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The impact of host country regulatory quality on the value creation process in e-business supply chains

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The use of e-business (EB) applications has reshaped an organisations' supply chain structure. EB applications have enabled supply chain organisations to integrate their upstream and downstream supply chain processes to reach higher performance outcomes. Employing the resource-based view and contingency perspective as theoretical anchors, we propose and test a model of the relationship between EB applications, supply chain integration and financial performance that is moderated by a country's regulatory quality. Cross-country data have been collected from 637 organisations through the International Manufacturing Strategy Survey research initiative. We hypothesise that the efficacy of the EB value creation process depends on the regulatory quality of the country that companies are located in. Results indicate that EB has a stronger impact on supply chain integration and supply chain integration has a stronger impact on financial performance, if the companies are situated in countries with high quality regulatory levels.

Keywords: e-business; supply chain integration; value creation

1. Introduction

Over the last decade, there has been a significant increase in the development, as well as the implementation of e-business (EB) in the supply chain domain. The arrival of EB-related business-to-business applications has provided new and innovative opportunities for supply chain management (da Silveira and Cagliano 2006; Chen, Yang, and Li 2007; Oh et al. 2014). EB applications have enabled organisations to integrate and efficiently conduct business across firm boundaries (Boone and Ganeshan 2007). EB can be defined as information systems to acquire, process and transmit information for more effective decision-making, relative to competitive standards (Powell and Dent-Micallef 1997; Zhu and Kraemer 2002; Zhu 2004; Ray, Muhanna, and Barney 2005; Sanders 2007; Jeffers, Muhanna, and Nault 2008).

EB applications, such as electronic/online-based auctions or requests for quotations/proposals and order management and tracking has enabled companies to enhance the integration of their supply chain networks (Rai et al. 2006; da Silveira and Cagliano 2006). This paper is particularly interested in external supply chain integration (SCI). We define SCI as the close collaboration and information sharing activities with key customers and suppliers (Wong 2011). It has been well established in the literature that a tightly integrated supply chain can provide a company with various operational and strategic benefits (Schoenherr and Swink 2012; Melnyk, Narasimhan, and DeCampos 2014).

Furthermore, the enabling and supporting role of EB for SCI is viewed as a value creation process that has been extensively studied in the MIS and OM literature (Melville, Kreamer, and Gurbaxani 2004, Wiengarten et al. 2013b). The existing view has been that the relationship between EB and supply chain integration ultimately leads to significant improvements in firm performance in the form of financial and operational improvements (Barua et al. 2004). In this case, EB is acting as an enabler for SCI, which ultimately improves an organisation's performance.

However, recent research has also been calling to assess the role of contingency factors in the EB value creation process, particularly in the supply chain (Iyer, Germain, and Claycomb 2009). Previous research has assessed the importance of various factors in the EB value creation process such as organisational processes, culture, strategy and structure (Wiengarten et al. 2013a). However, the role of external contingency factors in the realm of an organisation's supply chain has been largely neglected. We believe this is a significant omission in the literature as scholars have argued that the external environment that an organisation operates in shapes its structures and processes (Donaldson 2001). Contingency theory posits that a firm's performance is dependent on the 'fit' between the structure and processes of a firm,

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and the environment (Lawrence and Lorsch 1967; Thompson 1967; Miller 1986). Applying contingency theory to the supply chain integration literature, Flynn, Huo, and Zhao (2010) suggest that the manufacturer's efforts in external integration with both suppliers and customers is extremely advantageous in its pursuit of internal integration and eventually resulting in better operational performance (Flynn, Huo, and Zhao 2010).

Extending this line of thinking, in this study, we dwell deeper into understanding the contingency role of a country's regulatory system (i.e. the ability of a national government to formulate and implement effective policies and regulations that promote and enhance private sector development) on the EB value creation process. Regulatory quality as operationalised by the World Bank is a multi-dimensional construct consisting of myriad factors such as the ease of administrative procedures for setting up a new business, policies dealing with tax and trade regulations for an existing business, role of the current labour laws in supporting business and whether the environmental regulations are hurting competitiveness. These environmental regulations are also assessed in terms of whether they were respected and compatible with other countries' legal systems. Specifically, they dwell into issues such as contract viability, repatriation and payment delays, and role of customs in efficient transit of goods, banking regulations and access to capital markets, both domestically and overseas. We believe these factors would have a direct impact on the financial performance of an organisation.

This paper explores the following research question: *Is the efficacy of the e-business-supply chain integration value creation process dependent on a country's regulatory quality?* Underpinned by the resource-based view (RBV) and contingency theory, we propose that companies situated in environments characterised by high regulatory environments may gain significantly more performance benefits through the EB value creation process. To explore our research question, we use survey data collected through the *International Manufacturing Strategy Survey* (IMSS).

This paper is organised as follows. We will start with conducting a literature review and develop hypotheses on the relationships between EB, SCI and performance. Following this, we will review and hypothesise the role of regulatory quality on these aforementioned relationships. Afterwards, we will analyse the data to test our model, discuss our results and finally provide some concluding discussions.

2. Literature review

2.1 *EB and supply chain integration*

Web/Internet-based technologies have enabled companies to integrate processes and operations throughout their internal and external supply chain (Croom 2005; Akyuz and Rehan 2009; Thun 2010). According to Sanders (2007), EB enables companies to integrate and collaborate among supply chain partners to improve inventory planning, demand forecasting, order scheduling and customer relationship management (Cagliano, Caniato, and Spina 2003; Wang, Tai, and Grover 2013).

