

A suppliers' perspective of e-procurement integration in automobile industry

NOOR RAIHAN AB HAMID¹ and AZNUR HAJAR ABDULLAH²

¹Faculty of Business Administration

Universiti Tun Abdul Razak

MALAYSIA

raihan@unitar.edu.my <http://www.unitar.edu.my>

²Faculty of Management

Multimedia University

MALAYSIA

aznur.hajar@mmu.edu.my <http://www.mmu.edu.my>

Abstract: - Most automakers find that integrating with their suppliers in an e-procurement environment able to help them streamlining information across diverse suppliers base. However, many barriers to the integration of e-procurement could hold back suppliers' from realizing the integration with automakers (buyers). This study deals with e-procurement integration (EI) barriers within the Malaysian automobile industry, focusing on parts and components suppliers as the target respondents. A number of barriers, grouped as buyers, cultural, financial, IT and security barriers have been identified to influence suppliers' decision to participate in EI network. However, only buyers' barriers was identified as the major impediments to EI within the industry. This study also illustrates the effects of suppliers' EI strategy and firm size on suppliers' decisions in EI involvement. Overall, the suppliers who take on a passive approach to EI and large firm suppliers view buyers' barrier as significant.

Key-Words: - E-procurement integration (EI), Automobile industry, Financial barriers, Cultural barriers, IT barriers, Buyers' barriers and Security barriers.

1 Introduction

The automobile industry today faces many uncertainties due to uncoordinated and masquerading information flow between order generating and order fulfillment channels, which have made the industry incapable of pacing in a linear flow. Among the uncertainties experienced by the industry players (the automakers and suppliers) are erratic shifts in demand, constant changes in process and control and market volatility. One of the ways to reduce those uncertainties and increase efficiency is the use of electronic medium in the supply chain activities, such as e-procurement.

E-procurement is defined as an organization's procurement using the Internet technologies [1][2]. However, this definition excludes old applications like ordering by telephone or by fax. The unique features of e-procurement are its automation and integration of the entire procurement processes by automating order-requisitioning, approval, shipping, receiving process payment system and provides for automated routing and tracking capabilities, essentially eliminating the need for human intervention other than on an exception-only basis [3][4][5]. These features enable continuous and uninterrupted supply chain activities, faster access to updated information as well as increased information visibility which entail speed and improved decision making. To automakers, without integrating the

applications with key components and parts suppliers the value of any e-procurement application might be impeded. However, potential barriers that may arise along the integration process could cast doubts to suppliers from realizing successful e-procurement integration (EI) with automakers (buyers).

Barriers to e-procurement integration have received considerable attention from the academics. Nevertheless, such literature lacks empirical evidence from suppliers' perspective [3][4]. However, in a networked environment, risk identification must take into accounts the dependencies on other organizations [5]. Since an e-procurement system's success largely depends on the willingness of the suppliers to participate, studies to fully understand the suppliers' opinions on integration barriers merit further investigation. Hence, this study aims to assess on the suppliers' perceptions towards barriers to integrate and the extent to which those perceptions affect suppliers participation.

In addition, previous studies mainly focussed on Western business context which lack generalisability - the Eastern region may report different findings due to its unique business environment. For example, South East Asian countries have great potential for growth in the automobile industry. Hence, studies to understand the factors contributing to the industry's success are worthwhile. This research aims to understand the issues

in e-procurement integration from South-East Asian context where differences in culture, technology literacy level and business environment prevail.

Apart from filling up the gap in the literature, this study also aims to assess whether suppliers' EI strategy and firm size moderate the relationships between perceived EI barriers and suppliers' involvement in EI. Davila et al., [5] Hoppen et al., [6], and Muhge et al., [11] asserted that suppliers may view EI barriers differently from one another because of existing differences among them such as in terms of company size and EI adoption strategy. There seems to be a general understanding in previous studies, regarding the importance of EI strategy and firms' size contributing to the way EI barriers are perceived. Nevertheless, the studies examining the relationships between EI strategy and firm size in governing perceived EI barriers and suppliers' involvement in EI were not sufficiently documented. Thus, this study seeks to investigate the extent to which suppliers EI strategy and firms size affect firms' decision to integrate.

