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Editorial Note

The May 2018 issue of the *Journal of International Business Disciplines (JIBD)* has been the result of a rigorous process in two stages:

- Stage 1: all papers that were submitted to 2018 IABD conference went through blind reviews, and high quality papers were accepted for presentation at the conference.
- Stage 2: approximately ten percent of the accepted articles and two invited manuscripts were selected for possible publication in *JIBD*. The respective authors were contacted and asked to resubmit their papers for a second round of reviews. These manuscripts went through a blind review process. In the end, three articles were recommended for publication in the May 2018 issue of *JIBD*.

JIBD is committed to maintaining high standards of quality in all of its publications.

Ahmad Tootoonchi, Chief Editor
Journal of International Business Disciplines

Contents Volume 13, Number 1, May 2018

AN EMPIRICAL INVESTIGATION OF THE EFFECTS OF NAFTA, CHINA'S ADMISSION TO THE WORLD TRADE ORGANIZATION, AND IMPORTS FROM MEXICO AND CHINA ON EMPLOYMENT IN US MANUFACTURING

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ABSTRACT

Since the year 2000, employment in manufacturing in the US has declined at a rapid pace. Several factors have been cited as responsible for this decline. Politicians and commentators have focused on cheap imports of goods from China and Mexico. Other factors cited are the North American Free Trade Agreement (NAFTA), China's admission to the World Trade Organization (WTO), and technology in manufacturing.

There is a lack of empirical quantitative studies on what affects employment in manufacturing. In this study, we use time series analysis to determine if a relationship exists between imports of goods from China or Mexico and employment in manufacturing in the US. In addition, we determine if NAFTA or China's admission to the WTO affect US employment in manufacturing. Results show that imports from China and Mexico have a positive effect on US employment in manufacturing. China's admission to the WTO has a negative effect on US employment in manufacturing. On the other hand, NAFTA has no effect on employment in manufacturing.

INTRODUCTION

Employment in manufacturing in the United States has been on the decline for decades. In the 1960s, one in three jobs in the US was in manufacturing; in 2013 less than 9% of jobs were in manufacturing. This loss of manufacturing jobs has contributed to income inequality (Autor, Katz, & Kearney, 2008). Since 2000, the decline in manufacturing jobs has been at a rapid pace. This has been attributed to several factors: import competition from countries such as Mexico and China, NAFTA, China's admission to WTO, and technology (Autor et al., 2008; Acemoglu, Autor, Dorn, & Hanson, 2016; Krugman, 2008; Mullen & Panning, 2009). NAFTA, which was signed into law in 1994, has been blamed for loss of manufacturing jobs in the United States. The elimination of tariff on trade between Mexico and the US through NAFTA and the lower labor cost in Mexico was an inducement for manufacturing firms in the US to move across the border into Mexico.

Another factor that was blamed for loss of manufacturing is China's admittance to the WTO in 2001. Other factors mentioned are the trade deficit in the US and the increase of technology in the workplace (Edwards & Lawrence, 2013). Technological innovation in the form of robotics and IT could have had an effect on reducing jobs in manufacturing. Increase in labor efficiency, induced primarily by new technology, decreased employment in a number of industries: chemical, electric, and electronic (Kuehn & Braschler, 1986). However, according to Chang and Hong (2013), the majority of the manufacturing industries hire workers when there is improvement in technology. Contrary to common belief, technological innovation was found to create more jobs in the short and long run.

Of interest is the fact that while unemployment in manufacturing has been on the rise, there is no evidence that unemployment at the national level has been affected by loss of jobs in manufacturing. This could imply that lost jobs in manufacturing were recreated in different sectors of the economy (Jensen, 2016).

Politicians cite imports of cheap goods from China and Mexico as the cause for loss of jobs in manufacturing. There are few recent quantitative studies in the literature dealing with cause or causes for the rise of unemployment in manufacturing. In this study, we determine, using statistical time series analysis on economic data over years, if a relationship exists between employment in manufacturing in the US and the following factors: NAFTA, China's admission to the WTO, and U.S. import of goods from China and Mexico.

REVIEW OF LITERATURE

Brynjolfsson and McAfee (2011) argued that technological innovation and information technology (IT) will continue to replace workers in all sectors, but particularly in IT-intensive sectors such as manufacturing. Acemoglu et al. (2014) pointed out that IT-intensive industry show increased productivity, which could translate into reduced employment. US manufacturing data for the period 1980 – 2009 were used in their study. The authors utilized multiple linear regression relating productivity to IT. Their findings did not support the argument that IT-intensive industry show increased productivity.

Krugman (2008) pointed out that through free trade, low-wage countries had a disruptive effect on labor in high-wage countries. This effect can be quite significant as the low-wage country share of US imports increased substantially. As reported by Autor, Dorn, and Hanson (2013) low-wage country share of US imports climbed from 15% in 2000 to 28% in 2007 due largely to imports from China. The authors studied the effect of import competition between 1990 and 2007 from China, a relatively low-wage country, on the labor market in the US. The authors concluded that rising imports contributed to a decrease in employment and lower wages in the manufacturing industry. A quarter of the decline in manufacturing employment in the US was attributed to import competition.

Jensen (2016) pointed out that presidential nominees and administrations in the US love the manufacturing sector and have come up with programs to create manufacturing jobs. He argues

that a rebound in manufacturing is not likely to have an impact on the national employment since manufacturing accounts for only about 8% of the labor force. The author was of the opinion that the US would benefit from focusing attention on trade in services. He presented statistics showing that global trade increased seven times during the period 1980-2010 and the US services share of this world trade increased from about 10% in 1980 to about 20% in 2010. He stated that the US had a significant opportunity for increasing economic growth through exports in business services.

Acemoglu et al. (2016) reported that imports from China after 2000 was a major contributor to the reduction in employment in manufacturing and to weak overall job growth in the US. The authors estimated that 2.0 – 2.4 million job losses in the period 1999-2011 occurred because of imports from China.

Mullen and Panning (2009) studied empirically the effect of outsourcing and investment in technology on the employment of unskilled workers in manufacturing in a sample of US manufacturing industry from 1997 to 2002. Outsourcing was measured by the imports of intermediates by the manufacturing industries. Technology investment was measured by the spending by firms on research and development (data obtained from the National Science Foundation) and by US Bureau of Economic Analysis data on the component of the total investment spending by the manufacturing firms that was allocated to information and communication technology. Results of their regression analysis showed that both outsourcing and technology investment contributed significantly to a decrease in the employment of unskilled workers in manufacturing.

Logan (2008) studied the effect of trade liberalization through NAFTA between Mexico, US, and Canada and proximity to international borders on employment and wages in the US manufacturing sector between 1980 and 2000. Results indicated that location or proximity to borders had no effect, while trade liberalization with Canada had a positive effect in the sense that it increased employment in manufacturing and contributed to wage growth. It was estimated that a 1% reduction in U.S. tariffs on imports from Canada and Mexico led to a 2.35% and a 4.31% employment growth in manufacturing, respectively. However, a 1% increase in manufacturing imports from Mexico led to a 0.16% reduction in employment growth.

Silva and Leichenko (2004) reported that trade liberalization, although it had an overall beneficial effect, had a negative effect on industries with less skilled labor.

Using US bilateral imports and exports in manufacturing for the period 1989-2001, Datta and Kouliavtsev (2009) studied the effects of labor wages, tariffs and exchange rates on the composition of US imports of textiles before and after NAFTA. The authors found little evidence of any effect of NAFTA on textile trade diversion. There was an effect on trade creation. Tariffs and exchange rates were found to have significant effects on US import composition.

Using regression methodology, Kemeny et al. (2015) examined the effect on job loss in manufacturing of trade in the form of low-wage imports, taking into consideration individual and firm characteristics, in particular adoption of technology. They found that imports from low-wage countries had a negative effect on employment of low-skilled workers, those that did not have a full high-school education. Low-wage imports had no effect on job loss for workers that had at

least a Bachelor's degree. Technology was not related to job loss. It was found that investment in computer equipment was associated with job retention.

Several studies in the literature show that job loss due to plant closure and lay-offs are related to import competition or import from low-wage countries, but not to trade in intermediaries (Addison et al., 2000; Haveman, 1998; Kletzer, 2000).

Baily and Bosworth (2014) presented data, which showed that manufacturing share of the GDP in the US was stable since 1960, while employment in manufacturing was on a steady decline. The fact that manufacturing value was stable is due to improvement in productivity attributed to technology, such as computers and electronics. The authors pointed out that 90% of manufacturing firms that are not technology-intensive showed slow growth in productivity and their share of the GDP decreased substantially.

METHODS

Quarterly economic data for U.S. imports of goods from China and Mexico and employment in manufacturing in the US were obtained online from the St. Louis Federal reserve *(*https://www.stlouisfed.org*).* Data were available for the period 1985-2016.

In order to determine if NAFTA or China's admittance to the WTO had any effects on U.S. employment in manufacturing a time series intervention analysis was used. In addition, the time series transfer function analysis was used in order to determine the relationship between imports from Mexico or China and employment in manufacturing in the U.S. The SAS software was used in the analysis. Time series analysis is the correct method of analysis for time series data where the errors are auto correlated. Regression analysis for time series data is known to give spurious results (Granger & Newbold, 1974).

Intervention Analysis

Intervention analysis (Box & Tiao, 1975) is used to study the effect of an intervention on a time series response variable, when the time (T) of the intervention is known. For instance, if the intervention is NAFTA, it is entered in the model as a step function (0 before 1994 and 1 at and after 1994). If the response due to the impact is felt b periods after the intervention at time T, the impact of the intervention on the response variable is

$$WB^{b}S_{t}^{T}, \quad (1)$$

where, b is the time delay for the impact of the intervention to be felt, w is the impact coefficient and

$S_t^T = 0, \quad t < T$
$\quad\quad 1, \quad t \geq T$

However, if the response due to the impact is gradual, the impact can be specified, in general, as

$$wB^b S_t^T/(1-YB) \quad (2)$$

Where Y is between 0 and 1 (Wei, 2006).

The intervention model is written as

$$y_t = x_t + wB^b S_t^T \quad \text{or} \quad y_t = x_t + wB^b S_t^T/(1-YB) \quad (3)$$

where y_t is the observed series and x_t is the series before the intervention. The time series must be stationary. If a series is not stationary, then differencing is used to make it stationary.

Time Series Transfer Function Model

A time series transfer function model relating a stationary output series y_t to a stationary input series x_i is

$$y_t = v(B)\, x_t + a_t \quad (4)$$

where $v(B) = w(B)B^c/d(B)$.

Here, $w(B) = w_0 - w_1B - \ldots - w_sB^s$

$d(B) = 1 - d_1B - \ldots - d_rB^r$.

and c represents the time delay (or lag) until the input variable x_t produces an effect on the output variable y_t.

The function v(B) with its lags is determined from the cross correlations between the pre-whitened input series x_t and filtered output series y_t, namely the significance at a given lag and the pattern of the cross correlations over lags (Wei, 2006). For instance, if the correlation is significant at only lag 0, then Equation (2) becomes

$$y_t = w_0x_t + a_t.$$

Once v(B) is identified, one can express a_t in Eq. (4) as

$$a_t = y_t - v(B)\, x_t \quad (5)$$

and identify the appropriate time series model for Eq. (5). With a_t known, one can determine the final model in Eq. (4).

RESULTS

Mexico

Transfer Function Model

The best model fit from Equations (4) and (5) to the observed import data from Mexico (impm) and employment in manufacturing in the U.S. (empl) was found to be

$$(1-B)(1-B^4)empl_t = (0.048 + 0.072B + 0.043B^2)(1-B)(1-B^4)impm_t + (1+0.439 – 0.269)e_t \quad (6)$$

Here, B is the backshift operator and e is the random error.

Equation (6) indicates that import from Mexico is positively related to employment in manufacturing in the United States. This positive relationship was significant Also, the cross correlation between the two series (impm and empl) was positive and significant. This seems to be contrary to the expectation that cheap import has a negative effect on employment. As will be explained later, if import includes raw materials and intermediate products or goods used for manufacturing, then the effect on employment can be positive.

Intervention Analysis

The cross correlation between the step function S_t^T representing NAFTA and employment in manufacturing was not significant. This implies that NAFTA was not related to employment in manufacturing in the U.S. Likewise, w in Equation (3) was not significantly different from zero indicating no effect of NAFTA on employment.

China

Transfer Function Model

The cross correlation between import of goods from China (cimport) and employment in manufacturing in the U.S. (empl) was positive and significant. The best transfer function model fit to the observed import and employment data was found to be

$$(1-B)(1-B^4)empl_t = (0.0247 + 0.0184B)(1-B)(1-B^4)cimport_t + ((1-0.61B^4)/(1-0.693B))e_t \quad (7)$$

Here, B is the backshift operator and e is the random error.

In agreement with the positive cross correlation between employment and imports from China, equation (7) shows that imports from China have a significant positive effect on employment as indicated by the positive coefficients of the cimport independent variable. This is in agreement with the results for Mexico and can only be explained by the import of raw material and intermediate goods for use by firms in the U.S. to manufacture finished products for the market.