In the OM domain, researchers have investigated the performance effects of EB applications within the context of supply chain management (e.g. Rai et al. 2006; Devaraj, Krajewski, and Wei 2007; Sanders 2007; Sanders 2008; Rai et al. 2012; Tenhiälä and Helkiö forthcoming). Scholars have investigated a mixture of applications supporting supply chain processes (Clark and Lee 2000; McAfee 2002; Kent and Mentzer 2003; Ranganathan, Dhaliwal, and Teo 2004; Jin 2006; Wu et al. 2006), which might be categorised into internal, supply-side and customer-side applications (Barua et al. 2004; Subramani 2004; Devaraj, Krajewski, and Wei 2007). Devaraj, Krajewski, and Wei (2007) investigated the impact of EB technologies on operational performance through production information integration in the supply chain. Their analysis showed that there was no direct benefit of EB technologies on performance; however, these technologies supported customer and supplier integration. Similarly, Sanders (2007) investigated the impact of EB on organisational collaboration and performance. They identified that the use of EB technologies is a significant enabler of intra- and inter-organisational collaboration. Focusing on financial performance gains, Barua et al. (2004) investigated the indirect performance benefits of online information capabilities through supplier- and customer-side digitisation. They identified that whilst most firms are lagging in their supplier-side initiatives relative to the customer-side, supplier-side digitisation has a strong positive impact on customer-side digitisation, which in turn leads to improvements in financial performance.

Whilst Barua et al. (2004) and Sanders (2007) are a welcome exception, most studies only focused on either upstream or downstream EB-SCI relationships. We see this as a limitation, since different technologies are used for either up- or down-stream processes. Subsequently, these processes may affect performance differently (e.g. Barua et al. 2004).

In conclusion, this review has highlighted that despite some negative results, EB applications in general have a significant enabling and supportive role on SCI. It has also been shown that previous research rarely considers the customer and supplier side of SCI simultaneously and the role that EB applications are playing. Subsequently, in order to further investigate these aspects, we propose the following hypotheses:

$H1_{(a)}$: Supplier-side EB applications (SSEB) have a significant positive impact on supplier integration.

$H1_{(b)}$: Customer-side EB applications (CSEB) have a significant positive impact on customer integration.

2.2 *SCI and performance*

Previous research has highlighted various performance benefits stemming from tightly integrated supply chain processes and the extensive exchange and sharing of information with customers (e.g. Wong 2011; Schoenherr and Swink 2012) and suppliers (e.g. Frohlich and Westbrook 2001; Koufteros, Vonderembse, and Jayaram 2005). Cousins and Menguc (2006) highlighted that in order to create a seamless supply chain, integration needs to occur at both upstream and downstream supply chain processes. Through high levels of integration, companies can more effectively and efficiently respond to customer requests and needs, increase forecasting accuracy, lower inventory levels, improve process and product design and to ultimately increase the performance of the supply chain. Furthermore, the notion of 'competing through supply chains' stems from the growing strategic importance of achieving high levels of integration along the supply chain. Competitors may find it difficult to replicate a resource or capability like this. A successfully integrated supply chain typically takes an extended time period to develop and can be a source of sustainable competitive advantage. Furthermore, some authors have highlighted that through high levels of integration, opportunistic behaviour can be managed and the need for sanctioning control mechanisms is reduced (Dyer and Singh 1998; Mesquita, Anand, and Brush 2008; Childerhouse and Towill 2011).

However, when taking a closer look at the literature linking integration to performance, previous studies indicate some mixed findings. Specifically, with regard to supply side integration, Cousins and Menguc (2006) could not identify significant operational performance improvement. Similarly, Flynn, Huo, and Zhao (2010) identified that supplier integration was not directly related to operational and business performance and was conditioned on various interacting contingency factors. Narasimhan, Swink, and Viswanathan (2010) even detected a negative impact of supplier integration on performance. Similar mixed results have been detected on the customer side. Devaraj, Krajewski, and Wei (2007) tested the impact of EB applications on integration and operational performance. They identified that whilst supplier integration did have a positive impact on operational performance, customer integration did not affect performance significantly. Furthermore, Flynn, Huo, and Zhao (2010) could not identify a relationship between customer integration and business performance. They argued that some of these mixed results could be explained through various contingencies factors that have been absent in previous research. These mixed results are especially apparent when investigating the impact of integration on financial performance. For example, Rosenzweig, Roth, and Dean Jr (2003) could not find any direct impact of integration on sales growth, but did detect a relationship between integration and revenue/ROA. Nevertheless, positive findings regarding supplier and customer integration provide merit to propose the positive impact of supply chain integration on financial performance. For example, through integration, cost saving can be achieved through inventory management. Through the involvement and collaboration with suppliers and customers, forecasting accuracy can be improved which may result in further cost savings. Furthermore, joint product or service developments may occur, which result in greater sales and growth in market share (Frohlich and Westbrook 2001; Koufteros, Vonderembse, and Jayaram 2005; Wong 2011; Schoenherr and Swink 2012). Subsequently, we propose the following two hypotheses:

$H2_{(a)}$: Supplier integration has a significant positive impact on financial performance.

$H2_{(b)}$: Customer integration has a significant positive impact on financial performance.

2.3 *The impact of regulatory quality on the EB-SCI value creation process*

2.3.1 *The moderating role of regulatory quality on the EB-SCI relationship*

In the introduction, we highlighted the potentially important role of external contingency factors for the EB-SCI value process. Previous studies have largely investigated the importance of internal contingency factors on this process (Wiengarten et al. 2013a) and there is a need to consider the importance of external factors that reside outside the boundary of firms. Therefore, in this paper we are specifically interested in the role of regulatory quality on the value creation process.

