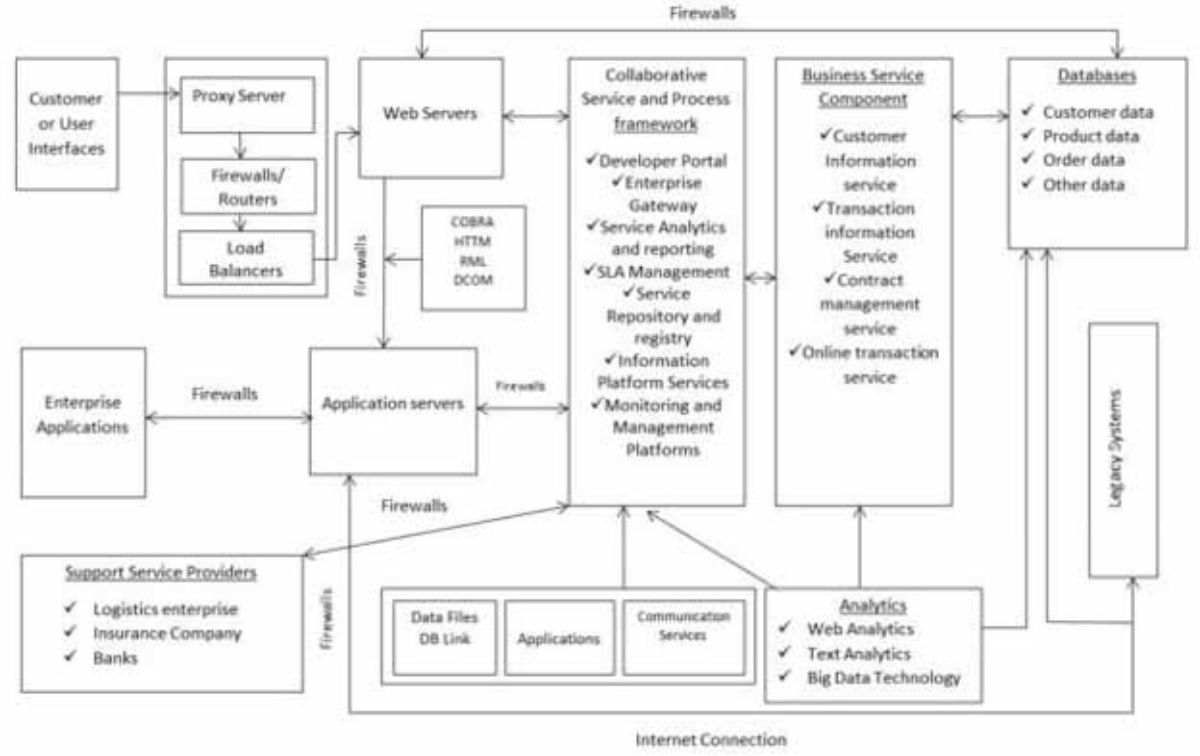
Companies must decide what kind of e-commerce application to implement in application-service layers. The data-transcription and data-management layer works as an intermediary between customers and information providers. It also provides real-time updates about transactions and impressions and facilitates future transactions. An interface layer including such elements as interactive catalogs and directory-support services provides customized information to different users. The main problems of CBEC transactions are privacy and security. To protect privacy and security, companies implement different security layers such as firewalls. Encryption and authentication techniques ensure security, privacy, and confidentiality of users' data. Middleware layers integrate the diversified software programs and improve their interaction. In this case, companies also require following certain standards related to communication protocols, objects, and databases to align with industry practices and avoid regulatory hassles. Finally, to ensure effective and efficient lineage between customers and suppliers, companies develop a prudent network infrastructure.

CBEC Technology Infrastructure: Optimization Problem and Solution

A company needs to carefully consider the design of technology infrastructure because the outcome of operations depends on it. Some CBEC companies, such as Amazon, have reached the peak of success because they have adopted up-to-date customer-oriented technology architecture. Because of its technology architecture and huge product lines, Amazon has been successful in extending its operations to more than eleven countries. Some technological limitations create obstacles to operationalizing CBEC. The limitations are as follows:

- Although various companies are working on issues of CBEC-architecture security, the architecture's security, reliability, communication protocols, and standards still lack stem strength and are vulnerable to hackers and other attackers.