Intervention Analysis

The cross correlation between the step function S_t^T representing China's admittance to the WTO and employment in manufacturing in the U.S. was negative and significant. Likewise, the intervention model in Equation (3) showed a significant negative effect (w = -285.08) for S_t^T. The final estimated model is

$$empl_t = (1 + 0.494B)(1- 0.754B^4 – 0.168B^5)((e_t/(1-B)(1-B^4)) - 285.08B^2S_t^T/(1-0.885B) \quad (8)$$

Here, e_t is the random error term and B is the backshift operator. The impact of the intervention was felt after a time delay of two quarters (b=2).

DISCUSSION

Of interest is the finding that imports of goods from China and Mexico are positively related to employment. In other words, imports from China and Mexico benefit employment in manufacturing and are good for the economy. These results can only be explained if a substantial proportion of imports are used by firms and factories to produce finished products at a competitive rate. Perry (2016), in an interesting article on imports being beneficial for US employment, states that "The lower the price of inputs for US businesses (whether sourced internationally or domestically), the more competitive those companies are, the more of their products they can sell (both internationally and domestically), the greater market share they can achieve, and the more US workers they can hire."

Perry presents data showing that more than one half of US imports are raw materials or intermediate components that are used by US firms in manufacturing and are not goods for direct consumption by households. He even makes the point that nearly all imports are inputs for US firms, retailers and factories. Perry is of the opinion that we should be reporting the total volume of trade rather than focus on trade balance. The total volume of trade is the real measure since both exports and imports help the economy. An increase in total volume of trade is indicative of an expanding economy.

Our results, based on the statistical analysis, are in agreement with Perry's conclusion that cheap imports are beneficial to employment. Perhaps future data on imports should distinguish consumer goods from raw materials and intermediate goods.

Results from the intervention analysis indicate that NAFTA has no significant effect on reducing employment in manufacturing in the US. This is in spite of the fact that some firms moved part of their operations south of the border. On the other hand, admittance of China to the WTO has a negative effect on employment in manufacturing in the US. This may be due to increased competition with US firms on the world markets.

CONCLUSION

In this study, we investigated the effects of imports from China and Mexico on the employment in manufacturing in the United States using the transfer function time series modeling approach. In addition, we ran an intervention analysis to determine if NAFTA or China's admittance to the WTO had any significant effect on employment in manufacturing in the US. Results showed that imports from Mexico and China had a positive effect on employment. This was attributed to the fact that over 50% of imports were raw materials and intermediate goods, which served as low price inputs for firms, and factories in the US and which helped them to gain a larger market share and hire more employees.

The intervention analysis did show that China's admittance to the WTO had a negative effect on employment in manufacturing in the US. In addition, there was negative cross correlation between employment and China's admittance to the WTO. This was attributed to more competition on the World markets because of China's admittance. On the other hand, the intervention analysis did not show that the creation of NAFTA had any effect on employment in manufacturing. Also, there was no significant cross correlation between NAFTA and employment.

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E-GOVERNMENT IN HUBEI, CHINA: AN EVALUATION OF COUNTY PORTAL USABILITY, ACCESSIBILITY, ELECTION, AND MOBILE READINESS

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ABSTRACT

Many studies have investigated e-government issues in the US at the state and local levels. However, similar research about Chinese e-government websites is relatively few. To fill this void, this study investigated the e-government practices by the counties in Hubei province, China. Hubei province is selected due to its size, economic status, and geographic location, which makes it a good representative of other provinces in China. Besides usability, this study investigates Hubei county e-government portals on their accessibility, election content, and mobile readiness, to give a comprehensive evaluation of the local e-government practices in China. The findings suggest that though most Hubei county e-government websites followed many usability rules well, they deliver very little voting and election content on their websites. Many of them do poorly in compliance with accessibility standards. The mobile readiness, on the contrary, is quite high and matches the current mobile trend in China.

INTRODUCTION

The differences in geographic locations, political climates, governance structures, and technological developments make the deployment and diffusion of e-government vary dramatically from country to country and region to region. Therefore, the research of e-government and e-politics of different countries and regions tends to have its uniqueness, academic values, and practical significances. Because of this uniqueness and diversity of e-government implementation, e-government and its growth has attracted researchers' interests from all over the world. For instance, scholars conducted a comprehensive investigation of U.S. local e-government portals (Huang, 2007; King & Youngblood, 2016), proposed approaches to the assessment of e-government efforts from European perspective (Mates, Lechner, Rieger, & Pekná, 2013), surveyed citizens' attitude toward e-government in Australia and New Zealand (Freeman, 2013; Gauld, Goldfinch, & Horsburgh, 2010), presented the growth pattern of Africa e-government and issues addressed by research on Africa e-government (Dombeu & Rannyai, 2014), used U.N.'s e-government readiness score to analyze how e-government implementation varied among Latin American and Caribbean countries (Warf, 2014), investigated the factors that drove innovations in Chinese public sector (Zhang, Zhao, Zhang, Meng, & Tan, 2017) and the influence of Chinese

cultural elements on the user experience with e-government sites (Lei, Liu, Wu, Jin, & Wang, 2017), and explored how personal data was protected in the e-government environment across countries such as the US, China, and Germany (Wu, 2014). These studies reflect the fact that the difference and uniqueness of political status, governance structure, culture, and technological readiness decides that the e-government experiences and theories drawn on one country or region cannot be directly applied to another.

Usability refers to a quality attribute that assesses how easy user interfaces are to use. It also refers to methods for improving ease-of-use during the design process (Nielsen, 2012). Usability has received broad coverage, which is defined and measured by five quality components (Nielsen, 2012). They are: *learnability*–how easy it is for users to accomplish basic tasks the first time they encounter the design; *efficiency*–how quickly users can perform tasks; *memorability*–how easily can users re-establish proficiency after a period of not using the design; *errors*–how many and how often user make errors and how severe those errors and; and *satisfaction*–how pleasant is it for users to use the design. Since Jakob Nielsen published his famous book *Designing Web Usability* in 2000, many scholars joined him by publishing research papers and books to emphasize the importance of usability to web design. They confirmed the importance of usability to the success of a website and extended Nielsen's measurement of usability by including clarity, simplicity, predictability, consistency, as well as ease of use these constructs into the domain of usability.

Though usability advocates stress the importance of usability on web and software design, some researchers have started a series of research to investigate usability practice by industries and governments (Cappel & Huang, 2007; Huang & Cappel, 2012; Youngblood & Mackiewicz, 2012). Cappel and Huang (2007) studied the usability of INC 500 companies' websites systematically. They designed eleven usability measurement standards, which are categorized into three areas: avoidance of usability mistake, the following of usability principles, and the promotion of usability. They found that INC 500 companies had a lot of room to improve their website usability. After that, Sandvig and Bajwa (2011) studied users' perceptions of search enhancement in web search; Green and Pearson (2011) integrated usability into the electronic commerce acceptance model; and Zollet (2014) investigated the Interactivity of Corporate Websites. Following the explorative study of INC 500 company website usability, Huang and Cappel (2012) extended their usability model and measurement instrument to compare the usability practices of Fortune 500 vs. INC 500 companies. They found that usability has a high correlation with a company's resources and technological support. The more resources and technological expertise a company has, the higher usability its website tends to possess.

In recent years, the usability of e-government websites has gained researchers' attention (Huang & Benyoucef, 2014; Youngblood & Mackiewicz, 2012). During the diffusion of e-government, usability has a critical role to play in increasing citizens' acceptance and participation (King & Youngblood, 2016; Youngblood & Mackiewicz, 2012). Alabama state e-government leaped into the top 10 in 2008 after being ranked bottom three for three consecutive years. However, the rise in the state's e-government website quality ranking did not help much to the diffusion of municipal government websites in Alabama. Citizens' participation and use of e-government websites were not on par with the high ranking of Alabama's e-government. In their research, Youngblood and Mackiewicz (2012) found it was the poor government website usability that eroded citizens' involvement and participation in e-government, which significantly impaired the web credibility

of municipalities trying to engage citizens, to create or strengthen sustainable practices, and to attract companies that can bring new jobs and improve the local economy. Another study also reveals that the credibility of an e-government website is highly correlated with its usability. The higher the usability, the more credibility a government website has to citizens, and vice versa (Huang & Benyoucef, 2014).

People also started paying attention to the usability and accessibility issues of government websites. Shi (2006), for instance, conducted a longitudinal comparison study of the accessibility of Australian and Chinese e-government websites. Shi (2006) found that provincial e-government websites in China had serious accessibility issues in 2004. The accessibility issues worsened in 2005. He concluded that Chinese governments did not spend much effort in improving the usability of their websites. In comparison, Australian government websites had much better accessibility. Shi (2006) alerted Chinese governments to pay attention to the accessibility issues and give more consideration in the design to the needs of people with disability. Hong, Katerattanakul, and Joo (2008) also investigated the accessibility issues of e-government by comparing Korean and U.S. e-government websites. They found accessibility problems and errors in both Korean and U.S. e-government websites in the period of 2004 to 2007. Similarly, Isa, Suhami, Safie, and Semsudin (2011) and Al-Khalifa (2012) found accessibility issues in Malaysian and Saudi e-government websites. Though Shi (2006) started exploring usability issues in Chinese government website design, overall research efforts in this area seem to be lacking. There are many unknowns in the usability and accessibility practices by Chinese government websites that deserve to be investigated and analyzed.

This research tries to give a comprehensive evaluation of Chinese local e-governments and has two major implications. First, it will contribute an important case of local e-government websites of the world most populous country to the e-government literature. It will shed light on the literature by providing empirical data and analysis results. Second, it will bring insights to practitioners such as Web architect and developers on how to incorporate usability and accessibility principles into government website design and evaluate the usability of their own websites.

RESEARCH QUESTIONS

According to the e-government literature, the development of e-government has significant values to the politics, economy, culture, and governance to any country, especially the largest developing country as China. China is the most populous country in the world. According to Chinese Bureau of Statistics, China has a population of nearly 1.4 billion. China also has one of the highest officer-citizen ratios in the world, which incurs extraordinary administrative expenses (Rothstein, 2015). It has been proven by research that e-government is effective in reducing administrative costs, improving service efficiency, increasing government transparency, and even improving democracy (Watson & Mundy, 2001). Watson and Mundy (2001) found that e-government web function could dramatically reduce the cost of property tax processing to 22 cents from five dollars in the U.S. With four times the population in China than in the US, e-government could save more for Chinese governments. However, as aforementioned, government websites in China face the

challenges of low usability and accessibility (Shi, 2006). With unfriendly interfaces, poor accessibility, inadequate/missing functions, and weak search capabilities, it is hard for Chinese government websites to attract mass citizens to use the websites and justify the governments' investments on e-government websites. Citizens still follow the traditional channels to conduct administrative tasks, leaving expensive e-government sites unused. Therefore, it is interesting and imperative for researchers to systematically analyze the usability of government websites in China. The research question is accordingly raised as follows.

RQ1. How well do e-government websites in China meet usability guidelines?

Disabled people exist in both developed and developing countries. An estimated 650 million people worldwide live with some form of disability (World Health Organization, 2011). Disability is defined as one or more abnormalities in anatomical structure or the loss of an organ or function (either physical or psychological) affecting a person's ability to carry out a normal activity and to participate fully in study, work, and community and social life. In the US alone, about 50 million adults suffer from various forms of disability, including hearing loss, visual impairment, cognitive impairment, and limited mobility (Zheng et al., 2011). In China, about 85 million people have a disability or another condition that affects their daily lives and social activities (Peng, Song, Sullivan, Qiu, & Wang, 2010). Furthermore, disability can lead to limited access to education, health care, and rehabilitation services, to the detriment of the disabled people, their families and local communities, health-care systems and social security systems. Therefore, specific strategies, policy initiatives and sustainable programs are needed to improve the health status of the disabled population (Zheng et al., 2011). One of such policies in the US is Section 508 standard. Chinese governments and businesses did not typically pay attention to provide facility and convenience to disabled people. The research question in this regard is raised.

RQ2. How well do e-government websites in China meet accessibility guidelines?

The content of e-government, especially political content such as voting information is an important part and function of e-government websites. According to Watson and Mundy (2001), e-democracy is the highest level of e-government practice. Implementing e-democracy demands a careful and comprehensive plan for citizens to master it (Watson & Mundy, 2001). E-democracy also requires governments to have a high level of transparency and close and direct interactions with its citizens. E-democracy includes online voter registration and voting functionalities on e-government websites. However, according to Huang (2007), even the U.S. local e-government diffusions only reach the information and communication stages at most, but poorly at transaction and democracy stages.