As described in the introduction, regulatory quality includes a range of factors such as legal systems, security of payment mechanisms, labour laws, regulatory support provided by the government and competitive pressure. Taking the past literature as a guide, scholars have demonstrated that various elements of regulations are beneficial for e-business

use. For instance, Zhu and Kraemer (2005) have employed a data-set of 624 firms across 10 countries in the retail industry and find that financial commitment, competitive pressure and regulatory support are important antecedents of e-business use. Based on prior evidence, we argue that this role of the government becomes pivotal by encouraging e-business use by establishing supportive business laws and legal systems that are secure, protect customers against fraudulent behaviour and also create an environment where legal systems can protect procurement contracts, thus creating a trustworthy platform for organisations to exchange financial information (Kaynak, Tatoglu, and Kula 2005). A conductive government policy in terms of developing supportive legal regulations, trade associations and technical standards will enable developing trust and exchange of information (Azadegan, Napshin, and Oke 2013). These issues have been discussed extensively by Lane (1997) in her book on public sector reform where she looks specifically at countries in the western world and demonstrates that trade associations, legal regulations and technical standards result in greater inter-firm trust and collaboration in Germany compared with in Britain. The role of the government in developing supportive regulatory policies is also very critical in developing countries such as China that are typically characterised by lower regulatory quality levels. Therefore, by developing favourable policies for setting up business in a particular area, regulating monopoly power and encouraging free and fair competition, providing tax incentives and creating a trustworthy financial environment so that any irregularities in financial transactions can be dealt with swiftly, the government can play a critical role in accelerating supply chain integration (Zhu, Kraemer, and Dedrick 2004).

In order to investigate the relationship between regulatory quality and value creation, we also draw on the RBV on this process. The RBV framework provides guidance about the identification of value-adding firm resources (Wiengarten et al. 2013a). According to Barney (1991), a firm is said to have a competitive advantage when it implements a value-creating strategy, which is not simultaneously being implemented by any current or future competitor. Furthermore, other firms are unable to duplicate the benefits of this strategy (Barney 1991). We subsequently discuss the potential impact of regulatory quality on the impact of EB on SCI; and SCI on financial performance. Regulatory quality as mentioned earlier has been defined as the perception of the ability of the country's government to formulate and implement sound policies and regulations to promote growth and development (Kaufmann, Kraay, and Mastruzzi 2010).

Scholars have also identified how environmental uncertainty as one of the defining characteristics of regulatory quality can impact supply chain integration. For instance, Koka, Madhavan, and Prescott (2006) highlighted the importance of environmental uncertainty (i.e. the inability of a firm's managers to accurately assess the external environment of the organisation or the future changes that might occur in that environment) and munificence on patterns of network change (Vijayasarathy 2010). Environmental munificence refers to the amount of resources within an environmental context and the extent to which that environment can support sustainable economic growth (Rosenzweig 2009). Through a matrix figure, along the axes of changes in munificence and changes in uncertainty, they highlighted that an increase in munificence may either lead to network expansion (in the case of an increase in uncertainty) or network strengthening (in the case of decrease in uncertainty). In both cases, it may be concluded that increases in munificence strengthens the network or increases its size.

In applying this reasoning to our model, we propose that SSEB and CSEB will have a stronger impact on supplier and customer integration if associated with a higher level of regulatory quality. In other words, companies that are located in contextual environments with high levels of regulatory quality will experience greater EB-enabling capabilities, when compared to companies situated in low regulatory environments. Based on the rationale by Koka, Madhavan, and Prescott (2006), higher levels of regulatory quality indicate an increase in environmental capability, which ultimately supports a firm's supply chain strategy. Therefore, considering both, EB and high regulatory quality together would result in a stronger impact of EB on SCI.

This can be further elucidated from the resource complementarity argument, through a combination of the RBV with the contingency perspective. An increase in regulatory quality leads to an increase in the capabilities of the EB system to support SCI. Complementing EB systems with a strong regulatory quality environment may result in an EB-based supply chain having enhanced integration capabilities. Subsequently, we propose the following hypotheses:

$H3_{(a)}$: The greater the host country's regulatory quality, the higher the impact of SSEB applications on supplier integration.

$H3_{(b)}$: The greater the host country's regulatory quality, the higher the impact of CSEB applications on customer integration.

2.3.2 *The moderating role of regulatory quality on the SCI–performance relationship*

In Section 2.2, we reviewed literature regarding the relationship between integration and firm performance. Specifically, it has been highlighted that previous research has identified some mixed results with regards to the SCI–performance relationship. We believe that one of the reasons for these mixed results is due to the myriad

factors that constitute regulatory quality. For example, the environmental context, which is an integral aspect of regulatory quality, plays an important role in shaping how a firm conducts its business. Therefore, the industry, competitors and dealings with government matter significantly in e-business value creation (Tornatzky and Fleischer 1990). Such external environment conditions represent a major contingency faced by an organisation (Stonebraker and Liao 2006). Research testifies to the fact that the external environment plays a significant role in supply chain integration efforts and technology implementations (Zhu et al. 2004; Bhakoo and Choi 2013). The open-standard nature of the Internet that facilitates supply chain integration raises unique and critical issues regarding business law, payment mechanisms and security of transactions specifically with trading partners that do not have a prior business relationship. These factors, along with government's stimulants, play a critical role in fostering or dampening the use of e-business technologies and impacting the financial performance of the organisation. The impact of such regulatory climate is expected to influence supply chain integration practices. We believe that these factors have an impact on both customer and supplier side integration and therefore the financial performance. For example, in countries with high regulatory quality environment, the state plays a very proactive role in providing loans, certifications, research grants, tax incentives and venture capital. Thus, the government has a positive influence on the organisation and also from a policy perspective.

Recently, Rosenzweig (2009) assessed the impact of various contingency factors on the e-collaboration–performance relationship. As part of her study, she assessed the moderating role of environmental munificence. Results indicate that environmental munificence moderates the impact of e-collaboration on operational performance, but not on business performance (i.e. customer retention, sales volume and profitability). Furthermore, adopting the Koka, Madhavan, and Prescott (2006) matrix would indicate that an increase in regulatory quality may not only lead to an increase in the strengthening of network ties (i.e. increase in supply chain integration), but also in an increase in the efficacy of SCI in terms of financial performance.