Figure 2. Technology framework of CBEC



- Insufficient telecommunication bandwidth is another problem for successful implementation of CBEC.
- The technology environment is very volatile. Newer and newer software is entering the market, and features of existing software components are changing rapidly.
- Sometimes integrating e-commerce software with existing database and applications is very difficult.
- Companies require special web servers and other infrastructure even after having network servers.
- Incompatibility between hardware and software components and between application software and system software is another major problem.
- Lack of awareness and lack of interest about modern technology hinder CBEC companies from undergoing revolutionary change.
- The digital divide around the world keeps a great many people away from modern technology.
- Technology personnel's lack of skills and expertise and the absence of proper cyber law and cyber brand image decrease the confidence of both customers and marketers.
- The development and maintenance costs of CBEC architecture are high, and the renovation of e-commerce architecture often goes through drastic change.

To overcome those problems, merchants need to provide more-personalized services to clients in addition to providing one-stop shopping and omni-channel delivery systems. Different countries have

different cultures and traditions. CBEC companies need to take local characteristics into account when designing CBEC technology architecture.

ARCHITECTURAL FRAMEWORK AND BUSINESS SIZE FOR CBEC

The architectural framework of CBEC means the integration of different technologies involved in the exchange of products or services: data depository, software language, communication, DBS, payment agent, international supply chain management, and legal backup. For functionality and operation, the integration of these technologies may take place in different layers. This process differs with the size of operation and level of integration among buyers and merchants and with the nature and policy of governments involved. It is obvious that businesses of different sizes—small, medium, and large enterprises—do not require the same architecture to successfully engage in CBEC.

Technologies for Small Firms for CBEC

Small firms typically do not have many products and much variety of services to offer globally. Thus, they have limited business transactions. However, small business could not engage in CBEC without the support of experts and state-of-the-art technologies. The first part of the solution is for small businesses to look for freelancers on platforms such as Upwork or Fiverr. Second, small businesses must manually check country-specific restrictions on different products since the whole world is not a free trade zone yet. Finally, small businesses must offer scalable technology or a platform for cross-border customers. Many online platforms offer basic features and options for small businesses to operate free of cost. BigCommerce.com, Casengo, MailChimp, and ShipStation are some of the leading ones.

Technologies for Medium-Sized Businesses for CBEC

The global market is saturated with similar products. Hence, businesses seeking to enter the market must carefully and completely examine the cross-border market by analyzing the potential competition and its strategies and what else they can offer. Once they decide to enter, the first step is to recruit the best agents at home or abroad for creative and customized design, customer services, and order processing. Second, once a business has these functionalities, it must merchandise its products by focusing on the target market. Most importantly, merchandising products requires the business to examine the climate, competition, customer trends, and religious sensitivity of the target market. Unlike a small business, a medium-sized business must rely on technological support while preparing to enter foreign market through e-commerce. Major technological supports include email marketing, product-information management, and order processing. Last but not least, medium-sized businesses must have a strong foundation in logistics and shipping.

Technologies for Large Enterprises for CBEC

For enterprises that already have high turnover, engaging is CBEC is necessary to continue to grow. Large enterprises must place a corporate culture within the management practice to respond to any cross-border issues locally and authoritatively. At this stage, incorporating point-of-sale (POS) systems is

very important. They help enterprises to synchronize inventory automatically. Clover, SpringBoard, and Square are commonly used POS systems around the world. Very often enterprises in CBEC emphasize transformative lifestyle. Similarly, enterprises must localize the technology they use for reaching their target market. For example, if one wishes to expand marketing in China, WeChat is a better technology to use to connect with customers than Instagram is. Finally, a transparent, global omni-channel solution is a must for any large enterprise seeking to engage in CBEC.

Regardless of the size of the business, entering CBEC is an expensive decision and time consuming to receive feedback from operations. Hence, a business must undertake a comprehensive analysis of the technologies involved and the entrepreneur must be able to assess trends and risks. Because, little happens quickly.