2 Literature Review

2.1 Barriers in e-procurement integration

Previous research on EI barriers centered in the following areas: Enterprise Application Integration (EAI), integrated information flows, IT enablement integrated supply chain and e-business, focusing mostly on non-automobile industry. Themistocleous [7] states that EAI (i.e: e-procurement integration) is an emerging research area and as a result, there remains an absence of unifying theories on EAI. Derived from previous literature this study proposes five barriers namely financial barrier, buyers, cultural, IT and security barrier. In order to understand each barrier and its effects on suppliers' involvement in EI, the relevant literatures are presented in the following paragraphs.

2.1.1 Financial barriers

Investments in EI can be in the form of initial investments, maintenance on existing system or human resource investments on system specific skills [16]. However, the investment costs could be even higher when converting and integrating existing internal information systems, with any new information system. These efforts proved to be complex and expensive, so much that only the largest of players made any real progress [17]. Indeed, if a firm adopts a losing technology, it means not only losing the resources invested in implementing it, but also higher operating costs rather than the promised saving [5]. However, the multitude of rapidly growing B2B e-business standards

in the automobile industry can confuse rather than clarify the future adopters of how much business processes and what types of purchases will be moved to e-procurement technologies, what e-procurement application should be used and what realisable benefits they will get after the integration takes place and so forth. This situation in turn creates uncertainty of the potential return from e-procurement investment. If firms perceive the cost of adoption and its negative impact on an organization is large than its expected benefits, this may resistance. Thus, we propose the following hypothesis:

H₁: Perceived financial barriers affect suppliers' involvement in EI with buyers.

2.1.2 Buyers' barriers

Buyers who have a larger contractual payment from a particular supplier will choose to have a dedicated link with that supplier [21]. However, the suppliers are reminded that, the buyers would not necessarily provide appropriate support for its non e-business capable suppliers [18] [20]. Lack of support from buyers may discourage suppliers to move fast into EI with the buyers. Besides, suppliers may also disfavor integrating with buyers' e-procurement if the products demanded by buyers have low strategic value, which will be reflected in low transaction volume. When transaction volume is low, integration does not increase any value to suppliers' integration investment as the suppliers do not possess bargaining power with the buyers in the supply chain. In this instance, the integration would be costly for implementation and maintenance [22].

Another identified issue in buyers' barriers is product specifications demanded by buyers and its suitability to be transacted via e-procurement. Automated e-procurement is ideally used for structured product (e.g. materials that are used for production (direct materials), normally reorder items such as replacement parts and tooling items). It is because the nature of the product specifications which do not change with time, have simpler set of rules in defining product specifications and supplier selections which can help organisations to reduce the transaction cost by negotiating long term contract with a supplier and later designing an automated procurement processes for reorder items. Nevertheless, when products specification increases, this in turn affects other procurement elements such as increase in product complexities, suppliers' relationships with buyers and procurement processes. If that is the case, the need for e-procurement adoption is reduced and traditional communication might be favoured [5][22].

Besides, buyers also have tendency to force suppliers to reduce selling prices after the integration.

For example, suppliers particularly smaller-sized companies may be skeptical to make changes to their own systems and processes to adapt to the buyers' system if the result forces a price reduction. Some suppliers are likely to perceive the integration will only benefit the buyers [23][24]. Thus, we propose the following hypothesis:

H₂: Perceived buyers' barriers affect suppliers' involvement in EI with buyers.

2.1.3 IT barriers

Despite the fact that the EI clearly exists to achieve necessary information sharing, there are many IT hurdles to be overcome. First, e-procurement solutions need to not only "talk" with internal information systems, but also need to cooperate with external constituencies - mainly suppliers and buyers [2]. However, many studies reported that buyers face difficulties to integrate their IT applications with suppliers due to suppliers' deficiency in technological infrastructure (see [5] [6] [19][20][25][26]). This in turn makes buyers' effort to integrate with their suppliers impossible.