Applying contingency theory and considering regulatory quality as a critical external factor, we propose that SCI has a stronger impact on financial performance when combined with high levels of regulatory quality. In using the same arguments as in the development of H3, we propose that the combined effect of SCI with high regulatory quality will have a stronger impact on financial performance. Subsequently, we propose the following hypotheses:

$H4_{(a)}$: The greater the host country's regulatory quality, the higher the impact of supplier integration on financial performance.

$H4_{(b)}$: The greater the host country's regulatory quality, the higher the impact of customer integration on financial performance.

Figure 1 illustrates our proposed model including the variables and hypotheses. In summation, we propose a mediation and moderation effect. The impact of EB applications on financial performance is mediated through supply chain integration. Furthermore, we propose that the EB value creation process within the supply chain context is moderated through the level of regulatory quality. Whilst EB applications may enable integration and subsequently improve financial performance, the impact is likely to be more significant in environments characterised by high regulatory quality.

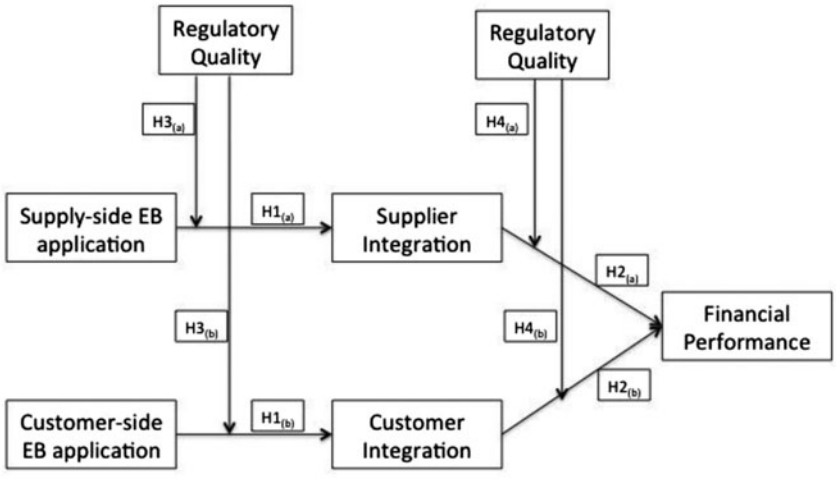

Figure 1. Conceptual model.

Furthermore, the model is split into the up- and down-stream side of the supply chain reflecting supplier and customer perspectives.

3. Research methods

3.1 *Sampling and data collection*

Data collected through the IMSS was used to explore the importance of a country's regulatory quality capabilities on SCI and its efficacy. The IMSS is a research network of business schools and assembly manufacturing firms, designing a common database and collecting data for the study of manufacturing management strategies and practices on both a global and national scale. In this study, we utilise data collected from the fifth round of the survey collected in 2009. The companies were contacted multiple times through emails and telephone calls. The final combined response rate of the companies in the different countries was 24.18%.

We also included a secondary data source by *The Worldwide Governance Indicators* for *The World Bank*. Regulatory quality indicates the level of ability of governments to formulate and implement sound policies and regulations that permit and promote private sector development (Kaufmann, Kraay, and Mastruzzi 2010). The World Bank used a range of sources to collect this data, which included World Economic Forum, Economist Intelligence Unit, European Bank for Reconstruction and Development, Global Insight, World Bank and European Bank for Reconstruction and Development, Asian Development Bank, Institute of Management Development.[1] For consistency purposes, we also used scores provided for 2009. However, over the years the changes for regulatory quality are relatively small country wise. For example, the Netherlands, which had a regulatory quality score of 1.76 in the year 2009 had a score of 1.79 in 2010 and 1.84 in the year 2011. Similarly, Belgium's score changed from 1.31 in 2009 to 1.25 in 2011.

The final sample selected for the purpose of this study consisted of 637 plants situated in 19 countries in Europe, Asia and North America. Tables 1 and 2 provide overviews of our sample in terms of country, regulatory quality score and industry.

Before starting with the analyses, we tested our sample for common method bias or variance. We assessed common method bias through the Harman's one factor test (Sanchez and Brock 1996). Results indicate that the single factor model (χ^2/df = 21.24; RMSEA = .179; AGFI = .49; CFI = .76; GFI = .57; IFI = .76; NFI = .75; RFI = .72) produced a significantly worse model fit compared to our proposed and confirmed five-factor model (χ^2/df = 2.93; RMSEA = .055; AGFI = .89; CFI = .97; GFI = .91; IFI = .97; NFI = .96; RFI = .95). Furthermore, we assessed potential issues regarding response bias. Unfortunately, we could not obtain information regarding the date of response to compare the responses across early and late respondents for each country.

Table 1. Sample overview by country and regulatory quality.

Country	Frequency	Regulatory Quality Score (2009)
Belgium	33	1.31
Brazil	37	.14
Canada	17	1.49
China	51	−.19
Denmark	18	1.91
Estonia	27	1.43
Germany	35	1.53
Hungary	69	1.09
Italy	56	.93
Japan	20	1.05
Korea, Rep.	33	.82
Mexico	14	.27
Netherlands	44	1.76
Romania	30	.62
Spain	36	1.18
Switzerland	31	1.57
Taiwan	27	1.09
UK	15	1.60
USA	44	1.40
Total	637	

Table 2. Sample overview by industry.