FUTURE TECHNOLOGIES FOR CBEC

Incredible advancements in technologies have had momentous impacts on CBEC. In this era of continuous change in technology, businesses can never stop developing ways of connecting with customers, making the shopping experience more cost-effective, and empowering customers with delivery to ther doorstep. The latest technological trends in CBEC include the following:

- **Omni-channel support:** One new online-shopping trend is cross-channel researching and purchasing. CBEC requires that customers have video-chatting, cobrowsing, screen-sharing, document-interaction, and even digital-signature functions available to them while shopping online.
- **Extensive personalization of product:** Customers in the future will appreciate a product comparing their previous experiences. Their relative judgments have put CBEC in a dynamic and complex direction of making customers happy.
- **Conversational marketing:** Allowing customers to express their preferences in real time through CBEC is now a new trend. Apart from ready-made questions and answers, two-way conversation helps potential customers to learn more about a product. This is made possible by third-party agents or artificial intelligence.
- **Demand-driven forecasting:** Artificial intelligence and big-data technology are now common ways to help a business predict demand for and supply of its product. Anticipatory product design different customized offer and promotion will mostly lead the future CBEC.
- **Artificial intelligence for customer communications:** The use of artificial intelligence in customer support is not a new trend in e-commerce. Common examples are chatbots and virtual assistance. For example, the Starbucks chatbot gives customers details on their order and other matters.
- **Image and voice-recognition search:** Imagine a customer saw a customized chair on a television show. If the customer can take a picture of it and use the picture to search for a similar chair from a company, the customer may be able to act on their preference. Similarly, voice-recognition customer order and conversation are a recent trend in CBEC.
- **Digital supply chain:** Digital optimization of supply chain management through port management (autonomous freight shuttles), inventory management (hack-proof RFID chips), warehouse management, and delivery can ensure customer satisfaction and loyalty.
- **ROBO/ROPO:** Recently, ROBO (research online, buy offline) and ROPO (research online, purchase offline) have been trending.

Other future technologies in CBEC include product visualization, augmented and virtual reality, and big data.

DEVELOPMENT STAGES OF CBEC: THE CASE OF CHINA

The global development of CBEC does not mean all countries are developing at the same time. Countries may reach different stages of CBEC development at different times and different success rates. Despite differences across countries, from the perspective of the industry economic theory cycle there are four common stages of CBEC development for any country (Hongfei, 2017; Ming & Zhongtao, 2017). To illustrate, I present in table 3 the development of CBEC in China along with the development stages.

As in the case of China, the development of CBEC in any country can be measured and highlighted using the four stages of industry economic cycle theory.

BUSINESS MODEL IN CBEC

Notwithstanding the success stories of Amazon, Alibaba, and eBay (Alt & Zimmermann, 2016), recently many cross-border marketplaces have failed because of poor performance (Ahmad, Abu Bakar, Faziharudean, & Mohamad Zaki, 2015). For example, in 2016 Metao.com failed in 2016 within only three years of beginning operations. CBEC faces some barriers concerning language, cultural differences, the law, geography, and payments (Terzi, 2011; Turban, Whiteside, King, & Outland, 2017). Earlier research focused on buyers' perspective on CBEC—for instance, their focus on lower product prices (Mou, Cohen, Dou, & Zhang, 2017). Buyers were satisfied with the CBEC marketplace as measured by quality of website, ease of use, security, and other factors (Davis, 1989; Delone & McLean, 2003; Kim, Ferrin, & Rao, 2009; Y. S. Wang, 2008). The problem is one of trust building, a crucial factor (Guo, Bao, Stuart, & Le-Nguyen, 2018). Buyers consider trust along with reputation and word of mouth when making purchasing decisions (for example, (Fong & Burton, 2008). Though only a few studies conducted from the seller's perspective have considered trust and perceived risk, from the buyer's perspective those factors have been considered (Fornell & Larcker, 1981). One exception that focuses on the seller's perspective on e-commerce and the CBEC marketplace is (Huang, 2018), who developed a method for identifying fraudulent merchants.

Based on previous research, Cui, Mou, Cohen, and Liu (2019) develop a business model from the seller's perspective by taking a three-stage sequential multimethod approach and drawing on two popular theories: the valence framework and the system-success model. The system-success model provides a framework for understanding which features are relevant to a system and what the effect of these features is on user behavior (Delone & McLean, 2003). The valence framework shows the variance between perceived benefits and perceived costs. Valences applied this framework on the context of e-commerce and describe user's purpose for maximizing net utility (Peter & Tarpey Sr, 1975). obtain constructs from previous e-commerce research and explore the relationship among such factors as perceived benefit, perceived cost, trust, system quality, intention to use.