Second, unavailability of qualified IT suppliers to maintain an integrated system may create a barrier for the firm from implementing any integrated system. It has been noted that businesses who have limited knowledge of EI or lack employees with IT skills may seek support from other sources when it comes to taking EI decisions [27]. Sulaiman and Jani [19] studied e-business implementation in the Malaysian manufacturing industry and report that insufficient qualified IT suppliers for developing applications is one of the most common barriers in implementing e-business in the industry. In other words, having enough internal technical expertise is crucial in maintaining an integrated system as to changes in users specification and resolving any unforeseen technical problems which require rapid system recovery and system adjustments. Without sufficient technical expertise within firms to support the e-procurement operation, some firms may not consider adopting any e-business application. Thus, we propose the following hypothesis:

H₃: Perceived IT barriers affect suppliers' involvement in EI with buyer

2.1.4 Security barriers

Many firms are reluctant to share information with their supply chain partners because of lack of trust, the fear of information leakage and security attacks from malicious individuals or groups. They believe that once an integrated e-procurement system is established, it could

jeopardise confidential information and operating systems [5][17][20][28][29]. For example, many suppliers' discomfort to share information on prices or costs with buyers is due to fear if buyers might use such information to erode margins or disclose costs to competitors [30].

Meanwhile, Internet fraud has left many firms skeptical about using the Internet as a purchasing tool [19] [20] [25]. Min and Galle [20] showed various possibilities of fraud available over the Internet transactions: (1) A false claim that the sale was not authorized; (2) supplier fraud committed when a buyer never authorizes a transaction; and (3) third-party fraud committed through unauthorized use of an account. Unless a buyer and a supplier engage in prior agreements on specific legal terms, responsibilities, and obligations prior to electronic contracts, there would be considerable concern over the credibility of e-business as a legitimate purchasing tool. Besides Internet fraud and security vulnerability, many firms still believe that transactions conducted electronically are open to hackers and viruses, which are beyond their control [5] [20][29]. Thus, we propose the following hypothesis:

H₄: Perceived security barriers affect suppliers' involvement in EI with buyers.

2.1.5 Cultural barriers

Childerhouse et al., [1] pointed out the attitudes of some of the supply chain members with regard to the information flow. "People factors" can greatly contribute to barriers to change as humans do not always use "rational" methods to make decisions. This is because they view their world symbolically as well as literally - they will not always do what they are told to do, but they can be very creative in sabotaging structures and processes they fear or dislike. In addition, the formal organization exhibited in the organizational chart inadequately describes how members actually conduct their business.

Lack of top management support is one of the ideal examples for cultural barrier. Top management practices that support EI corporate culture can facilitate firms to embrace EI quickly. Top management is the central point where a "yes" or "no" decision takes place. Without getting support from the top management, any investment on e-procurement cannot precede further [5] [19] [20]. The reluctances of top management to be proactive in EI can be due to the belief that e-procurement is just a "flavour of the month technology" which will soon be obsolete. Rapid changes in technology and standards could result in firms needing to have necessary funds to keep up to date with frequent technology changes. System integration is a complex

technological task, and infrastructure decision that seems right today might be obsolete tomorrow [31]. This may be the reason why some firms to stay comfortable with their "old" practices in managing their procurement activities.

With the availability of e-procurement, certain manual approval processes may be abolished as e-procurement can now automate the processes. Employees that have purchasing autonomy may perceive they would slowly loose their autonomy to a corporate mandate which requires them to adopt new approval procedures. This may result in resistance by some upper level position workers who control the approval processes. [1] [5] [6] [8] [27] [32] [33]. However, Min and Galle [20] believe that, uncertainty towards new events or applications is normal since users have less or zero prior knowledge about the new application. This can also lead to resistance among employees in using the new application or in changing the way they do routine jobs. However, employees' resistance may be solved through top management's mandate and sufficient staff training and education. Thus, we propose the following hypothesis:

H₅: Perceived cultural barriers affect suppliers' involvement in EI with buyers

2.2 Barriers in e-procurement integration in relation to EI strategy and firm size

EI strategy plays an important role to influence a firm's perception towards EI barriers. Firms may view barriers to integrate differently, depending on the firms' e-procurement adoption strategy, either aggressive adoption strategy or passive adoption strategy. Studies have shown that organisations with aggressive adoption strategy perceive market are more predictable and e-procurement barriers as less significant than their conservative or passive counterparts. Passive adopters mostly invest in small scales as they believe that they are still premature and inexperience to make a significant investment in e-procurement technology. However, they are ready to move fast when technology and business uncertainties are resolved. Thus, we propose the following hypothesis:

H₆: Suppliers' EI strategy moderates the relationship between perceived EI barriers and suppliers involvement in EI with buyers.