Industry	Frequency
Manufacturer of metal products	233
Manufacturer of machinery and equipment	183
Manufacturer of office, accounting and computing machinery	12
Manufacturer of other electrical machinery/ apparatus	91
Manufacturer of TV, radio and communication machinery/apparatus	42
Manufacturer of medical, precision and optical instruments, watches and clocks	39
Manufacturer of motor vehicles, trailers and semi-trailers	52
Manufacturer of other transport equipment	33
	637

However, we could compare responses from individuals that provided answers to all survey questions to those that only partially completed the questionnaire. We utilised the latter group as a proxy for non-respondents that have been included in our final sample. We conducted independent sample t-tests that indicated non-significant differences between complete and incomplete questionnaires, suggesting that non-response bias is not a serious concern (Schoenherr and Narasimhan 2012).

3.2 *Measures*

EB applications were conceptualised through asking respondents multiple questions relating to the extent that they use electronic tools with their key/strategic suppliers and customers to enables various practices and processes. Supplier- and customer-side EB applications were each measured through five items ranging from one (none) to five (high usage) indicating the level of EB usage. The items have been adapted from those used by Frohlich and Westbrook (2002).

SCI was conceptualised through customer and supplier side integration. Respondents were asked multiple questions with regard to how they coordinate planning decisions and flow of goods with their key/strategic suppliers and customers. Customer and supplier integration were each measured through six items ranging from one (none) to five (high) indicating the level of adoption (Frohlich and Westbrook 2001). The customer and supplier items are listed in Table 3 and were used previously by other researchers of the IMSS network (e.g. Frohlich and Westbrook 2001; Cagliano, Caniato, and Spina 2003).

As mentioned previously, regulatory quality measures the perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. It is measured by the Worldwide Governance Indicators (WGI) and published by the World Bank through multiple items such as competitive practices, burden of governmental regulations, a country's protectionism and ease of starting a business and tax effectiveness (Kaufmann, Kraay, and Mastruzzi 2010). Regulatory quality is measured on a continuous scale ranging from –2.5, indicating weak regulatory quality to +2.5, indicating strong regulatory quality enforced by the country-specific government.

Finally, financial performance was measured through multiple items indicating the current performance of their business. Respondents were asked four questions with regard to how they would rate their performance relative to their main competitors on a scale of one (much worse) to five (much better).

In addition, we employed two control variables to ensure the generalisability of our results in terms of industry type and level of globalisation. Level of globalisation was conceptualised as the percentage of sourcing and sales outside the plant's country.

3.3 *Reliability and validity*

We conducted confirmatory factor analysis (CFA) to validate our measures and to confirm our proposed factor structure. We analysed validity in terms of content validity, convergent validity, discriminant validity and reliability (Nunnally 1978; Anderson and Gerbing 1988). Firstly, content validity is assured through the several development and design stages of the IMSS survey. Secondly, we used our CFA results to test for convergent validity as suggested by O'Leary-Kelly and Vokurka (1998). Our proposed structure of the items measuring supplier- and customer-side EB, supplier integration, customer integration and financial performance resulted in a reasonably good fitting model (χ^2/df = 2.61; RMSEA = .049; AGFI = .90; CFI = .98; GFI = .92; IFI = .98; NFI = .96; RFI = .96), indicating convergent validity (Bollen 1989). Furthermore, all factor loadings exceeded the value of .50 and the t-values were all greater

Table 3. CFA results.

Construct	Mean	S.D.	Stand. Loading	*t*-value	Std. error	R^2
Supply-Side EB applications (α = .823)						
Scouting/ pre-qualify	3.18	.973	.64	17.79	.048	.41
RFX (request for quotation, proposal, information)			.71	20.04	.046	.51
Data analysis (audit and reporting)			.80	22.84	.042	.64
Order management and tracking			.70	19.03	.043	.49
Contract and document management			.70	19.35	.043	.49
Customer-side EB applications (α = .862)	3.24	1.00				
Scouting/ pre-qualify			.56	16.21	.051	.32
RFX (request for quotation, proposal, information)			.69	19.38	.046	.48
Data analysis (audit and reporting)			.79	22.69	.044	.63
Order management and tracking			.75	21.27	.044	.56
Contract and document management			.71	20.05	.044	.50
Supplier Integration (α = .862)	3.07	.850				
Share inventory level information with key/strategic suppliers			.76	21.15	.045	.58
Share production planning and demand forecast information with key/strategic suppliers			.70	18.98	.042	.49
Agreements on delivery frequency with key/strategic suppliers			.54	15.88	.039	.37
Dedicated capacity for key/strategic suppliers			.60	16.06	.043	.39
Vendor managed inventory or consignment stock with key/strategic suppliers			.63	17.05	.044	.39
Plan, forecast and replenish collaboratively with key/strategic suppliers			.72	20.57	.042	.52
Customer Integration (α = .827)	2.97	.998				
Share inventory level information with key/strategic customers			.73	20.38	.048	.53
Share production planning and demand forecast information with key/strategic customers			.77	22.05	.044	.60
Agreements on delivery frequency with key/strategic customers			.67	18.79	.044	.45
Dedicated capacity for key/strategic customers			.70	19.78	.047	.49
Vendor managed inventory or consignment stock with key/strategic customers			.67	18.70	.047	.45
Plan, forecast and replenish collaboratively with key/strategic customers			.74	21.48	.043	.54
Financial performance (α = .838)	3.29	.712				
Sales			.68	18.50	.040	.47
Market share			.74	18.82	.044	.55
Return on sales (ROS)			.65	18.54	.043	.43
Return on investment (ROI)			.69	18.73	.043	.48

than 2.0 (see Table 3) (Vickery et al. 2003). Finally, the factor loadings all exceeded twice the value of their associated standard error, which provides further support for convergent validity (Flynn, Huo, and Zhao 2010).