Financial benefits, product benefits, strategic benefits, and marketing benefits are variables under the heading of perceived benefits. Another item—buyers' and sellers' perspectives on CBEC—has been added based on earlier research on perceived benefits (Kim et al., 2009). Financial costs, logistic

Table 3. Stages of CBEC

Development stage	Development criteria	Development of CBEC in China
Initial stage	• Only a few enterprises begin to integrate their traditional business with the internet to bridge with the international market. • There are few or no regulatory barriers. • Enterprises have very poor customer response rates because the country has few internet users. • The online payment system is very complex and restricted. • Logistics and distribution networks are poor.	• From the inception of the internet in 1994 till 2000, only 5.2% of current e-commerce enterprises' initiated operations in China. • Nanjing Technology Development Company became in 1996 the first chemical company to establish a website. It was a B2B website. • The first C2C e-commerce platform was eBay. • Alibaba, a B2B platform, was established in 1999. • In 2020, the first government office for CBEC—China Electronic Commerce Association—was established.
Accelerated-development stage	• The number of internet users increases exponentially. • The e-commerce industry becomes an important trading channel. • Major foreign investors are attracted by the country's e-commerce potential (go-local strategy). • Governments start to regulate e-commerce activities.	• According to China Internet Network Information Center (CNNIC), by 2007 the number of internet users in China reached 210 million, out of which 46.4 million were online shoppers. • In 2002 eBay bought EachNet and became the first foreign investor in China. • In 2004 Amazon bought Joyo Net for $75 million. • Alibaba promoted the third-party payment guarantee by launching Alipay. • The Chinese government imposed the Electronic Signature Law of the People's Republic of China, governing online trading platforms in 2004. • In 2004 the first business conference on e-commerce using the C2C model was held in China.
Standardization stage	• All departments of government participate in making policy or promoting short-term and long-term models for integrating e-commerce. • The number of internet users reaches its peak. • CBEC gets higher priority than domestic e-commerce.	• According to CNNIC, the volume of online shopping in China grew to 1.3 trillion yuan in 2012 from 128.15 billion yuan in 2008. • The Ministry of Commerce issued the "e-commerce model specification" and "online shopping service standard" in 2009. • The Ministry of Human Resources and Social Security issued "the Notice on the Entrepreneurship Leadership Program for National University Students." • The General Administration of Quality Supervision, Inspection and Quarantine issued the "e-commerce work product quality improvement action plan." • Many other government departments have adopted CBEC policies.
Globalization stage	• Domestic growth of e-commerce reaches maturity, and CBEC grows steadily.	• In 2014 Alibaba, Jumei, and Jingdong went public in foreign capital markets.

costs, marketing costs, and product costs are variables under the heading of perceived risk. In the case of perceived cost, overall risk can be considered a measurement variable (Kim et al., 2009). Ease of learning, order management, logistic system, product management, interface, and ease of learning are the variables under the heading of system quality (Y. S. Wang, 2008). Special needs, ability to answer, willingness to help, problem solving, security and privacy, and e-market service are variables under the heading of quality.

Trust is the subjective belief that an entity has to fulfill its obligations on the internet (Delone & McLean, 2003). In the virtual market, it is not possible to interact with the seller, so trust can be obtained

by system quality and service quality (W.-T. Wang, Wang, & Liu, 2016). System quality and service quality are the indicators that constitute trust (Morris, Marshall, & Rainer Jr, 2002).

There are theoretical and practical implications of this business model (Cui et al., 2019). By combining the system-success model and the prevalence framework, we can see that service quality and system quality significantly increase a seller's trust in the perceived benefits of cross-border trade. In this business model, cross-border trade from the seller's perspective has managerial implications also. Firstly, long-term sellers should be focused on improving system quality; at the same time, they need to increase service quality to build trust and enhance subsequent cooperation. Secondly, both cross-border and domestic sellers consider perceived benefits as a strong attractor and plan to recruit sellers.