China is a non-democratic socialist country, though it has achieved enormous economic growth in the past three decades. Its political system is run by the Chinese Communist Party, therefore, Party membership affects political beliefs and behaviors in contemporary China. However, Party members are not more likely than other citizens to support and trust the state institutions, neither do they produce more support for the local state (Dickson, 2014). While China Party Congress put the grass-roots self-government into the basic categories of democratic politics with Chinese characteristics, due to the voting information and process ambiguity, improper campaign conduct, such as bribery, interest groups, administrative intervention, violence election and so on, have

plagued the normal village committee elections and higher level local elections (Li & Zhang, 2010). This insufficient support of Party members to the local state and improper campaign conduct poses a serious impediment to the construction of China's democracy. E-government technology is believed to play an important role in fostering the redistribution of power and encouraging government-citizen interactions (Seifert & Chung, 2009) and promoting e-democracy (Lappas, Triantafillidou, Kleftodimos, & Yannas, 2015; Padget, 2005). Chinese governments want to use e-government technology to leapfrog its political democracy and governance, without paying the high costs, such as political turmoil and governance instability, associated with the democratization process. One important solution is to publicize voting and election information on the e-government portals to increase the election transparency. In recent years, using indices to assess the performance of election administration has become a prominent method (Clark, 2015). By using indices, a series of criteria can be used to assess the functionality and usability of election websites. For example, King and Youngblood (2016) established 22 election information content criteria to measure Alabama election websites. It would be interesting to see how e-democracy is carried out through Chinese e-government practice. The following research question is asked.

RQ3. What type of voting and election information is provided on Chinese e-government websites?

In 2009, mobile Internet users have reached 233 million in China ("China - Mobile internet users," 2010). In 2013, the number of mobile Internet users with smartphones totaled 330 million ("China - China's smartphone mobile," 2013). By 2015, China's mobile users already exceeded 1.3 billion, over 90% of China's population, of whom 29.6 percent are 4G users (He, 2016). With such a big population of mobile users, online transactions have been largely moved to mobile platforms. WeChat Pay and AliPay digital wallet services have sped this process (Larson, 2015). The mobile pressure on e-commerce has also been infused into the e-government zone. Mobile-government, aka m-government, is becoming an important trend of e-government technology (Al-Hubaishi, Ahmad, & Hussain, 2017; Faisal & Talib, 2016; Hung, Chang, & Kuo, 2013). West (2011) already found 17 U.S. states had websites designed for smaller screens in 2008. In general, however, few studies have investigated m-government deployment at the local level (King & Youngblood, 2016). It will be interesting to see how m-government has been implemented in China with such an enormous mobile user population. The following research question is established.

RQ4. How is the mobile readiness of Chinese local e-government websites?

RESEARCH METHODOLOGY

In this research, we investigate the e-government practices by counties in Hubei province. Hubei province is selected for a couple of reasons. First, Hubei province is in a unique geographic location. It is located at the center of China and is the hub of air, water, and land (road and rail) transportation. Its economic size is ranked in the middle of 35 provinces and special municipalities in China. The quality ranking of Hubei e-Government is ranked 15 among 35 provinces and special municipalities in China (Guomai, 2012). Hence, the e-Government status of Hubei province is typical and representative of other provinces.

Both county-level cities and county government websites will be considered. Some administrative units, though called city in China, are no more or less than a county with regard to the administrative functions. County governments face a more scattered and less dense population (example in Figure 1) than larger cities. County citizens have lower education levels and per capita incomes. Technological infrastructure is also less developed than in cities. Therefore, citizens' requirements for government websites tend to be lower.

We first finalized the list of counties in Hubei province from the City Population website (https://www.citypopulation.de/) and verified the list with the Chinese provincial government website. There are 64 counties and county-level cities found in Hubei province. The list of these counties and their demographic information is provided in Appendix 1. A county-level city has the name of a city but is administered as a county. Its administrative functions and geographic size are similar to a county. Therefore, in this research, we include these county-level municipalities in our analysis. Next, we conducted a search via Baidu.com, the top search engine in China, using the county name and "government" as the keywords, and examined the first page of results. We have found all government portals of 64 counties and county-level cities in Hubei province. However, one county website - Shenlongjia - was infected with virus. Thus, this county is removed from our research and our total sample size is 63. We then analyzed these county e-government portals for their usability, accessibility, election content, and mobile readiness following the research framework tested by King and Youngblood (2016). The content analysis methodology was carried out as guided by Neuendorf (2002). The instruments of measuring county e-government usability, election content, and accessibility are adapted from previous empirical research (Huang, 2007; King & Youngblood, 2016; Youngblood & Mackiewicz, 2012) and are presented in Appendix 2, Appendix 3, and Appendix 4 respectively. Data collection occurred over a 40-day period between February 15 and March 30, 2017, with two primary coders. The coders met for one training session and coded 10 county e-government portals from the adjacent Hunan province (around 16% of the Hubei sample size) to check for the intercoder reliability. The intercoder reliability is acceptable with a Krippendorf's alpha greater than 0.8 (Neuendorf, 2002). The final intercoder reliability reached 0.995.

FIGURE 1. GONG'AN COUNTY GOVERNMENT WEBSITE HOMEPAGE

The common method to measure usability is to use usability standards, checking for the presence or absence of site features. In this research, a usability instrument was established in the previous studies (Cappel & Huang, 2007; Huang, 2007; Huang & Cappel, 2012; King & Youngblood, 2016). These usability measurements are categorized into six areas including overall design standards, hypertext, navigational standard, readability, language option, and findability (see Appendix 2). These measurement standards also considered guidelines from the federal government's usability.gov website. As suggested by King and Youngblood (2016), the usability heuristics are applied to the election information page for each site.

Using the content recommended by Pew Center on the States (2008) and King and Youngblood (2016), plus additional content criteria pertinent to China's situation, a 22 election information measuring instrument is established. Each county and county-level city was given one point for the presence of each criterion, with a maximum election information score of 22. Counties without online election information will have a score of zero. As aforementioned, China is a communist country. Public and direct election is not a common political phenomenon or widely implemented practice. Most leaders, if not all, are elected by communist party members instead of eligible voting citizens. However, it is still possible to see local governments display election results on their websites to inform their citizens. Certain election information items may not be visible in Hubei county websites, such as voter registration. To keep its integrity and make it easy to compare with research results of other studies, such as King and Youngblood (2016), we keep the similar election information instrument as that of Pew Center on the States (2008) and King and Youngblood (2016).

When Chinese citizens turn to their smartphones to access the Internet and conduct transactions, as RQ4 asked, how mobile ready are Chinese local e-government portals? To measure that, small screen devices should be used to test e-government mobile readiness. A mobile ready e-government site will display websites in a different style: smaller fonts and concise web design that enables smartphone usage.

RESULTS

All of 64 Hubei counties have e-government portals. One county, Shenlongjia's e-government portal was infected by virus and was forbidden to visit. Therefore, 63 valid county websites were analyzed and evaluated on their usability, accessibility, election content, as well as mobile readiness.

The mean land area of Hubei counties is 2,429.22 square kilometers, with an average rural population of 650K. The average GDP of Hubei counties is 12.92 billion RMB (US $1.88 billion) and average GDP per capita is 19,500 RMB (US $2,834). The GDP and Per Capita GDP gap from county to county is large. The social and economic data of Hubei counties are provided in Table 1. According to Huang (2007), socioeconomic factors such as population change, household income etc. significantly impacted on local e-Government diffusion. Similarly, GDP and per capita GDP has influence on e-government website design and functionalities.

TABLE 1. DEMOGRAPHIC DATA OF HUBEI COUNTIES

	N	Minimum	Maximum	Mean	Std. Deviation
LandAreaSqKm	64	604.00	5763.00	2429.22	1078.96
RuralPop10K	64	7.60	156.20	65.13	31.59
GDP (Billion RMB)	64	1.68	44.42	12.92	9.45
PerCapGDP (RMB)	61	3,949.95	69,321.51	19,504.69	12,246.21

Hubei counties do not do well in six of sixteen usability standards. These six usability standards are (a) a small random floating window on homepage is NOT used (41.3% failing rate), (b) all text links are blue (some shades of blue) (76.2%), (c) all text links are a different color than the main text (42.9%), (d) all text links color changes after a link is clicked (98.4%), (e) all text links are underlined (55.6%), and (f) page has a non-Chinese version or a translation option (95.2%). Hubei as an inland province; most counties have relatively few foreign immigrants. That could be the reason that these counties do not provide a non-Chinese version or translation option on their e-government website. However, with China's economy linked to the world increasingly closely and with more Chinese companies doing business with foreigners, it is important for local governments to add language choices to their websites to serve foreign companies and travelers better. Other than these six usability measures, Hubei counties are doing fine in following the other 10 usability rules.

As China is evolving on its democracy, the election content provided on Hubei counties' websites is limited. The highest election information score (EIS) is 7, out of possible 22. Many counties achieved zero EIS. The void of election content is rooted in the China's political system and administrative policies. When direct election is not an adopted practice at the county level, it cannot be expected to see counties publish much election content on their portals. However, it would be beneficial for local governments to release more information on candidates, election results, and election process to increase their administrative transparency.

China did not typically enforce laws to protect people with disabilities. Most public buildings did not have a ramp for handicapped people until recent years. It is also relatively new for websites in China to adopt section 508 standards to increase its accessibility. In this research, it is interesting to see that 8% of counties do not violate any section 508 standards, and only one county violates all section 508 standards. Other counties violate 2 to 4 accessibility standards. The lack of accessibility compliance is most significant with redundant links for server-side image maps (63.5%) and frames shall be titled with text that facilitates frame identification and navigation (63.5%). When it comes to mobile readiness, over 90% counties provide a mobile device friendly version of the government website. It proves that Hubei counties are well prepared for mobile technology and market.

Usability

Out of four overall design standards, county e-government portals in Hubei province are doing well in three standards, but failed significantly in the measure O2 that a small random floating

window on homepage is NOT used (Table 2). Over 40% of county portals, i.e. 26 counties out of 63, used at least one small random floating window/image on their government homepage that keeps floating across the screen in random directions. These governments try to use the floating window/image, most clickable, to propagandize a new government slogan, promote a service, or solicit user feedback. An example of floating window/image can be viewed in Figure 2. However, according to Nielsen (2000) and Nielsen and Loranger (2006), a floating window/image on a webpage is a bad usability practice. It is annoying and distracting, and seldom clicked by the users. Therefore, though governments try to get more attention from e-government portal users, the bad practice of usability in fact annoys its users and may not get the click rate as they expected. It seems that county e-government portals in Hubei province has a hard time to meet the conventions for hyperlinked text in main text suggested by Nielsen (2000) and Nielsen and Loranger (2006). Chinese e-government websites like to use red and gold colors for their website themes. Red and gold are two favorable colors in the Chinese culture. Obviously, the cultural factor is weighed in significantly in government website design which supersedes the usability rules, whilst shades of blue are recommended for hyperlinks. Of the 63 county e-government portals, 76.2% failed to provide hyperlinks in blue or shades of blue; 42.9% failed in using a different color for text links than the main text; as high as 98.4% do not change text link colors when they are clicked; and 55.6% failed to underline their text links.

FIGURE 2. AN EXAMPLE OF RANDOM FLOATING WINDOW/IMAGE USED BY COUNTY PORTALS

In terms of navigation standards, Hubei county e-government portals followed three of four usability rules well, except the standard N2, i.e., a county logo or other header graphic serving as a home link on internal pages. As high as 79.4% of websites failed in taking advantage of using county logo or similar header images as a home link to guide users from internal pages back to the portal home page. Beyond these violations, county portals were doing relatively fine in following other navigation rules, such as providing a home text link on internal pages, main navigation on the top or left side of the page, and having 10 or less visible items per navigational grouping, with a failed rate of 3.2%, 1.6%, and 4.8% respectively.

Readability rules are relatively easy to follow and meet the general custom. Most e-government websites meet readability rules with a low failing rate of 1.6% in R1 and R2. With that said, most Hubei county e-government portals have text left aligned and underlined the text if it is a hyperlink.

Out of 63 valid county e-government portals, only one provided an English version, 95.2% of county e-government portals in Hubei province failed to provide a non-Chinese version or translation options. Though it seems to be a high violation to this usability rule, it may not be a significant issue to these county e-government websites, as their main service targets are Chinese citizens. However, when the economy keeps growing and the market is more open to foreigners, the county governments in Hubei province should realize the importance of providing other-language options on their e-government portals.

Most county e-government are findable from Baidu. Baidu.com is the most popular search engine in China and has the highest portion of the search market. It is important for county e-government websites to be searchable and listed as the first page results from Baidu when the county name and "government" are used as the search keywords. Only 2 county e-government portals (3.2% failing) are beyond the first page search results from Baidu. However, we did notice that many confusing search results exist when the county name and "government" are used as the keywords to search Baidu. These searched sites also claim themselves as "XXX county e-government portal" on their home pages and provide a lot of government related information as well. When checked carefully, however, these websites are not official e-government portals but a website built by a company or a government-affiliated organization. It is very confusing and misleading to the citizens who try to find the official e-government portal and use its services. The bogus e-government portals appeared on the Baidu search results for 18 counties. These county governments should scrutinize these bogus e-government portals and make sure they do not use "government portal" text on their websites. Otherwise, it would be easy for these websites to conduct fraudulent services to their users or at least mislead users who need official government services. The usability results of Hubei counties are summarized in Table 2.