To test for discriminant validity, we conducted CFA using a constrained model with every possible pair of latent constructs and set the correlations between the paired constructs to 1.0 (Flynn, Huo, and Zhao 2010). We compared the obtained results with the original unconstrained model. Results regarding χ^2 differences indicate discriminant validity (O'Leary-Kelly and Vokurka 1998; Flynn, Huo, and Zhao 2010).

Finally, Cronbach's alpha (α) has been used to test for the reliability. The Cronbach's alpha values listed in Table 3 are all above the commonly accepted level of .80, which indicates that reliability is relatively high. Table 4 displays the correlations between the hypothesised variables and control variables.

Table 4. Correlation table.

	(1)	(2)	(3)	(4)	(5)	(6)
Industry (1)						
Globalisation (2)	.038					
SSEB (3)	.167**	.017				
CSEB (4)	.019	−.038	.697**			
SS Integration (5)	.164**	−.050	.444**	.336**		
CS Integration (6)	.087*	−.023	.335**	.499**	.562**	
Financial Performance (7)	−.008	−.021	.154**	.183**	.132**	.125**

**Correlation is significant at the .01 level (2-tailed).
*Correlation is significant at the .05 level (2-tailed).

Before carrying out the analyses, we calculated the mean composites for supply- and customer-side EB applications and customer integration, supplier and customer integration and financial performance. To do so, we calculate the mean scores for our constructs. Afterwards, we standardised these scores.

4. Analyses and results

We conducted path analysis and OLS regression analysis to test our hypothesised framework in Figure 1. Before conducting the analysis, we tested for normality and multicollinearity through the variance inflation factors (VIFs). Results indicate that the data were normally distributed and no VIFs were greater than 1.6. Subsequently, we conclude that the assumptions required to conduct the analyses were met.

4.1 *Mediation model*

In hypotheses $H1_{(a–b)}$ and $H2_{(a–b)}$, we propose that customer- and supplier-side EB impacts on financial performance indirectly through enabling customer- and supplier integration (i.e. mediated by customer and supplier integration). To test H1 and H2, we constructed a path model using Lisrel 8.80. Results are presented in Table 5.

In hypotheses $H1_{(a–b)}$, we proposed that supplier-side and customer-side EB applications will have a positive impact on supplier- and customer-integration. The results of our analysis indicate support for both $H1_{(a)}$ and $H1_{(b)}$. SSEB does have a significantly positive impact on supplier integration and CSEB does have a significantly positive impact on customer integration. Furthermore, in hypotheses $H2_{(a–b)}$ we proposed that supplier and customer integration has a positive impact on financial performance. Results presented in Table 5 provide partial support for $H2_{(a–b)}$. Whilst supplier integration does indeed have a significant positive impact on a firm's financial performance, the impact of customer integration on financial performance is not positive. Furthermore, the direct paths between SSEB (.036) and CSEB (.025) on financial performance are insignificant.

4.2 *Moderation model*

In hypotheses $H3_{(a–b)}$ we proposed that EB applications have a relatively stronger impact on SCI when a company is situated in an environment characterised by high levels of regulatory quality. Similarly, in hypotheses $H4_{(a–b)}$ we proposed that SCI has a stronger impact on financial performance when a company is situated in an environment characterised by high levels of regulatory quality. To test for a potential moderating effect, we conducted OLS analysis.

To test these moderation effects we entered the 2 controls in the first step, the independent variables and moderator in the second step and the interaction term in the third step. In hypothesis $H3_a$, we postulated that SSEB applications have a stronger impact on SSI in environments characterised by high levels of regulatory quality. Results in Table 6 (Model 1) indicate that our results provide support for this hypothesis and the interaction term was significant (β = .121; p = .009). Furthermore, conducting the simple slope tests revealed a significant slope (β = .49; p = .002) for SSEB applications in combination with high regulatory quality levels. Furthermore, the slope with low regulatory quality was insignificant. Subsequently, these results provide support for $H3_a$. In $H3_b$, we proposed that CSEB applications have a stronger impact on SCI in environments characterised by high levels of regulatory quality. Results in Model 2 reveal that the interaction term is not significant and subsequently the hypothesis is not supported (β = .046; p = .186).

Table 5. Path model results for mediation.

Paths	Standardised path coefficient	t-values
$H1_a$: SSEB → SS Integration	.45	12.53***
$H1_b$: CSEB → CS Integration	.50	14.39***
$H2_a$: SS Integration → Financial Performance	.11	2.73**
$H2_b$: CS Integration → Financial Performance	.07	*n.s.*
Industry	−.03	*n.s.*
Globalisation	−.01	n.s.

*p < .05; **p < .01; ***p < .001.

Table 6. Results of regression for moderation.

	Model 1 $H3_a$			Model 2 $H3_b$			Model 3 $H4_a$			Model 4 $H4_b$		
	Step 1 β	Step 2 β	Step 3 β	Step 1 β	Step 2 β	Step 3 β	Step 1 β	Step 2 β	Step 3 β	Step 1 β	Step 2 β	Step 3 β
Control Variables												
Industry	.174***	.093*	.091*	.093	.069	.071*	−.003	−.033	−.034	−.004	−.022	−.020
Globalisation	−.058	−.021	−.018	−.032	.033	.034	−.011	.027	.027	−.016	.022	.020
Independent Variables												
SSEB applications		.397***	.304***					.230***	2.21***			
CSEB applications					464***	.465***					.199***	.191***
Moderator Variable												
Regulatory Quality		.129**	.124**		.143***	.140***		.115*	.110*		.115	.109*
Interaction effects												
SSEB × Regulatory Quality			.121**						.173**			
CSEB × Regulatory Quality						.046						.028
SS Integration × Regulatory Quality												
CS Integration × Regulatory Quality												
ΔR^2	.032	.191	.075	.009	.263	.002	.000	.028	.054	.000	.026	.001
Overall R^2	.032	.223	.328	.009	.272	.268	.000	.089	.247	.000	.026	.027
Adjusted R^2	.029	.218	.321	.006	.267	.268	−.004	.101	.213	−.003	.019	.018
Overall model F	9.866	34.569	42.162	2.730	54.569	44.064	.37	5.881	12.140	.070	3.605	2.959
Sig. F Change	.000	.000	.042	.066	.000	.186	.963	.000	.000	.932	.001	.530

*$p < .05$; **$p < .01$; ***$p < .001$.