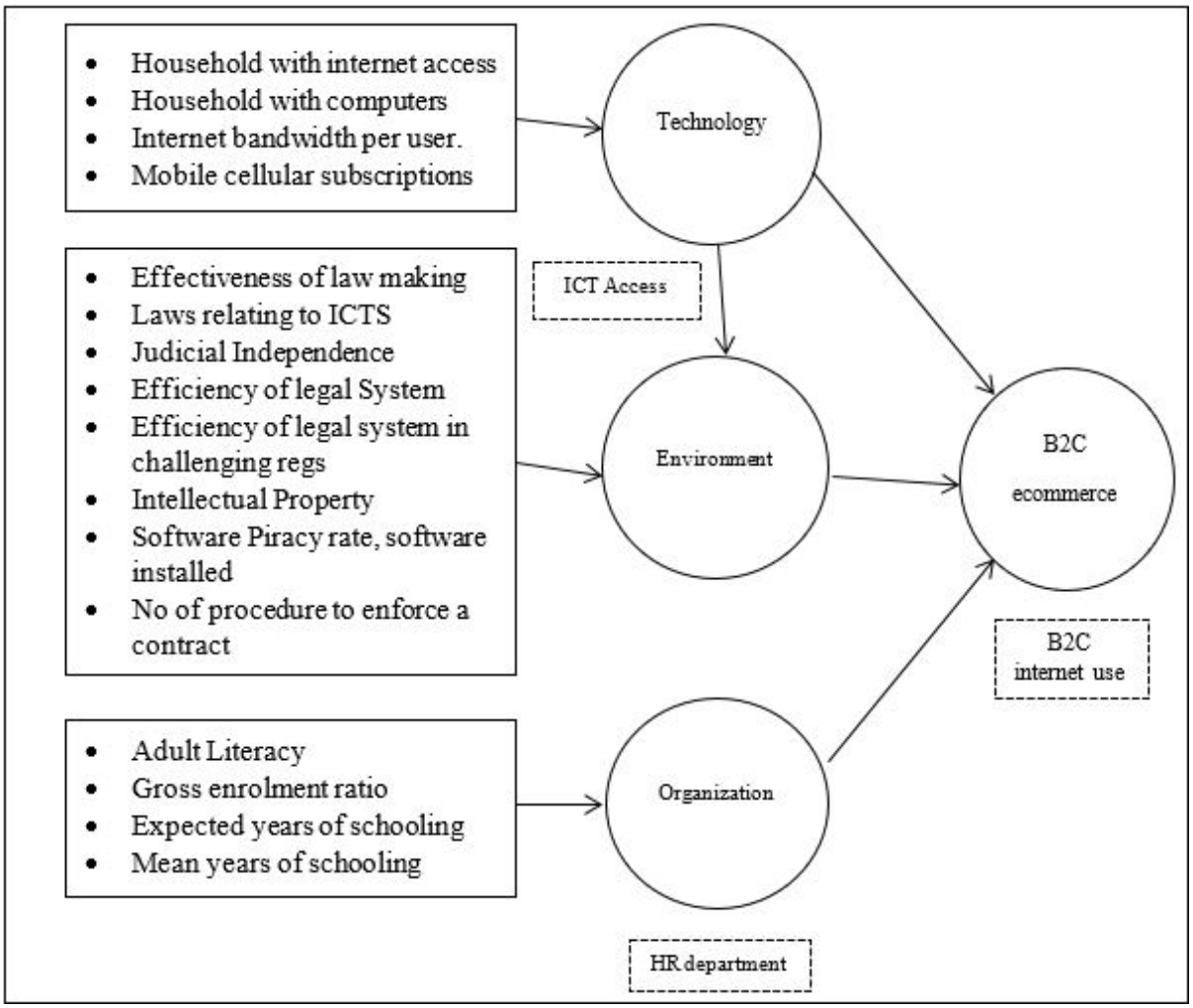
CITIZENS' READINESS FOR CBEC TECHNOLOGY ADOPTION

In recent years, many businesses worldwide have given priority to e-commerce (Kang & Kim, 2019). In most cases, companies depend on internet or information technology for business activities such as buying and selling products (Rodríguez-Ardura & Meseguer-Artola, 2010). Europe, Asia, and North America are experiencing growth in online business compared with the rest of the world (Kang & Kim, 2019). E-commerce is categorized by transactions between corporations, customers, and governments (Thatcher, Foster, & Zhu, 2006). Among these categories, B2C transactions especially have got customers' preference (Iddris, 2012). In 2018 about 1.8 billion people—one-seventh of the world—purchased products online (Statista 2019a). It is expected that in 2021 e-commerce retail sales will surge to $4.88 trillion (Statista 2019b).