3 Methods

3.1 Variables

3.1.1 Perceived EI barriers (independent variables)

The constructs used for perceived EI barriers were drawn from the literature and discussions with the industry expert as shown in Table 1. Each item in the questionnaire was measured using a five-point Likert scales ranging from 1 for strongly disagree to 5 for strongly agree. Using factor analysis, these 20 independent variables were later condensed into a more simplistic format into five groupings namely *financial*, *buyers*, *cultural*, *IT* and *security barriers*. The reliability analysis examination shows the Cronbach Alpha value range for perceived EI barriers were from 0.783 to 0.835.

Table 1: Factor items and mean (standard deviation) of the independent variables

Barriers	Mean	SD
<i>Financial barrier</i> ($\alpha=0.81$)	3.36	1.08
Human interaction is still needed		
Not sure returns get from EI investment		
High investment cost		
Maintenance exceeds EI benefits		
	<i>Mean</i>	<i>SD</i>
<i>Buyers barrier</i> ($\alpha=0.81$)	2.75	0.98
Buyers force price reduction		
Insufficient material volume		
Buyers don't provide assistance		
No requirement from buyers to integrate		
Types of material are not suitable for EI		
Limitation of the company size		
	<i>Mean</i>	<i>SD</i>
<i>IT Barrier</i> ($\alpha=0.84$)	2.65	1.18
Insufficient internal IT expertise		
Insufficient IT suppliers		
Poor internal telecommunications infrastructure		
	<i>Mean</i>	<i>SD</i>
<i>Security Barrier</i> ($\alpha=0.784$)	3.22	0.98
Lack of existing law to protect online transaction		
EI provides opportunity for hackers to paralyze the integrated system		
	<i>Mean</i>	<i>SD</i>
<i>Cultural Barrier</i> ($\alpha=0.79$)	2.39	0.94
Employees resist to the changes		
Top management does not supportive		
EI is a flavour of the month		

3.1.2 Suppliers' Involvement in EI with Automakers (dependent variables)

10 procurement activities were derived from various studies such as [29] [38][39][40], measuring the degree of intensity of suppliers' involvement in EI with their buyers' procurement activities. These 10 activities were later simplified into two groupings using factor analysis and classified into *Ongoing* and *Non-ongoing* procurement activities (Table 2). Each item was

measured using Likert scales with 1 stands for 'never involved' and 5 for 'very often involved'. The Cronbach Alpha values for suppliers' involvement in EI range from 0.710 to 0.930.

Table 2: Suppliers' involvement in EI with automakers

Factors	Mean	SD
<i>Non ongoing procurement activity</i> ($\alpha=0.930$)	2.01	1.3
<ul style="list-style-type: none"> Evaluating design requirement Evaluating bill of materials (BOM) Sending request for quotation (RFQ) Proposal bidding Negotiation Sharing inventory information Defect prevention information 		
<i>Ongoing procurement activity</i> ($\alpha=0.710$)	3.44	1.51
<ul style="list-style-type: none"> Receive purchase order (PO) Share delivery schedule 		

3.2 Moderating Variables

3.2.1 EI strategy (moderating variable 1)

Items for assessing EI strategy were adopted from Davila et al. [5]. The suppliers were categorized as a passive integrator (risk averse), if they marked either one of these strategies; strategy 1 "leave the learning cost to others and then invest", strategy 2 "aware about the need to integrate with buyers' e-procurement but do not want to commit major resources for any integration" or strategy 3 "invest selectively until the best e-procurement integration model for our firm identified". Otherwise, if a supplier marked strategy 4 "move fast into e-procurement integration" and strategy 5 "invest heavily in e-procurement integration to gain a competitive lead in the field" these indicate that the supplier is an aggressive integrator (risk taker). Dummy variables were created to represent the passiveness - aggressiveness of suppliers' strategy, with Dummy 1 represents passive integrator and Dummy 2 represents aggressive integrator.