In $H4_a$, we proposed that SSI has a stronger impact on financial performance in environments characterised by high levels of regulatory quality. Results in Model 3 reveal that the interaction term is positive and significant (β = .173; p = .007). Furthermore, conducting the simple slope tests revealed a significant slope (β = .55; p = .001) for SSI applications in combination with high regulatory quality levels. Furthermore, the slope with low regulatory quality was insignificant. Subsequently, these results provide support for $H4_a$. In $H4_b$, we proposed that CSI has a stronger impact on financial performance in environments characterised by high levels of regulatory quality. Results in Model 4 reveal that the interaction term is not significant and subsequently the hypothesis is not supported (β = .028; p = .530).

In conclusion, our analysis revealed that supplier- and customer- EB applications do indeed have a significant positive impact on supplier- and customer-side integration. Our results also revealed that supplier- and customer-side integration does significantly improve a company's financial performance. In terms of mediation, we have identified that supply chain integration partially mediates the impact of EB applications on financial performance. Furthermore, we have assessed the moderating role of the level of regulatory quality on our model. Results revealed that regulatory quality does indeed moderate the relationship between supply-side EB applications and SSI and the relationship between SSI and financial performance. However, we could not detect moderating influences on the customer side.

5. Discussion

The objective of this paper was to provide a coherent assessment of the EB value creation process taking into account the role of a very critical contingent factor i.e. regulatory quality. Specifically, the following research question guided our research endeavour: *Is the efficacy of the e-business-supply chain integration value creation process dependent on a country's regulatory quality?* We assessed both supply side and customer side technology and integration processes. Subsequently, we conducted a coherent analysis of the EB-enabled value creation process in the supply chain. As such, our results indicate that EB technologies are indeed an important enabler of supply chain integration. Furthermore, we identified that this EB enabled integration capability does partially improve a company's financial performance. Complementing the RBV with contingency theory perspective, we also assessed the importance of an organisation's external environment in the form of regulatory quality for this EB value creation process in the supply chain. Our results indicate that regulatory quality, which is a multifaceted construct developed by the World Bank as an indicator of the governmental support to promote private sector development, does moderate the supply side part of our model but not the customer side part. These results have various implications for theory and management, which we discuss below.

Our findings support hypothesis H1, with both supplier and customer EB technologies enabling SCI. EB technologies allow organisations to achieve a high level of integration with customers and suppliers, thus enhancing the ability to transmit, combine, and process data more effectively along the supply chain. Its external and internal systems are able to monitor order status at various stages in the process (such as during manufacturing or shipment) and automatically reflect order changes in upstream or downstream processes or systems (examples include inventory and manufacturing systems). Further, it should be easy to share data among various internal systems (for example forecasting, production, shipment and accounting) and to retrieve information from various databases for decision support (including cost information and reporting tools (Sikora and Shaw 1998). The ability of EB technologies to exchange rich and timely information, along the supply chain, promotes closer integration between suppliers, the focal organisation and customers. Supply chain management involves not only the movement of physical products and services, but also the flow of information in both directions. Coordination and collaboration between a firm and its suppliers/customers depends on the extent to which they share critical information such as inventory levels, demand and quality feedback. Visibility across the supply chain through information sharing helps reduce uncertainty, inventory and the bullwhip effect. In addition, the exchange of information lowers uncertainty arising from demand, quality, resource availability, lead-time, shipment, technology and volume (Lee, Padmanabhan, and Whang 1997) and, therefore, in many respects acts as a substitute for inventory.

With regard to hypothesis H2, the results only partially confirm the RBV complementarity argument as outlined by Nevo and Wade (2010, 2011) where supplier and customer integration mediate the application of EB technologies from both the supply side and customer side in enhancing financial performance. Whilst higher levels of EB technology adoption allows firms to more effectively coordinate procurement processes and material movement that can reduce inventory, obsolescence and transportation costs (Mukhopadhyay, Kekre, and Kalathur 1995), it only improves a firm's profitability through its supplier side. Tight coordination with suppliers can reduce the likelihood of stock-outs, lowering lead times, reducing order fulfilment errors and increasing inventory turnover rates (Straub et al. 2002). Ultimately, EB technologies enable firms to reduce uncertainty about demand, quality and inventory, which have a direct impact on financial performance.

Moreover, we could not detect any significant financial performance improvements from the customer integration side. The effect was positive but non-significant. Previous researchers have already questioned the proposition that an increase in supply chain integration leads to higher performance (Wiengarten et al. 2014). Our results provide further arguments against this proposition. Supply chain integration comes at a cost. This needs to be taken into consideration when identifying the 'right' level of integration to gain performance benefits. This, as it seems, is even more important in the case of customer integration.

Mixed results were also obtained with regard to both hypotheses H3 and H4. In both cases, host country regulatory quality does moderate the relationship between supply-side EB applications and SCI ($H3_a$), and between SCI and performance ($H4_a$). However, there was no moderating influence found on the customer side ($H3_b$ and $H4_b$). These results would appear to suggest that there is support for how regulatory quality as a contingent factor moderates on the supply side, but not with regard to customer-related EB applications influencing supply chain integration, or SCI on performance. In the first instance, these results would appear to be surprising, but on closer inspection there are a number of factors that could explain them.