A study of Spanish companies on the drivers for B2C e-commerce used the technology-organization-environment (TOE) theoretical model and found technological readiness, ICT usage, government regulations, and scope of firm operation affect the implementation of B2C e-commerce (Kang & Kim, 2019; Rodríguez-Ardura & Meseguer-Artola, 2010). The TOE framework has been adopted in different areas of the field of information systems such as EDI, open systems, and interorganizational systems. The TOE model has been applied to the implementation of CBEC by information-systems scholars. Depietro, Wiarda, and Fleischer (1990) argue that technological, environmental, and organizational contexts influence the procedure for implementing technological innovations in the TOE framework. In this framework, organizations implement technological innovations that are influenced by organizational (features and resources of the organization), technological (equipment, processes), and environmental (the firm's competitors, the size and structure of the firm, the regulatory environment) contexts. Gibbs and Kraemer (2004) explain that technological readiness and environmental factors play important roles in the adoption of CBEC. Technological, environmental, and organizational contexts are discussed in figure 3.

- **Technological Context:** Technological readiness refers to the technology infrastructure of a firm and the application of IT in the HR department; it ensures the availability of technologies to the firm (Oliveira & Martins, 2009). Several studies find that the technological infrastructure of a country greatly influences the implementation of CBEC and also ICT systems (Aljowaidi, 2015; Krishnan, Teo, & Lim, 2013). ICT access includes households' internet access, personal computers, fixed-telephone subscriptions, internet bandwidth per user, and mobile-telephony subscriptions (ITU 2017). In addition, government policies or mechanisms can be applied to control ICT

Figure 3. Technological, environmental, and organizational contexts in CBEC
Source: (Adam, Alhassan, & Afriyie, 2020)



access of citizens countrywide for measuring and ensuring privacy and security issues in CBEC (Adam et al., 2020).

- **Environmental Context:** The environmental context includes regulations governing organizations' environment, the structure and size of the organizations, and the macroeconomic environment (Tornatzky, Fleischer, & Chakrabarti, 1990; Zhu & Kraemer, 2005). Dwivedi, Ayaburi, Boateng, and Effah (2019) study laws that influence the diffusion of ICT among businesses, countries, and individuals. Environmental context refers to the political and regulatory environment including ICT laws, the efficiency of the legal system, judicial independence, protection of intellectual property, software privacy, lawmaking bodies, installed software, procedures, and days needed to enforce a contract (Baller, Dutta, & Lanvin, 2016).
- **Organizational Context:** Organizational context includes management structure, HR, degree of formalization, centralization, and relationships among employees (Tornatzky et al., 1990).

Employees are important sources for the development of organizations. Providing training and educating these employees affects the quality of HR and surely influences technological adoption of CBEC (Srivastava & Teo, 2010). Literacy rate, expected years of schooling, and mean years of schooling are variables under the heading of HR development (World Bank Group 2016).

Adam et al. (2020) find a positive relationship between ICT access and readiness to adopt B2C e-commerce solutions. However, the increased number of internet users across the globe has provided opportunities for CBEC (Amornkitvikai & Lee, 2020). For example, proliferation of mobile devices has enhanced mobile commerce (m-commerce), which ensures substantial growth in CBEC (Adam et al., 2020). The findings of (Adam et al., 2020) are consistent with those of (Aljowaidi, 2015) on the direct relationship between a country's technological infrastructure and its adoption of CBEC.

An earlier literature finds that the rules and regulations in a country's ICT sector curb ICT diffusion (Du, Zhang, Li, & Wu, 2019). Infrastructure development in the ICT sector can enhance ICT diffusion and also enhance market structure and local competition. It is possible to reduce cost by changing the number of ICT providers, which can improve ICT access and service costs such as African and Latin American countries (World Bank 2006). This technology-adoption model also finds that if a citizen uses the internet or has access to ICT, the government will be able to regulate their use and ensure privacy and security of CBEC platforms (Adam et al., 2020).