TABLE 2. HUBEI COUNTY E-GOVERNMENT PORTAL USABILITY (N=63)

		Websites failing (%)
Overall Design standards		
O1	A splash page is Not used	6.3%
O2	A small random floating window on homepage is NOT used	41.3%
O3	Audio and video do NOT auto play when page loads	3.2%
O4	Horizontal scrolling is NOT required with the browser window set to 1024 pixels across.	0%
Conventions for hyperlinked text in main text		
C1	All text links are blue (some shades of blue)	76.2%
C2	All text links are a different color than the main text	42.9%
C3	All text links color changes after a link is clicked	98.4%
C4	All text links are underlined	55.6%
Navigation Standards		
N1	A "home" or "return" text link appears on internal pages	3.2%
N2	A county logo or other header graphic serves as a "home" link on internal pages	79.4%
N3	Main navigation is on the top and/or left-side of the page	1.6%
N4	There are 10 or fewer visible items per navigational grouping	4.8%
Readability		
R1	Main body text is left aligned	1.6%
R2	Any text that is underlined is a link	1.6%
Language option		
L1	Page has a non-Chinese version or a translation option	95.2%
Findability		
F1	County website is in the first page of results from Baidu	3.2%

Election Content

To measure e-democracy in China, county voting and election information is used as a measuring tool. Though China has made tremendous success in its economic growth and business-oriented transformations, it is still a communist country and its government still claims that it will stick to its communist characteristics down the road. Its administrative style is regarded as authoritarian by scholars (Zhang, 2017). China holds direct elections for deputies to serve in the Local People's Congress (LPC) at the county and township levels, and it seems possible that the LPC will become more representative and therefore make local government more responsive. However, according to Zhang (2017), the LPC is more like an inclusive institution, sometimes degenerating into patron clientelism, rather than a representative institution. Moreover, direct elections are tightly controlled and sometimes deteriorate into personalized patronages, because private entrepreneurs purchase votes to win personal privileges, rather than to promote institutional reform (Zhang, 2017). Besides LPC, other major government officers at county level or above are elected via the

communist party system, instead of through direct elections. However, China governments like to advocate publicly that they have a democratic system with unique socialist characteristics. Under this circumstance, it is expected that county e-government websites display election related information to general public.

From Table 3, however, we can see that up to 12 election related information content of 22 are not provided by any counties in Hubei province. These items are contact information (form), contact information (phone), contact information (online chat), email information sign up, text information sign up, online downloadable voter registration form, voter registration status/search, sample ballot, vote by mail (absentee) ballot application, update voter registration address link/form, voter registration locations, and voter ID information and requirements. It is interesting to see that almost half the counties in Hubei (46.0%, 29 out of 63) listed the names of election officials on the websites. However, the general contact information (phone, form, etc.) about election or candidates was not provided to general public on the government websites. It seems that county governments do not want to get citizens involved in the election process nor want their opinions on the election or candidates.

As high as 65.1% counties (41 out of 63) offered media/press information section on their government websites. It somehow matches the findings of Huang (2007) in that most local e-government websites stay at the "information" stage. The main purpose of local e-government portals is to inform the citizens about rules and administration policies. Therefore, though the election process was not transparent to the general public, up to 44.4% counties chose to display election results on government websites. About 20% reported election results of 2015 and over 10% election results of 2010.

Up to nine counties did not provide any election related information on their government websites (see Figure 3). Huangmei County had the highest election information scores (EIS) of 7, out of possible 22. Three counties, Xingshan, Jiangling, and Chongyang had an EIS of 6. Following that, eight counties had an EIS score of 5. Other counties had a score of 4 or below. Obviously, the governments at the national and provincial levels opted out of having any policies or commands on the local county governments' websites about elections, so it is up to the county to decide what election information it wants to report. Based on the current election practice, most counties in Hubei had no desire to release more election information than the status quo. Comparing to what reported by King and Youngblood (2016) on Alabama counties, Chinese e-government websites have more to catch up on reporting election related information.

Accessibility

When scrutinizing Hubei counties' government websites' compliance with section 508 standards, we could find most counties violate web accessibility rules here and there. Over 90% counties violate at least one of the five web accessibility standards, with one county violated all standards, and only five counties (8%) violated none (see Table 4). A further look at the violation details of the accessibility standards reveals that many counties failed to provide redundant links for server-side image maps (63.5%) or their frames were not titled with text to facilitate frame identification

and navigation (see Table 5). Twenty-seven counties (42.9%) had forms that are not accessible. Following that, 28.6% counties had scripts not identified by accessible text and 12.7% counties did not have text equivalent for non-text.

TABLE 3. ELECTION INFORMATION DISTRIBUTION BY HUBEI COUNTIES

	Number of counties	% of all counties
Election website	7	11.1%
Specific link on main county site for election website	2	3.2%
Name of election official(s)	29	46.0%
Contact Information (email address listed)	1	1.6%
Contact information (form)	0	0.0%
Contact information (phone)	0	0.0%
Contact Information (online chat)	0	0.0%
Email information sign up	0	0.0%
Text information sign up	0	0.0%
Media/press information section	41	65.1%
Physical Address	9	14.3%
Online downloadable voter registration form	0	0.0%
Voter registration Status/Search	0	0.0%
Voting location address search	1	1.6%
Sample ballot	0	0.0%
Vote by mail (absentee) ballot application	0	0.0%
Update voter registration address link/form	0	0.0%
Voter registration locations	0	0.0%
Voter ID information and requirements	0	0.0%
Election results (any)	28	44.4%
Election results for 2015	13	20.6%
Election results for 2010	8	12.7%

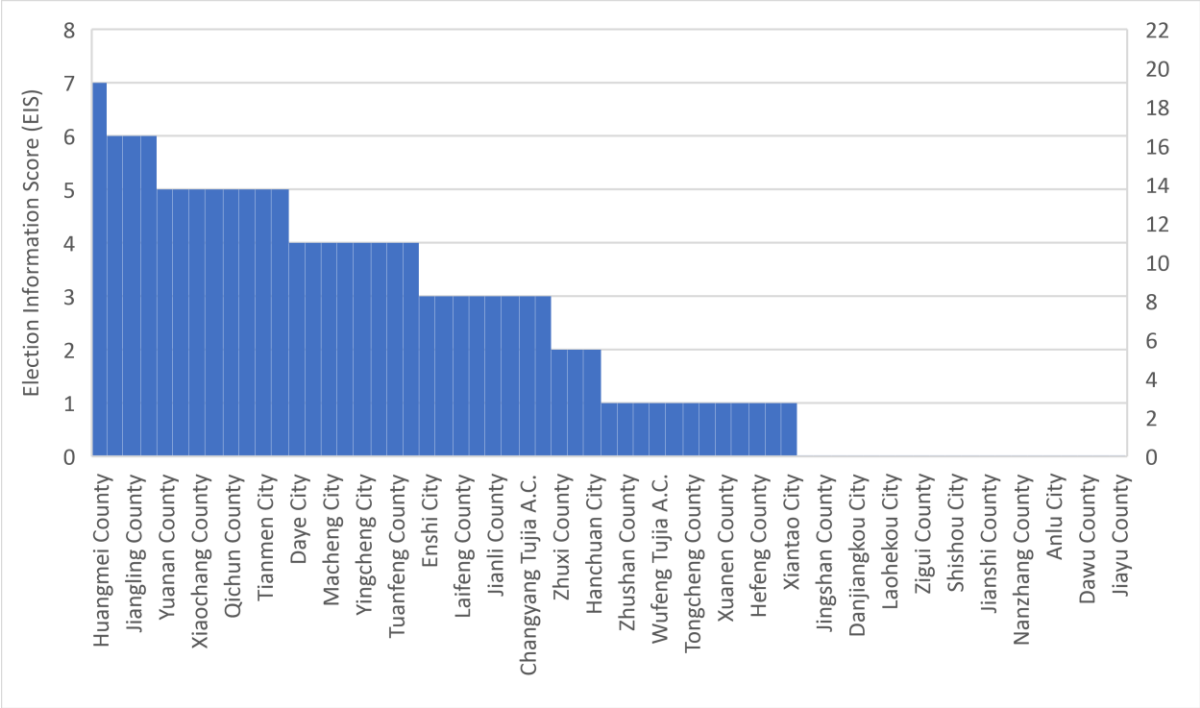

FIGURE 3. ELECTION INFORMATION SCORE (EIS) DISTRIBUTION

Due to illness, impairment, or aging factors, many people are regarded as disabled in front of the Internet browsers. However, it is not right to exclude them from the service provided by governments via their digital services. China has a large disabled population. For many of them, an accessible online government website can bring government services to their homes. This will increase their satisfaction with the government, ease the services, and reduce the costs for governments as well. Under this circumstance, it is necessary for local governments make sure their websites meet accessibility standards to facilitate access to the government information and services that people with disabilities need.

TABLE 4. SECTION 508 ACCESSIBILITY VIOLATION DISTRIBUTION BY HUBEI COUNTIES

# of accessibility violations	Counties with violations	% of all counties
0 Violation	5	7.9%
1 Violation	14	22.2%
2 Violations	19	30.2%
3 Violations	20	31.7%
4 Violations	4	6.3%
5 Violations	1	1.6%

TABLE 5. SECTION 508 ACCESSIBILITY STANDARDS VIOLATION

Section 508 standards	Counties with violations	% of all counties
Text equivalent for non-text	8	12.7%
Redundant links for server-side image maps	40	63.5%
Frames shall be titled with text that facilitates frame identification and navigation.	40	63.5%
Scripts should be identified by accessible text	18	28.6%
Forms should be accessible	27	42.9%

Mobile Readiness

When King and Youngblood (2016) found that less than a quarter of Alabama county websites were prepared for mobile, it is interesting for this research to find that as high as 92.1% of Hubei counties, i.e., 58 out of 63 counties, were mobile-ready. Mobile readiness means that the webpage design changes to suit a smaller screen when a mobile device is detected in use. The server provides webpages with larger fonts, less crowded design, and more concise menu options to facilitate easy mobile navigation and operation. Normally, web designers use a different set of Cascading Style Sheet (CSS) for mobile devices. It is automatically loaded when the server detects a mobile device rather than a desktop/laptop computer is in use. In terms of technology, it is not a difficult matter. It is more about the management and attention the government pays to the mobile readiness issue. With a huge number of mobile users in China, about 700 million (Deagon, 2016), companies are paying closer attention to their services via mobile channels. Obviously, governments at local levels, such as Hubei counties, are catching onto this trend and making their e-government portals mobile friendly.

DISCUSSION AND CONCLUSIONS

The benefits of e-government are tremendous, including reducing government spending and increasing interest earning, improving delivery of government services, and promoting e-democracy (Huang, 2007). E-government can significantly reduce government transaction costs. For example, savings of e-democracy could be as much as $110 billion and €144 billion a year; $3 trillion in exchanges happen between citizens and U.S. governments each year (Watson & Mundy, 2001). Other research reports that e-government can transform bureaucracy, can allow public sectors to focus on user satisfaction and control and flexibility in service delivery (Ho, 2002), and can support businesses (Gengatharen & Standing, 2005). However, it takes a lot of resources and strategic vision to establish a good e-government website that will be adopted by citizens for information, communication, transactions, and democracy purposes. As King and Youngblood (2016) commented, when we move forward with increasing numbers of government transactions and information sharing being facilitated via digital means, it is critical to consider who may be excluded and under what conditions the exclusion happens. It is necessary to

investigate what administrative resources and capacity or service and information delivery priorities lead to different decisions by local governments to establish a web presence. To design a government website with high user satisfaction, local governments should consider usability, accessibility, as well as mobile readiness. While these three issues are more technology-related, the voting and election content is not. Election is an administrative process guided by a country's laws and policies. If the current law at China's county level does not support direct election, local governments can still choose to publish the election information about candidates, their contact information, and election results etc. to increase government transparency and interest citizens in politics. This research provides a comprehensive evaluation of local e-governments in Hubei province in terms of usability, accessibility, election content, as well as mobile readiness. The data and insights from this research will be useful for scholars and practitioners who are interested in e-government management in China.