First, we discuss why country regulatory quality moderates the supply side. In terms of the influence of moderators, Wade and Hulland (2004) propose that environmental factors (those that operate outside the firm's boundaries) can have a moderating effect on the relationship between EB resources and performance. Environmental factors reflect the uncertainty in an organisation's operating environment. In terms of the RBV, one specific environmental factor identified by Wade and Hulland (2004) is that of environmental turbulence. In highly turbulent environments, different assets and capabilities than those needed in more stable environments are required, to achieve superior performance. Within the current study, a country's regulatory control could be viewed as an environmental factor, since it defines the nature of competition. For example, when regulatory quality is low, then in many industry sectors, there is likely to be high barriers to entry with limited competition. In such environments, there tends to be a small number of large companies with high market share. Management effort tends to focus on achieving competitive advantage, which tends to be sustained over an extended period of time. By contrast, in environments with a high degree of regulatory control, most industry sectors have lower barriers to entry and are highly competitive. The ability to stay on top of business trends and to respond to market needs is critical for superior firm performance. Wade and Hulland (2004) suggest that 'outside in' resources play an important role when the environment is turbulent, as is the case with high regulatory control. One of the key elements of the outside-in resources relates to a firm's ability to work with suppliers to develop appropriate EB systems and infrastructure to support external relationships downstream. The ability to work with and manage these relationships is an important organisational resource that should lead to competitive advantage and superior performance.

Now we discuss the rather puzzling aspects of our results. Our results highlight that country regulatory quality does not moderate the customer side. EB is associated with customer integration regardless of the level of country regulatory quality. This implies that for EB to enable customer integration, the external environment (in terms of regulatory quality and turbulence) is not important. We believe that this might be due to the fact that customer integration is more likely to be implemented due to a request from a customer. The role of the government as indicated in the factors that comprise regulatory quality may be minimal in that regard.

In addition, our results also show that unexpectedly country regulatory quality does not moderate the relationship between customer integration and financial performance. This means that customer integration is associated with financial performance regardless of the level of country regulatory quality. This also explains why firms may want to integrate with customers regardless of the level of a country's regulatory quality. Customer integration pays-off in terms of financial performance regardless the level of regulatory quality.

In response to the findings described above, with regard to EB value, organisations need to consider a more comprehensive assessment of the contribution of EB resources. Focusing on the focal firm's EB system might not lead to the identification of significant performance improvements. However, adopting a holistic perspective of EB and taking the suppliers' and customers' EB systems into consideration, in combination with SCI, may provide a more coherent approach to assessing EB value. In other words, a company's EB system might on its own not be a source of sustainable performance improvements since it does not fulfil Barney's VRIN conditions. However, once linked to an appropriate EB system implemented across the supply chain, enhanced performance might be achieved. This argument is supported by Saraf, Langdon, and Gosain (2007) who studied the value creation of IS application capabilities in interfirm partnerships. They identified that some IS applications require a firm's customers and partners capabilities in order to create value. This argument is also supported by recent conceptual work on IT business value by Nevo and Wade (2010). They argue that IT assets (commodity-like and off-the-shelf systems as applied in the majority of contemporary EB solutions) in isolation cannot play a significant role in forming a firm's sustainable competitive advantage. However, when combined with complementary resources, such as SCI, synergy effects might be created which lead to an IT resource having the potential to create sustainable competitive advantage. This is also consistent with contingency theory

that suggests that individual dimensions of supply chain integration interact differently with the external environment to impact performance (Flynn, Huo, and Zhao 2010).

In summary, the main managerial implication is that companies should invest in EB technologies that enable them to integrate with suppliers and customers. These investments can pay off in terms of financial performance if developed jointly with the corresponding supply chain processes (information sharing, joint production planning, etc.). However, we have seen some negative effects with regards to customer integration. The country regulatory quality will enhance the impact of the supply side integration, whereas it will not have any effect on customer integration. This is an important finding as firms operating in a low regulatory quality environment could not be willing to invest in EB and customer integration because there are few or no policies to promote and enhance the private sector development. Our results show that even in a low regulatory quality, customer integration pays off. This result also informs government policy-makers who can tailor strategies related to regulatory quality for promoting supply chain integration which will result in improved financial performance for organisations.

6. Conclusion

This research contributes to current stream of research in supply chain management, particularly on the topic of EB value creation in supply chains. Specifically we have assessed the importance of the contextual role of regulatory quality factor on this value creation process. Our results re-enforce the widely held view that 'context matters'; however, we provide a more nuanced understanding on how this context matters when organisations are integrating their e-business applications with customers and suppliers.

Nevertheless, this research has some limitations that should be taken into consideration when interpreting our results. Firstly, the IMSS data-set is not completely random. Secondly, as in most empirical survey-based studies, our data is solely cross-sectional. Finally, our research has specifically dwelled into one contextual factor. In addition to regulatory quality, other country specific factors such as culture, IT infrastructure, rule of law or logistical capability are likely to have an impact on the EB value creation process along the supply chain. Exploring the moderating role of such variables and how they play out across different countries should be addressed in future research. Doing this is a fruitful exercise because scholars have continuously acknowledged the importance of external contingency factors that impact supply chains. Supply chains are inherently global in character and cross organisational and country boundaries. Thus, the dynamic global environment where government regulations are consistently reviewed, changes are made to tax structures and sanctions imposed or relaxed against countries does indeed alter the competitive dynamics and the degree of e-business integration with customers and suppliers. We believe, our study should be viewed as a catalyst for initiating further research in this fertile and intriguing research domain.

Note

1. Details on how this measure was developed and the range of sources are included in Policy Research Working Paper 4978 (Kaufmann, Kraay, and Mastruzzi 2010).

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