SIGNIFICANCE OF BIG DATA IN CBEC

Because of the proliferation of internet applications, organizations produce a vast amount of data every second. In this technological era, big data has become a special factor. Big data investigates data in a different way and gathers valuable information that is required for maximum efficiency for today's organizations. In the era of big data, the demand of the organization is development of CBEC.[3] CBEC represents the connectivity of the world, for example, China's CBEC surged to 30 percent in the last five years.[4] CBEC has provided a new direction for trade domestically and internationally. In this context, organizations must reform themselves. With big data has come a profound impact on CBEC.

In this data-driven technology age, enterprises should know how to use data to improve operational efficiency and communication. In the age of big data, there are three key points: data analysis, data acquisition, and data products. The cost is high for participating and visiting customers. Data sorting and analysis is the key to operating a business based on big data. The business model of foreign trade traditionally uses data-management experience, which lacks scientific rigor and is subjective. The whole logic underlying big data is reversed in the business operation. It guides decision making through data change under the big data. The value brought by data is shown in five ways: to make management decisions, it can assist enterprise and monitor real-time marketing activities; it can optimize the supply chain; it can develop personalized services and precision marketing; innovation of models, services, and products; strategies.

CBEC in the Era of Big Data

In the era of big data, companies can analyze data to reduce costs, develop new products, improve efficiency, make more effective business decisions, and so on. Organizations can collect market-based

information with big data and can also improve the management of internal operations to enhance their efficiency[5]. Organizations are well equipped with big data to optimize their own websites, which are more detailed and significant and able to provide more detailed information to the customer who chooses among their products. In addition, big data helps to promote store operations, which is mainly improve marketing concepts and strategy for future operation and development.[6]

Suggestions for Applying CBEC Big-Data Marketing

First, big-data mining technology is used for product marketing that ensures the effective association between data by using big data. It is needed to ensure effective analysis of original data. Using big-data analysis, it is possible to mine the importance of products and effectiveness of recommendation. Second, by using big data for social-network marketing covered huge volume of people in high development of social media and rapid development of social network marketing. Through big-data analysis, people fully understand communication of social network and carry out e-commerce as well as social-network marketing.[7] For e-commerce enterprises, we should make full use of the advantages of big-data analysis, be able to grasp the analysis of social-network media for consumers' preferences, and effectively improve marketing efficiency. Third, geographic marketing uses big data and technical advantages for analyzing websites' transaction data, marketing of goods according to preferences of people located in specific regions. Big data analyzes the location of users' effective division wise, safeguard of differences and relevance of geographic information of users' and interested goods. Fourth, big-data analysis can address user behavior and marketing. E-commerce analyzes consumers' historical records and the purchasing behavior for obtaining consumption habits of users effectively and provides enterprise. E-commerce can analyze potential users' needs through related search behaviors, for further improvement of commodity types. Fifth, it is important to meet consumers' personalized requirements by using big data for personalized marketing recommendation, by which e-commerce enterprises meet the personalized marketing level. Development of a big-data environment, e-commerce enterprises carry out recommendation of product activities and classification of product according to users' personalized requirements and invite for users' attention to interest of the products[8].

CONCLUSION

There are theoretical and practical implications of this newly developed model (Cui et al., 2019). By combining the system-success model and the valence framework, it is seen that service quality and system quality significantly increase a seller's trust in the perceived benefit of CBEC from seller's perspective in e-marketplace could turn to seller's intention to use. Comparing with previous items, identified new variables of service quality and system quality are more definite rather unclear. For further research it can be used on CBEC. Newly identified variables of system quality and service quality items can be applied to CBEC from seller's perspective. In the meantime, the new variables associated with perceived cost are less influential. Cross-border from seller's perspective has managerial implications also. Firstly, long-term sellers should be focused point by improving system quality from exhibiting switching behavior; at the same time, they need to develop service quality for building trust and subsequent cooperation by training meetings who have intention to use their potential in the marketplace for both sellers and newcomers. Sellers' training in the ISSI model and valence framework is more important

for CBEC than for domestic e-commerce because of unpredictable foreign market trends, foreign laws, and cross-border logistical issues. Secondly, cross-border and domestic sellers both consider perceived benefits as a strong attractor.

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