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APPENDIX 1. COUNTIES IN HUBEI PROVINCE

CountyCN	*CountyEN*	*CNPortal*	*LandAreaSqKm*	*RuralPop10K*	*GDP*	*PerCapGDP*
阳新县	Yangxin County	http://www.hbyxx.gov.cn/	2783	102.0	128.70	12618
大冶市	Daye City	http://www.hbdaye.gov.cn/	1566	94.6	331.84	35078
郧西县	Yunxi County	http://www.yunxi.gov.cn/	3509	50.7	40.43	7974
竹山县	Zhushan County	http://www.zhushan.gov.cn/	3586	47.3	49.66	10499
竹溪县	Zhuxi County	http://www.zhuxi.gov.cn/	3311	37.4	42.72	11422
房县	Fang County	http://www.cnfx.gov.cn/	5110	48.7	43.77	8988
丹江口市	Danjiangkou City	http://www.danjiangkou.gov.cn/	3121	46.0	108.38	23561
远安县	Yuanan County	http://www.yuanan.gov.cn/	1752	19.4	101.13	52129
兴山县	Xingshan County	http://www.xingshan.gov.cn/	2327	17.6	56.26	31966
秭归县	Zigui County	http://www.hbzg.gov.cn/	2427	38.2	66.69	17458
长阳土家族自治县	Changyang Tujia A.C.	http://www.changyang.gov.cn/	3430	40.7	75.30	18501
五峰土家族自治县	Wufeng Tujia A.C.	http://www.hbwf.gov.cn/	2072	20.5	36.62	17863
宜都市	Yidu City	http://ldj.yidu.gov.cn/	1357	39.5	273.82	69322
当阳市	Dangyang City	http://www.hbdy.gov.cn/	2159	48.6	240.63	49512
枝江市	Zhijiang City	http://xxgk.zhijiang.gov.cn/	1310	49.6	232.72	46919
南漳县	Nanzhang County	http://www.hbnz.gov.cn/	3859	58.8	124.70	21207
谷城县	Gucheng County	http://www.hbgucheng.gov.cn/	2553	58.9	163.49	27757
保康县	Baokang County	http://www.bk.gov.cn/	3222	27.8	56.02	20151
老河口市	Laohekou City	http://www.lhk.gov.cn/default.asp	1032	53.3	165.57	31064
枣阳市	Zaoyang City	http://www.zyzf.gov.cn/	3277	112.1	301.81	26923
宜城市	Yicheng City	http://www.ych.gov.cn/	2115	57.3	165.10	28813
京山县	Jingshan County	http://www.jingshan.gov.cn/	3520	65.7	206.23	31390
沙洋县	Shayang County	http://www.shayang.gov.cn/index.html	2044	62.2	153.12	24617
钟祥市	Zhongxiang City	http://www.zhongxiang.gov.cn	4488	106.9	255.54	23905
孝昌县	Xiaochang County	http://www.xiaochang.gov.cn/	1217	67.6	73.08	10811
大悟县	Dawu County	http://www.hbdawu.gov.cn/	1985	64.2	79.65	12407

云梦县	Yunmeng County	http://www.yunmengnet.com/	604	58.0	130.23	22453
应城市	Yingcheng City	http://www.yingchengnet.com/	1103	67.8	151.57	12618
安陆市	Anlu City	http://www.anlu.gov.cn/alweb/government-firstPage.whbs	1355	63.4	108.03	17039
汉川市	Hanchuan City	http://www.hanchuan.gov.cn/index.html	1659	112.8	247.57	21948
江陵县	Jiangling County	http://www.jiangling.gov.cn/	2257	105.9	41.83	3950
公安县	Gongan County	http://www.gongan.gov.cn/	3460	156.2	134.62	8618
监利县	Jianli County	http://www.114huoche.com/zhengfu/JingZhou-JianLiXian	1048	40.9	156.64	12618
石首市	Shishou City	http://www.shishou.gov.cn/shishou/	1427	64.6	95.87	14841
洪湖市	Honghu City	http://www.honghu.gov.cn/	2519	94.1	122.89	13060
松滋市	Songzi City	http://www.hbsz.gov.cn/	2177	77.0	126.78	16465
团风县	Tuanfeng County	http://www.tfzf.gov.cn/	833	37.8	49.50	13095
红安县	Hongan County	http://www.hazf.gov.cn/	1796	66.4	82.26	12389
罗田县	Luotian County	http://www.luotian.gov.cn/	2129	61.4	72.93	11878
英山县	Yingshan County	http://www.chinays.gov.cn/	1449	40.1	52.07	12985
浠水县	Xishui County	http://www.xishui.gov.cn/	1949	103.0	124.68	12105
蕲春县	Qichun County	http://www.qichun.gov.cn/	2398	100.3	129.15	12876
黄梅县	Huangmei County	http://www.hmzx.gov.cn/	1701	98.9	108.50	10971
麻城市	Macheng City	http://www.macheng.gov.cn/	3747	116.3	156.67	13471
武穴市	Wuxue City	http://www.wuxue.gov.cn/	1246	78.8	159.52	20244
嘉鱼县	Jiayu County	http://www.jiayu.gov.cn/	1017	37.2	131.16	35258
通城县	Tongcheng County	http://www.zgtc.gov.cn/zw/	1172	50.0	73.80	14760
崇阳县	Chongyang County	http://www.chongyang.gov.cn/	1968	47.7	67.44	14138
通山县	Tongshan County	http://www.tongshan.gov.cn/	2680	46.8	56.20	12618
赤壁市	Chibi City	http://www.chibi.gov.cn/	1723	52.2	188.21	36056
随县	Sui County	http://www.zgsuixian.gov.cn/index.html	5763	97.9	120.94	12618
广水市	Guangshui City	http://www.zggs.gov.cn/	2641	94.7	166.76	17609
恩施市	Enshi City	http://www.enshi.gov.cn/zwz/index.html	3972	80.5	105.34	13086

利川市	Lichuan City	http://www.lichuan.gov.cn/	4607	90.6	64.77	7149
建始县	Jianshi County	http://www.hbjs.gov.cn/	2666	51.4	47.87	9313
巴东县	Badong County	http://wlwz.hbbd.gov.cn/	3354	49.0	57.52	11739
宣恩县	Xuanen County	http://www.xuanen.gov.cn/	2737	35.9	34.64	9649
咸丰县	Xianfeng County	http://www.xianfeng.gov.cn/	2550	38.5	41.98	10904
来凤县	Laifeng County	http://www.laifeng.gov.cn/	1342	32.7	35.24	10777
鹤峰县	Hefeng County	http://www.hf.gov.cn/	2872	22.3	30.43	13646
天门市	Tianmen City	http://www.tianmen.gov.cn/zwgk/ldzc/	2622	141.9	321.2	23989.0
仙桃市	Xiantao City	http://www.xiantao.gov.cn/zwgk/zcfg/	2538	117.5	444.2	
潜江市	Qianjiang City	http://www.hbqj.gov.cn/	2004	94.6	441.8	
神农架林区	Shennongjia District	http://www.snj.gov.cn/	3253	7.6	16.8	

APPENDIX 2. USABILITY INSTRUMENT

		Websites failing (%)
Overall Design standards		
O1	A splash page is Not used	
O2	A small random floating window on homepage is NOT used	
O3	Audio and video do NOT auto play when page loads	
O4	Horizontal scrolling is NOT required with the browser window set to 1024 pixels across.	
Conventions for hyperlinked text in main text		
C1	All text links are blue (some shades of blue)	
C2	All text links are a different color than the main text	
C3	All text links color changes after a link is clicked	
C4	All text links are underlined	
Navigation Standards		
N1	A "home" or "return" text link appears on internal pages	
N2	A county logo or other header graphic serves as a "home" link on internal pages	
N3	Main navigation is on the top and/or left-side of the page	
N4	There are 10 or fewer visible items per navigational grouping	
Readability		
R1	Main body text is left aligned	
R2	Any text that is underlined is a link	
Language option		
L1	Page has a non-Chinese version or a translation option	
Findability		
F1	County website is in the first page of results from Baidu	

APPENDIX 3. VOTING & ELECTION INSTRUMENT

	Measure
E1	Election website
E2	Specific link on main county site for election website
E3	Name of election official(s)
E4	Contact Information (email address listed)
E5	Contact information (form)
E6	Contact information (phone)
E7	Email information sign up
E8	Text information sign up
E9	Media/press information section
E10	Physical Address
E11	Online downloadable voter registration form
E12	Voter registration Status/Search
E13	Voting location address search
E14	Provisional ballot status search
E15	Sample ballot
E16	Vote by mail (absentee) ballot application
E17	Update voter registration address link/form
E18	Voter registration locations
E19	Voter ID information and requirements
E20	Election results (any)
E21	Election results for 2015
E22	Election results for 2010

APPENDIX 4. ACCESSIBILITY INSTRUMENT

A	Text equivalent for non-text
E	Redundant links for server-side image maps
I	Frames shall be titled with text that facilitates frame identification and navigation.
L	Scripts should be identified by accessible text
N	Forms should be accessible

COMPETITIVE ADVANTAGE THROUGH OPERATIONS SYSTEM AND SUPPLIER NETWORK RESPONSIVENESS

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ABSTRACT

This study extends Thatte and Agrawal's (2017) research which found positive effects of operations system responsiveness (OSR) and supplier network responsiveness (SNR) on competitive advantage (CA), and Thatte, Rao, and Ragu-Nathan's (2013) research which found positive relationships between supply chain management (SCM) practices, supply chain responsiveness (SCR), and CA. As such, by utilizing MANOVA, this study analyses how CA is effected by high and low levels of OSR and SNR. The study finds that high levels of OSR create high levels of CA for a firm collectively and individually on price, delivery dependability, product innovation, and time to market. The study also finds that high levels of SNR create high levels of CA for a firm collectively and individually on price and delivery dependability. Useful implications of the findings are drawn and discussed.

INTRODUCTION

Firms are finding it useful to aptly respond to changing customer needs (Huber, 1984; Ward, McCreery, Ritzman, & Sharma, 1998) and supply disruptions (Christopher & Peck, 2004; Lee, 2004) in today's global supply chains. Consistent with Thatte and Agrawal (2017) and Thatte, Rao, and Ragu-Nathan (2013), this research studies the SCR construct from the customer demand perspective, rather than a supply disruption perspective.

Thatte and Agrawal (2017) found OSR and SNR to positively impact CA. Thatte et al. (2013) dealt with large scale instrument validation and hypotheses testing between SCR and CA using structural equation modeling and found positive relationship between SCR and CA, SCM practices and SCR, and SCM practices and CA. This study extends Thatte and Agrawal's (2017) and Thatte et al.'s (2013) studies by examining how CA responds to high and low levels of OSR and SNR, in order to draw implications. Such a dimension level analysis between SCR and CA is lacking in

existing literature and this study aims to fill this research gap by offering insights into these relationships. Such an analysis can contribute towards providing more meaningful research implications.

The relationships among the constructs were tested using MANOVA, using data collected from 294 respondents to a survey questionnaire. The remainder of the paper is organized as follows. Section 2 presents the research framework, definitions, and theory underlying each dimension of SCR and CA. The research questions are identified in section 3. The research methodology and results of data analyses are described in sections 4 and 5 respectively. Section 6 presents the findings and implications of the study, while section 7 concludes the study by offering limitations and directions for future research.

RESEARCH FRAMEWORK

Figure 1 presents the framework being investigated in this research. Thatte et al. (2013) developed the SCR construct and a valid and reliable measurement instrument for SCR through rigorous statistical methodologies, including pretest, pilot-test, confirmatory factor analysis, unidimensionality, reliability, and validation of second-order construct.

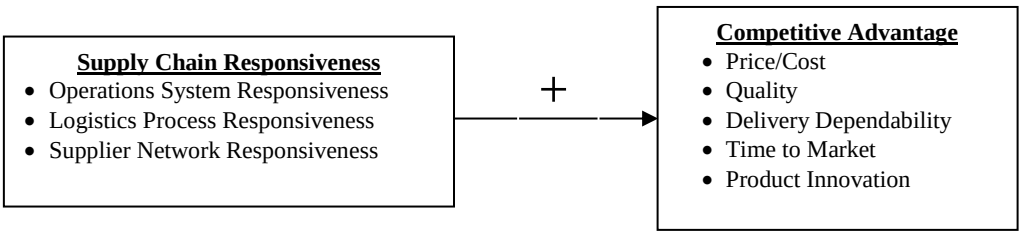

FIGURE 1. RESEARCH FRAMEWORK

Supply Chain Responsiveness (SCR)

SCR is defined as the capability of promptness and the degree to which a supply chain can address changes in customer demand (Duclos, Vokurka, & Lummus, 2003; Holweg, 2005; Lummus, Duclos, & Vokurka, 2003; Prater, Biehl, & Smith, 2001). This responsiveness is aggregate of three first-order constructs operations system responsiveness (OSR), logistics process responsiveness (LPR), and supplier network responsiveness (SNR). SCR is the ability of the supply chain to rapidly address changes and requests in the marketplace (Holweg, 2005), which implies that speed combined with flexibility results in responsiveness (Prater et al., 2001). Thatte et al. (2013) conceptualized and operationalized OSR, LPR, and SNR as three sub-constructs of SCR.

OSR is defined as the ability of a firm's manufacturing system to address changes in customer demand (Thatte et al., 2013). Although it encompasses manufacturing and service operations, this study focusses on firms within the manufacturing industry. In manufacturing operations, it includes the ability to rapidly configure or reconfigure assets and operations of a manufacturing

system in order to cope with consumer trends (Lummus et al., 2003; Wu, 2001), respond to changes in product volume, respond rapidly to unexpected events, effectively expedite emergency customer orders, and an ability to swiftly accommodate special or non-routine customer requests. OSR at each node in a supply chain is an integral component of SCR, since each entity in a supply chain is required to deliver the product or service in a timely and reliable manner, to fulfill customer demands (Duclos et al., 2003; Lummus et al., 2003; Meehan & Dawson, 2002). The items under this category measure the responsiveness associated with a specific node or firm in a supply chain (Duclos et al., 2003; Lummus et al., 2003). Measures used to operationalize the OSR construct are: operations system's ability to – respond rapidly to changes in product volume demanded by customers, effectively expedite emergency customer orders, rapidly reconfigure equipment to address demand changes, rapidly reallocate people to address demand changes, and rapidly adjust capacity to address demand changes.

LPR is defined as the ability of a firm's outbound transportation, distribution, and warehousing system (including 3PL/4PL) to address changes in customer demand (Thatte et al., 2013). These activities include warehousing, packing and shipping, transportation planning and management (Duclos et al., 2003; Lummus et al., 2003; Ricker & Kalakota, 1999), inventory management, reverse logistics, order tracking and delivery. This study focuses on the outbound logistics of the focal firm. The responsiveness in the logistic processes is a vital component in the success of a responsive supply chain strategy (Fawcett, 1992). Fuller, O'Conor, and Rawlinson (1993) suggest that a firm's logistics system is instrumental in creating value for its customers. This value creation for a firm's customers implies ensuring logistics flexibility (Duclos et al., 2003; Lummus et al., 2003) and speed within the supply chain to serve each distinct customer's needs. Responsiveness components in the logistics system include selecting logistics components that accommodate and respond to wide swings in demand over short periods, adjust warehouse capacity to address demand changes, handle a wide range of products, vary transportation carriers, have the ability to pack product-in-transit to suit discreet customers' requirements, and have the ability to customize products close to the customer (i.e. postponement), and do all of these speedily in order to gain a CA. Hise (1995) maintains that the logistics system of a firm needs to be flexible and responsive in order to be able to adjust its logistics resources rapidly for satisfying market needs. It is also important that firms have easy access to and are able to utilize different modes of transportation to be logistically flexible and responsive (Prater et al., 2001). Lummus et al. (2003) present critical logistics process flexibility aspects of a supply chain, which are vital for SCR. These aspects have been adapted for LPR to form its measures: logistics system's ability to - rapidly respond to unexpected demand change, rapidly adjust warehouse capacity to address demand changes, rapidly vary transportation carriers to address demand changes, and effectively deliver expedited shipments.

SNR is defined as the ability of a firm's major suppliers to address changes in the firm's demand (Thatte et al., 2013). The ability of firms to react quickly to customer demand is dependent on the reaction time of suppliers to make volume changes. A key to responsiveness is the presence of responsive and flexible partners upstream and downstream of the focal firm (Christopher & Peck, 2004). Supply chain networks must be ready to react to any ripple effects due to supply disruptions as well (Walker, 2005). In order to have a CA, organizations need to meet the changing needs of customers by being able to rapidly supply products, including any demand changes in terms of product volume, mix, product variations, and new product introductions. Meeting these needs

requires responsiveness in the supply chain at various stages from the raw materials to finished products to distribution and delivery. Supplier networks are the essential building blocks of a flexible system and their flexibility is an important ingredient of being responsive to customers (Holweg & Pil, 2001; Slack, 1991). In order to be responsive, organizations should be able to select suppliers who can add new products quickly and have suppliers make desired changes. Fisher, Ramen, and McClelland (2000) found that for short lifecycle products, such as fashion apparel, retailers are most successful if they can work with suppliers who can provide initial shipments of product based on forecasts, but then rapidly increase production to the right style, color, size, etc. based on actual sales. Several studies (e.g. Choi & Hartley, 1996) suggest that supplier selection based on product development capabilities, rapid deployment capabilities or product volume flexibility positively impact the delivery time of new products. Holweg (2005) found that the lack of supplier network flexibility hampered its customer's responsiveness capability. Supplier network flexibility (Slack, 1991) and thus SNR (Thatte et al., 2013) is an important part of SCR. The measures of SNR used in this study are: major suppliers' ability to - change product mix in a relatively short time, consistently accommodate the firm's requests, provide quick inbound logistics to the firm, and effectively expedite emergency orders.

Competitive Advantage (CA)

CA is defined as the "capability of an organization to create a defensible position over its competitors" (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006, p. 111). CA comprises of distinctive competencies that sets an organization apart from competitors, thus giving them an edge in the marketplace (Tracey, Vonderembse, & Lim, 1999). CA traditionally involved the choice regarding the markets in which a firm would compete, defending market share in clearly defined segments using price and product performance attributes (Day, 1994). Competition in today's global economy depends on anticipating and quickly responding to changing market needs. Porter's approach to CA centers on a firm's ability to be a low-cost producer in its industry, or to be unique in its industry in some aspects that are popularly valued by customers (Porter, 1991). Most managers agree that cost and quality will continue to remain the CA dimensions of a firm (D'Souza & Williams, 2000). Wheelwright (1978) suggests cost, quality, dependability and speed of delivery as some of the critical competitive priorities for manufacturing. 'Time' has been argued to be a dimension of CA in other research contributions (viz. Stalk, 1988; Vesey, 1991; Zhang, 2001). There is widespread acceptance of time to market as a source of CA (Holweg, 2005). Price/cost, quality, delivery dependability, and time to market have been consistently identified as important competitive capabilities (Skinner, 1985; Tracey et al., 1999; Vokurka et al., 2002; White, 1996). In a research framework, Koufteros, Vonderembse, and Doll (1997) describe competitive pricing, premium pricing, value-to-customer quality, dependable delivery, and product innovation as the five dimensions of competitive capabilities. These dimensions were further described and utilized in other contributions as well (Cleveland, Schroeder, & Anderson, 1989; Koufteros, Vonderembse, & Doll, 2002; Li et al., 2006; Rondeau, Vonderembse, & Ragu-Nathan, 2000; Safizadeh, Ritzman, Sharma, & Wood, 1996; Tracey et al., 1999; Vickery, Calantone, & Dröge, 1999). CA has been operationalized in existing literature (Koufteros et al., 1997; Zhang, 2001) and the measures have been adopted in this study with minor modifications. Based on the study of Koufteros (1995),

Zhang (2001), and Li et al. (2006) and as used in Thatte et al. (2013) this study uses price, quality, delivery dependability, product innovation, and time to market as the five dimensions of CA.

RESEARCH QUESTIONS

This study aims at answering the following research questions: (1) Are there significant mean differences in CA of a firm, as measured by a combination of price, quality, delivery dependability, product innovation, and time to market, for high and low OSR / SNR? (2) Are there significant mean differences in CA of a firm based on 'price', for high and low OSR / SNR? (3) Are there significant mean differences in CA of a firm based on 'quality', for high and low OSR / SNR? (4) Are there significant mean differences in CA of a firm based on 'delivery dependability', for high and low OSR / SNR? (5) Are there significant mean differences in CA of a firm based on 'product innovation', for high and low OSR / SNR? and (6) Are there significant mean differences in CA of a firm based on 'time to market', for high and low OSR / SNR?

RESEARCH METHODOLOGY

This study adopts the SCR instrument developed by Thatte et al. (2013) and the CA instrument developed by Zhang (2001) and Koufteros et al. (1997). The items for these instruments are listed in Appendix B. The unit of analysis in this study is a firm since SCR is dependent on the individual operating firms within a supply chain. Past studies (ex: Swafford, Ghosh, & Murthy, 2006) have used similar unit of analysis. Also a study that encompasses the entire supply chain domain, from raw materials through production/assembly at multiple stages/organizations, through delivery via diverse distribution channels, would be complex, time consuming, and costly.

Large-scale data collection was conducted using a web-based survey grounded on methods of Dillman (2000). E-mail lists were purchased from The Council of Supply Chain Management (CSCMP), Rsateleservices.com, and Lead411.com. Seven SIC codes were covered in the study: 22 "Textile Mill products", 23 "Apparel and other Textile Products", 25 "Furniture and Fixtures", 34 "Fabricated Metal Products", 35 "Industrial Machinery and Equipment", 36 "Electrical and Electronic Equipment", and 37 "Transportation Equipment." The lists were limited to organizations with more than 100 employees as these organizations were most likely to engage in SCM initiatives. Since the focus of this study is SCM, the target respondents were the operations / manufacturing / purchasing / logistics / materials / supply chain – vice presidents, directors, and managers, as these personnel were deemed to have the best knowledge of the supply chain area. The respondents were asked to refer to their major suppliers or customers when answering the questionnaire. The final version of the questionnaire was administered by e-mail to 5,498 target respondents. To ensure a reasonable response rate, the survey was e-mailed in three waves.

The response rate was calculated based on the number of click-throughs the emailing generated and total number that was converted to a completed survey. After three waves of emailing a total of 714 click-throughs were generated and 294 completes were obtained to provide a good response

rate of 41.18%. Response rate based on the click-throughs may represent a better measure for email surveys, since bulk emails sent out in this manner are treated as spam by respondents' organizations' email program and may never be retrieved or viewed by the target respondent. Since it is highly difficult to track this information accurately, a more appropriate measure would be to base the analysis on the number of people who have visited the site and have had an opportunity to review the request and purpose of this study, and then may have declined to complete the survey based on any number of reasons. 11% of the respondents are CEO/President, 45% are Vice Presidents, 25% are Directors, and 19% are titled as Managers. Thus 81% of the respondents (CEOs, VPs, and Directors) are high-level executives, implying a high reliability of the responses received, as these executives have a wider domain (job responsibility) and administrative knowledge. This is consistent with past survey-based research studies in SCM (ex: Frohlich & Westbrook, 2002). The areas of expertise were 11% executives (CEOs/Presidents), 12% purchasing, 22% SCM, 18% distribution/transportation/logistics, 20% manufacturing/production, 10% materials, and 7% belong to other category such as sales. Thus the respondents' domains cover all key functions across the supply chain ranging from purchasing, to manufacturing, to sales, to distribution. Also, since 33% of the respondents have been with the organization for over 10 years and 21% have been at their organization between 6-10 years, implies that majority of the respondents have a comprehensive view of their firm's supply chain program.

This research did not investigate non-response bias directly since the email lists had only names and email addresses of individuals without the organizational details. This research compares those subjects who responded after the first e-mailing wave and those who responded to the second/third wave. The succeeding waves of survey were considered to be representative of non-respondents (Armstrong & Overton, 1977; Lambert & Harrington, 1990). Similar methodology has also been used in prior SCM empirical research (Chen & Paulraj, 2004; Handfield & Bechtel, 2002; Li, Rao, Ragu-Nathan, & Ragu-Nathan, 2005). Chi-square tests (χ^2 statistic) were used to make the comparisons. No significant difference in industry type (based on SIC), employment size, and respondent's job title was found between these two groups (i.e. $p > 0.1$, when testing the null hypotheses: there is no significant difference in distribution of responses across SIC codes/employment size/job title between groups). Further, Chi-square tests of independence were also performed to observe if the distribution of responses across SIC codes, employment size, and respondent's job title is independent of the three waves when considered independently. No significant difference in industry type (based on SIC), employment size, and respondent's job title was found between each of the three groups / waves.

RESULTS

Thatte et al. (2013) found SCR to have a direct positive impact on CA of a firm and confirmed the assertion in literature that a responsive supply chain in terms of an organization's operations system, logistics and distribution processes, and suppliers could provide firms with CA on cost, quality, delivery dependability, product innovation, and time-to-market dimensions. This study builds on Thatte and Agrawal's (2017) study which found OSR and SNR dimensions of SCR to be significant in predicting CA on a composite basis. The data analysis utilized MANOVA to study how CA and its dimensions are impacted with high and low levels of OSR and SNR can provide

additional insights into improving CA and its constituents by means of OSR and SNR. Thatte and Agrawal's (2017) study which utilized regression analyses did not find support for impact of OSR or SNR on CA dimensions, with the exception of 'delivery dependability.' This section aims at understanding if the measures of CA when considered collectively and individually, significantly differ for high and low levels of SCR dimensions.

MANOVA has several advantages over ANOVA (analysis of variance) (Tabachnick & Fidell, 1996). First, by measuring several DVs instead one, the chances of discovering what actually changes as a result of the differing treatments or characteristics, and any interactions, improve greatly. Thus, we improve our chances of uncovering these effects by including the measures of CA in the analysis. A second advantage is that, under certain conditions, MANOVA can reveal differences that separate ANOVAs might not (Stevens, 1992; Tabachnick & Fidell, 1996). There are several available test statistics for MANOVA, including Wilks' Lambda (λ), Pillai's Trace, Hotelling's Trace, and Roy's Largest Root. The most commonly used is the Wilks' Lambda. Wilks' λ ranges from zero to one. The smaller the value of λ, more is the evidence for treatment effects or group differences (Stevens, 1992).

Thatte and Agrawal (2017) found OSR and SNR as two significant dimensions of SCR that predict CA. Thus for conducting MANOVA only OSR and SNR have been considered as two distinct independent variables (IVs). The dependent variables (DVs) are the five dimensions of CA (viz. price, quality, delivery dependability, product innovation, and time-to-market). The results of MANOVA shall answer the research questions presented in section 3.

This study follows the data analysis procedure for MANOVA as outlined by Mertler and Vannatta (2016). First, we evaluate Box's Test. If homogeneity of variance-covariance is assumed, we utilize Wilks' Lambda statistic when interpreting the multivariate tests. If the assumption of equal variances is violated, we use Pillai's Trace. Second, once the multivariate test statistic has been identified, we examine the significance (F-ratios and p-values) of factor interaction, which is necessary if two or more IVs are included. Third, we examine the significance of each factor's main effect by utilizing the F-ratios and p-values. If the results are significant, we proceed to the next step. If results are not significant, we stop data analysis. Fourth, we examine the univariate tests (ANOVAs) of individual DVs. If any tests are significant, we proceed to the next step. If tests are found to be not significant, we stop data analysis. Fifth, we perform Roy-Bargman stepdown F-test to support the results of ANOVA (Hair, Anderson, Tatham, & Black, 1998). Finally, we examine post hoc tests for the individual DVs.

Thatte and Agrawal (2017) found OSR to be the first SCR dimension to predict CA on a composite basis. We therefore perform a one-way MANOVA with OSR as IV, with high and low categories, and the five dimensions of CA as quantitative DVs. We utilize the OSR scale developed by Thatte et al. (2013), which was a 5-point Likert scale measured from 1 (not at all) to 5 (to a great extent). We define the "high" category as a score of 4 or 5, and "low" category as a score of 3 or below. It is desired that the DVs that are entered in the MANOVA analysis be correlated (Hair et al., 1998; Mertler and Vannatta, 2016). Therefore, before proceeding with the multivariate tests, Pearson correlation was performed to determine if the DVs are significantly correlated. Table 1 shows the Pearson correlation results.

TABLE 1. PEARSON CORRELATIONS FOR CA DIMENSIONS

	Price	Quality	Delivery Dependability	Product Innovation	Time to Market
Price	1	0.180**	0.222**	0.069	0.207**
Quality	0.180**	1	0.214**	0.108	0.078
Delivery Dependability	0.222**	0.214**	1	0.030	0.230**
Product Innovation	0.069	0.108	0.030	1	0.238**
Time to Market	0.207**	0.078	0.230**	0.238**	1

** Correlation is significant at 0.01 level

Results show some correlation between price, quality, delivery dependability, product innovation, and time to market. Since some correlation is observed, we proceed with the MANOVA tests. MANOVA was conducted utilizing the multivariate procedure in SPSS. The Box's Test presented in Table 2 tests the null hypothesis that the observed covariance matrices of the DV are equal across groups. The results show that the test is not significant, indicating that homogeneity of variance-covariance is fulfilled, $F(15, 242285.4) = 1.498$, $p = 0.096$, subsequently needing a Wilks' Lambda test statistic to interpret MANOVA results.

TABLE 2. BOX'S TEST OF EQUALITY OF COVARIANCE MATRICES FOR OSR

Box's M	22.914
F	1.498
df1	15
df2	242285.4
Sig.	0.096

The Wilks' Lambda multivariate test is presented in Table 3. MANOVA results indicate that the combined DV of price, quality, delivery dependability, product innovation, and time to market, significantly differs for high and low levels of OSR (Wilks' $\lambda = 0.858$, $F(5, 288) = 9.527$, $p = 0.000$, partial $\eta^2 = 0.142$). However, the multivariate effect size, η^2, is small, which reveals low strength in associations.

TABLE 3. WILKS' λ MULTIVARIATE TEST OF SIGNIFICANCE FOR OSR

Test	Value	F	Hypothesis df	Error df	Sig. (*p*)	Partial Eta Squared
Wilks' Lambda	0.858	9.527	5	288	0.000	0.142

Since the multivariate test was significant, we examine the univariate ANOVA results of individual DVs as presented in Table 4. As recommended by Tabachnick and Fidell (1996), ANOVA results are interpreted using a conservative alpha level of $\alpha = 0.01$ (i.e. 0.05/5) to counteract the potential of an inflated type I error rate which can be caused due to multiple ANOVAs.

ANOVA results indicate that the CA of a firm based on price ($F(1, 292) = 9.637$, $p < 0.01$, partial $\eta^2 = 0.032$), delivery dependability ($F(1, 292) = 16.085$, $p < 0.001$, partial $\eta^2 = 0.052$), product innovation ($F(1, 292) = 16.568$, $p < 0.001$, partial $\eta^2 = 0.054$), and time-to-market ($F(1, 292) = 20.421$, $p < 0.001$, partial $\eta^2 = 0.065$), significantly differs for high and low levels of OSR. Although significant group differences were found for these four DVs, the effect sizes are small, indicating that a small proportion of variance in the individual abilities of a firm to compete based on price, delivery dependability, product innovation, and time to market, is accounted for by OSR. The ability of an organization to compete based on quality does not significantly differ for high and low levels of OSR ($F(1, 292) = 0.095$, $p = 0.759$, partial $\eta^2 = 0.000$).

TABLE 4. ANOVA SUMMARY TABLE FOR OSR

Source	DV	Sum of Squares	df	Mean Square	F	Sig. (*p*)	Partial Eta Squared
OSR	Price	7.812	1	7.812	9.637	0.002	0.032
	Quality	0.030	1	0.030	0.095	0.759	0.000
	Delivery Dependability	7.434	1	7.434	16.085	0.000	0.052
	Product Innovation	11.313	1	11.313	16.568	0.000	0.054
	Time to Market	13.092	1	13.092	20.421	0.000	0.065

Roy-Bargman stepdown F test, as presented in Table 5, was performed to support the results of ANOVA and to check for significance of group differences while allowing DV inter-correlation. This test will assure that the effect of OSR on individual DVs is not due to the inter-correlation effect between the DVs, but by itself. Results show that four variables – price ($F(1, 292) = 9.637$, $p < 0.01$), delivery dependability ($F(1, 290) = 12.443$, $p < 0.001$), product innovation ($F(1, 289) = 16.342$, $p < 0.001$), and time to market ($F(1, 288) = 6.810$, $p = 0.01$)) have unique differences across high and low levels of OSR, indicating that the four dimensions of CA are not so highly correlated with each other that there are no unique differences in each of them after the effects of the other three are accounted for.

TABLE 5. ROY-BARGMAN STEPDOWN F TESTS FOR OSR

Variable	Between-Groups Mean Square	Within-Groups Mean Square	Stepdown F	Degrees of Freedom		Significance of Stepdown F
				Between	Within	
Price	7.812	0.811	9.637	1	292	0.002
Quality	0.019	0.306	0.062	1	291	0.804
Delivery Dependability	5.386	0.433	12.443	1	290	0.000
Product Innovation	11.116	0.680	16.342	1	289	0.000
Time to Market	4.035	0.593	6.810	1	288	0.010

Result suggests that, the level of OSR has significant separate effects on CA based on price that are unrelated to the CA of a firm based on delivery dependability, product innovation, and time to market. Similarly, results also show that: the level of OSR has significant separate effects on CA based on delivery dependability that are unrelated to the CA based on price, product innovation, and time to market; level of OSR has significant separate effects on CA based on product innovation, that are unrelated to CA based on price, delivery dependability, and time to market; level of OSR has significant separate effects on CA based on time to market, that are unrelated to CA based on price, delivery dependability, and product innovation. Thus the results suggest that high and low levels of OSR, both collectively as indicated by MANOVA and individually as shown by ANOVA and Roy-Bargman stepdown F tests significantly differ on price, delivery dependability, product innovation, and time to market.

TABLE 6. MEANS AND STANDARD DEVIATIONS FOR CA DIMENSIONS BY OSR

	OSR	Mean	Std. Deviations
Price	Low	3.25	0.92
	High	3.58	0.89
Delivery Dependability	Low	4.04	0.71
	High	4.37	0.66
Product Innovation	Low	3.63	0.87
	High	4.04	0.79
Time to Market	Low	2.94	0.80
	High	3.37	0.80

Table 6 presents the means and standard deviations for price, delivery dependability, product innovation, and time to market by high and low levels of OSR. The means are significantly different for high and low levels of OSR, indicating that organizations can compete based on price,

delivery dependability, product innovation, and time to market, to a greater extent if they have high levels of OSR. The results thus suggest that OSR has a positive impact on CA in terms of a firm's ability to compete based on price, delivery dependability, product innovation, and time to market, but not on its ability to compete based on quality.

Since Thatte and Agrawal (2017) found SNR to be the second dimension of SCR to predict CA on a composite basis, a one-way MANOVA is performed with SNR as IV, with high and low categories, and price, quality, delivery dependability, product innovation, and time to market dimensions of CA as five quantitative DVs. We utilize the SNR scale developed by Thatte et al. (2013), which was a 5-point Likert scale measured from 1 (not at all) to 5 (to a great extent). We define the "high" category as a score of 4 or 5, and "low" category as a score of 3 or below.

TABLE 7. BOX'S TEST OF EQUALITY OF COVARIANCE MATRICES FOR SNR

Box's M	12.003
F	0.784
df1	15
df2	207776.9
Sig.	0.697

The assumption of homogeneity of variance-covariance is tested within MANOVA. Box's Test presented in Table 7 is found to be not significant and indicates that homogeneity of variance-covariance is fulfilled, $F(15, 207776.9) = 0.784$, $p = 0.697$. Wilks' Lambda test statistic is thus used in interpreting the MANOVA results.

The Wilks' Lambda test is presented in Table 8. MANOVA results indicate that the combined DV of price, quality, delivery dependability, product innovation, and time to market, significantly differs for high and low levels of SNR (Wilks' $\lambda = 0.914$, $F(5, 288) = 5.428$, $p = 0.000$, partial $\eta^2 = 0.082$). However, the multivariate effect size (η^2) is small and which implies that a small proportion of the variance in CA dimensions is accounted for by SNR.

TABLE 8. WILKS' λ MULTIVARIATE TEST OF SIGNIFICANCE FOR SNR

Test Name	Value	F	Hypothesis df	Error df	Sig. (*p*)	Partial Eta Squared
Wilks' Lambda	0.914	5.428	5	288	0.000	0.086

ANOVA results were interpreted using $\alpha = 0.01$ to counteract the potential of an inflated Type I error rate as discussed earlier. Table 9 exhibits ANOVA results for SNR. The results indicate that CA of a firm based on price ($F(1, 292) = 8.105$, $p < 0.01$, partial $\eta^2 = 0.027$), delivery dependability ($F(1, 292) = 18.784$, $p < 0.001$, partial $\eta^2 = 0.060$), and time-to-market ($F(1, 292) = 7.044$, $p < 0.01$, partial $\eta^2 = 0.024$), significantly differs for high and low levels of SNR. Although significant

group differences were found for these three CA dimensions, the effect sizes are small, indicating that a small proportion of variance in the individual abilities of a firm to compete based on price, delivery dependability, and time to market, is accounted for by SNR. The results suggest that the ability of an organization to compete based on quality ($F(1, 292) = 6.249$, $p = 0.013$, partial $\eta^2 = 0.021$) and product innovation ($F(1, 292) = 0.650$, $p = 0.421$, partial $\eta^2 = 0.002$) does not significantly differ for high and low levels of SNR.

TABLE 9. ANOVA SUMMARY TABLE FOR SNR

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	Sig. (*p*)	Partial Eta Squared
SNR	Price	6.604	1	6.604	8.105	0.005	0.027
	Quality	1.926	1	1.926	6.249	0.013	0.021
	Delivery Dependability	8.606	1	8.606	18.784	0.000	0.060
	Product Innovation	0.468	1	0.468	0.650	0.421	0.002
	Time to Market	4.718	1	4.718	7.044	0.008	0.024

Roy-Bargman stepdown F test summarized in Table 10 shows that only two of the three significant variables from ANOVA results – price ($F(1, 292) = 8.11$, $p < 0.01$) and delivery dependability ($F(1, 290) = 12.193$, $p < 0.001$), have unique differences across high and low levels of SNR. 'Time to market' was found to be not significant ($F(1, 288) = 1.91$, $p = 0.168$), which implies that the effect of SNR on 'time to market' is due to the inter-correlation effect between the DVs, and not by itself. Thus, results indicate that only CA based on price and delivery dependability significantly differs for high and low levels of SNR.

TABLE 10. ROY-BARGMAN STEPDOWN F TESTS FOR SNR

Variable	Between-Groups Mean Square	Within-Groups Mean Square	Stepdown F	Degrees of Freedom		Significance of Stepdown F
				Between	Within	
Price	6.604	0.815	8.105	1	292	0.005
Quality	1.255	0.301	4.163	1	291	0.042
Delivery Dependability	5.283	0.433	12.193	1	290	0.001
Product Innovation	0.152	0.718	0.198	1	289	0.657

Time to Market	1.151	0.603	1.910	1	288	0.168

The result suggests that level of SNR has significant separate effects on CA of a firm based on price that are unrelated to the CA based on delivery dependability and time to market. Similarly, the level of SNR has significant separate effects on CA based on delivery dependability that are unrelated to the ability of an organization to compete based on price and time to market. Thus the results suggest that high and low levels of SNR, both collectively and individually, significantly differ on price and delivery dependability.

TABLE 11. MEANS AND STANDARD DEVIATIONS FOR CA DIMENSIONS BY SNR

	SNR	Mean	Std. Deviations
Price	Low	3.25	0.90
	High	3.56	0.91
Delivery Dependability	Low	4.02	0.68
	High	4.37	0.67

Table 11 presents the means and standard deviations for price and delivery dependability by high and low categories of SNR. The results point out that the means are significantly different for high and low levels of SNR indicating that SNR has a positive impact on the ability of organizations to compete based on price and delivery dependability, but not on their ability to compete based on quality, product innovation, or time to market. The following section discusses the findings, implications, and contributions of this research.

FINDINGS AND IMPLICATIONS

The study found that CA of a firm differs significantly, collectively based on its dimensions, viz. price, quality, delivery dependability, product innovation, and time to market, for high and low levels of OSR. This implies that firms may be able to improve their overall competitive position based on price, quality, delivery dependability, product innovation, and time to market, by having in place a responsive operations system in terms of the five measures of OSR set forth in Appendix B. This finding supports Thatte and Agrawal's (2017) findings about the positive relationship between OSR and CA. The study also found that CA of a firm differs significantly individually based on price, delivery dependability, product innovation, and time to market, for high and low levels of OSR. This effect is reinforced through the finding that high and low levels of OSR were found to significantly differ on price, delivery dependability, product innovation, and time to market. These findings imply that firms can achieve CA exclusively based on price or delivery dependability or product innovation or time to market, if they are more operationally responsive in terms of each of the five measures of OSR as presented in Appendix B. The study found that responsiveness of a firm's operations system had no effect on the firm's ability to compete based on quality, implying that CA of a firm based on quality is independent of and unaffected by the responsiveness of its operations system.

In the literature there have been arguments on both direct as well as inverse relationship between responsiveness and cost/price. The results of this study support Randall, Morgan, and Morton's (2003) argument about an inverse relationship, implying that firms with more responsive supply chains will be more adaptive to demand fluctuations and will handle this uncertainty at a lower cost / price due to the shorter lead time. Suggestions for future research to support this finding are summarized in the following section. Yusuf, Adeleye, and Sivayoganathan (2003) found high correlation between responsiveness and time to market, dependability, product innovation, and quality. This research partially supports Yusuf et al.'s (2003) findings, as there was no support for the impact of OSR on the ability of a firm to compete based on quality.

Also, the study finds that CA of a firm differs significantly, collectively based on its dimensions, viz. price, quality, delivery dependability, product innovation, and time to market, for high and low levels of SNR. This implies that firms may be able to improve their overall competitive position on all its five dimensions, by having in place a network of responsive suppliers in terms of the four measures of SNR as exhibited in Appendix B. This finding supports Thatte and Agrawal's (2017) findings about the positive relationship between SNR and CA. The study also found that CA of a firm differs significantly individually based on price and delivery dependability, for high and low levels of SNR. This effect is again reinforced through the finding that high and low levels of SNR significantly differ on price and delivery dependability. These findings imply that firms can achieve CA solely based on price or delivery dependability, if they have a network of responsive suppliers in terms of each of the four measures of SNR as set forth in Appendix B. The study found that responsiveness of a firm's network of suppliers had no effect on the firm's ability to compete based on quality, product innovation, or time to market, implying that CA of a firm based on quality, product innovation, or time to market, is independent of and unaffected by the responsiveness of its supplier network.

The findings from this research may encourage practitioners and firms to boost their OSR and SNR so as to improve the different facets of a firm's CA. The findings provide evidence to practitioners that by improving the responsiveness of a firm's operations system as measured by the five measures of OSR exhibited in Appendix B, firms may improve their capability to compete simultaneously on price, quality, delivery dependability, product innovation, and time to market as well as individually on price, delivery dependability, product innovation, or time to market. The study also suggests that by forming partnerships with responsive suppliers as measured by the four measures of SNR presented in Appendix B, organizations may increase their capability to compete simultaneously on price, quality, delivery dependability, product innovation, and time to market as well as individually on price or delivery dependability. This study also provides a research framework and insight for future research in the area of OSR, SNR, and CA.

LIMITATIONS AND FUTURE RESEARCH

This research has extended past research in several ways, by building on theoretical and empirical studies. Although this research has contributions from both theoretical and practical point of views, it also has some limitations, which are described below and which may be addressed in future research.

The individual respondents (high-level executives from purchasing, operations, materials, and logistics functions) in an organization were asked to respond to complex SCM issues dealing with all the participants along the supply chain, including upstream suppliers and downstream customers. However, no person in an organization is in charge of the entire supply chain. Therefore, the use of single respondent may generate some measurement inaccuracy. In addition, this study was limited to the industries (SIC codes – 22, 23, 25, 34, 35, 36, 37) used for this research. This could limit generalizability of results to other industry types. Future research may extended or replicate the study for other industry types to enhance generalizability. Future research may apply multiple methods of obtaining data. The use of single respondent to represent intra or inter-organization wide variables may generate some inaccuracy, more than the usual amount of random error (Koufteros, 1995). Future research could seek to utilize multiple respondents from each participating organization in an effort to enhance reliability of research findings. Future research may test the relationships across countries. Thus SCR dimensions impacting CA in different countries can be compared and country-specific SCM issues can be identified.

Additionally, future research may develop additional dimensions of SCR such assembly responsiveness and inbound logistics responsiveness and study their impact on CA. Future research may study SCR and its dimensions at the supply chain level. Observing a complete supply chain, it may be interesting to investigate the various SCR components across supply chains operating in different industries (e.g. electronic and computer, heavy machinery manufacturing, fashion and apparel, and consumer goods) and their role in creating CA. Further, to confirm the inverse relationship between responsiveness and cost/price found in this research, future research can study this relationship in greater detail. Finally, canonical correlation analyses may be used in future studies to test the simultaneous relationship between the various dimensions of SCR and CA. Such an analysis may provide additional insight into and easy interpretation of the various relationships pertaining to CA of a firm, and may enhance the quality of this research from a methodological standpoint.

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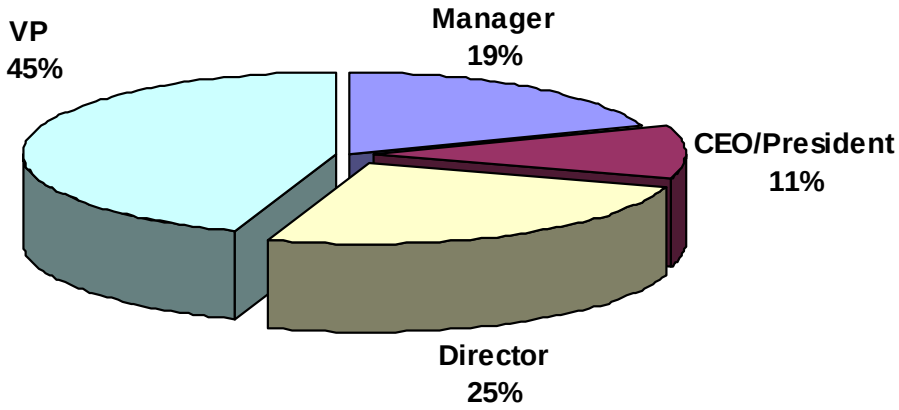
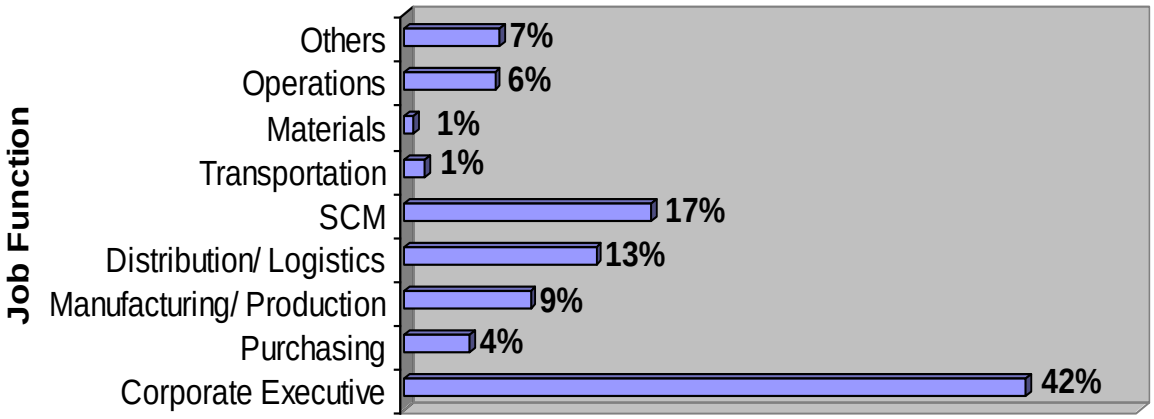
APPENDIX A1. RESPONDENTS BY JOB TITLE



APPENDIX A2. RESPONDENTS BY JOB FUNCTION



APPENDIX B. INSTRUMENT FOR SUPPLY CHAIN RESPONSIVENESS AND COMPETITIVE ADVANTAGE

Supply Chain Responsiveness*

Please circle the number that accurately reflects the extent of your supply chain's current level of responsiveness.

Operations system responsiveness (OSR)

OSR1 Our operations system responds rapidly to changes in product volume demanded by customers
OSR2 Our operations system effectively expedites emergency customer orders
OSR3 Our operations system rapidly reconfigures equipment to address demand changes
OSR4 Our operations system rapidly reallocates people to address demand changes
OSR5 Our operations system rapidly adjusts capacity to address demand changes

Logistics process responsiveness (LPR)

LPR1 Our logistics system responds rapidly to unexpected demand change
LPR2 Our logistics system rapidly adjusts warehouse capacity to address demand changes
LPR3 Our logistics system rapidly varies transportation carriers to address demand changes
LPR4 Our logistics system effectively delivers expedited shipments

Supplier network responsiveness (SNR)

SNR1 Our major suppliers change product mix in a relatively short time
SNR2 Our major suppliers consistently accommodate our requests
SNR3 Our major suppliers provide quick inbound logistics to us
SNR4 Our major suppliers effectively expedite our emergency orders

Competitive Advantage*

Please select the number that accurately reflects the extent of your firm's competitive advantage on each of the following.

Price/Cost (PC)

PC1 We offer competitive prices
PC2 We are able to offer prices as low or lower than our competitors

Quality (QL)

QL1 We are able to compete based on quality
QL2 We offer products that are highly reliable
QL3 We offer products that are very durable
QL4 We offer high quality products to our customers

Delivery dependability (DD)

DD1 We deliver customer orders on time
DD2 We provide dependable delivery

Time to market (TTM)

TM1	We are first in the market in introducing new products
TM2	We have time-to-market lower than industry average
TM3	We have fast product development

Product innovation (PI)

PI1	We provide customized products
PI2	We alter our product offerings to meet client needs
PI3	We cater to customer needs for "new" features

* All items are measured using a 5-point Likert scale measured from 1-not at all to 5-to a great extent

APPENDIX C. CHARACTERISTICS OF THE SURVEYED ORGANIZATIONS

1.	Organizations that have embarked upon a program aimed specially at implementing "Supply Chain Management" (294).	
	Yes:	63.27% (186)
	No:	36.73% (108)
	Average length of implementation: 4.15 years	
2.	Primary production system (283)	
	Engineer to Order	10.60% (30)
	Make to Order	35.69% (101)
	Assemble to Order	20.85% (59)
	Make to Stock	32.86% (93)
3.	Industry – SIC (278)	
	Textile mill Products (SIC 22)	0.00% (0)
	Apparel and Other Textile Products (SIC 23)	1.44% (4)
	Furniture and Fixtures (SIC 25)	2.52% (7)
	Fabricated Metal Products (SIC 34)	10.43% (29)
	Industrial Machinery and Equipment (SIC 35)	10.07% (28)
	Electrical and Electronic Equipment (SIC 36)	39.57% (110)
	Transportation Equipment (SIC 37)	9.35% (26)
	Other	26.62% (74)
4.	Number of employees (291)	
	1-50	4.12% (12)
	51-100	6.87% (20)
	101-250	12.03% (35)
	251-500	12.37% (36)
	501-1000	8.59% (25)
	Over 1000	56.01% (163)
5.	Annual sales in millions of $ (278)	
	Under 5	2.52% (7)
	5 to 10	3.60% (10)
	10 to <25	7.19% (20)
	25 to <50	8.99% (25)
	50 to <100	6.83% (19)
	>100	70.86% (197)

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