3.2.2 Firm size (moderating variable 2)

Further, this study aims to find out whether, when controlling for the effect of suppliers' firm size does it significantly moderate the relationship between perceived EI barriers and suppliers' involvement in EI with buyers. The categorisation of suppliers' firm size is based on annual sales turnover value as classified by

Small Medium Industries Development Corporation (SMIDEC) and Bursa Malaysia. Annual sales turnover for SMEs (Micro enterprise, small enterprise and medium enterprise) range from less than RM 250,000 to RM 25 million, while large enterprise's annual sales turnover are more than RM 25 million. Dummy 1 was created to represent SMEs while dummy 2 represents large enterprise.

3.4 Sampling Method and Data Collection

The source of respondents came from a list of suppliers obtained from The Malaysian Automotive Parts Alliance Group (www.mapag.org.my) and asiaep.com. Since the size of population of the target respondents of this study only totaled 231 firms, no sampling is deemed required in order to increase the response rate. Prior to distributing the survey, the researchers consulted industry experts to check the internal validity of the survey question. Based on their input, a survey questionnaire was prepared and tested on a pilot study. The pilot test was conducted on 10 suppliers and their feedback on any unclear technical wordings or survey instructions were reflected in the modified questionnaire.

The surveys were then distributed to suppliers using three modes; e-mail, fax and visits to the respondent's firm premises. Among these three modes, e-mail surveys are the most convenient to the respondent because they require no facilities or expertise beyond those applications used in their day to day email communication [41]. The completed forms were then returned via email to the researchers.

4 Results

Out of 231, 188 suppliers were considered valid representatives of the total population. The remaining was excluded due to several reasons. The first reason is due to suppliers' contact information such as contact numbers and firm website is no longer in service, which impedes the researcher's efforts to get in touch with them. Secondly, some of these suppliers are no longer producing automotive parts, which warrant them to be excluded from the study population. Thirdly, some of them share similar e-procurement systems with the parent firm; thus, the researcher excluded them from this study to avoid redundancy in analysis. From 188 suppliers, 71 suppliers participated and returned the survey with no missing values. The other suppliers either did not respond or had turned down our invitation to participate in the survey. Overall, the response rate for this study is 37.7%.

4.1 Respondent Profile

Based on Table 3, out of 71 suppliers, 47.8% are the SMEs while the remaining 52.1% are the large enterprises. Most suppliers in this study vary in the levels of e-procurement usage. Apparently, most of them use buyers' portals due to the need to conform to the mandate received from the buyers (the automakers), its ease of use and cost savings. Unlike one-to-one applications integration, which require high integration and maintenance cost, the portal involves lower learning curve and investment in infrastructure.

Table 3: Respondent Profile

Item	Percentage (%)
No. of suppliers: 71	
<u>Company Size:</u>	
Large	52
Small and Medium	48
<u>No. of IT Staff</u>	
None	20
Less than 10	73
10-20	1
More than 20	6
<u>No. of years of integration</u>	
No plan to integrate	70
Less than 3 years	16
More than 3 years	14
<u>Types of application:</u>	
Email	97
Automakers' portal	79
Order fulfilment software	51
Internal system linked with automakers' system	16
E-marketplace	14
<u>Integration strategy:</u>	
Active	24
Passive	76

At a general level, the suppliers have basic e-business strategy with 90.1% of them fall under the sub area strategy category means suppliers use e-business applications partially, that is, there are some parts of the process are done manually. Only 8.5% of the suppliers use firm wide area strategy or so called "all round users" (the use of e-business applications in all business areas: marketing, sales, procurement and others).

The suppliers in this study generally have reasonable amount of IT staff for IT maintenance aspects with 73.2% of them have less than 10 IT staf Interestingly, although 16.9% of the SME suppliers do not have any IT staff at all, 28.2% of them hire IT staffs. This indicates that SME suppliers are in the mainstream

recruiting reasonable number of IT staff and have a mix need in term of IT staffs. Only 5.6% suppliers have more than 20 IT staffs and they profound to be large enterprises. Most suppliers were found to form EI intensely with the automakers within 0-3 years duration. In 2002, two dominant automakers in Malaysia, Proton and Perodua launched their portal systems called PRECISE and ESIMS respectively [42][43], which explains why the number of suppliers who integrated within 0-3 year's duration is high.

4.2 GLM MANOVA

In order to measure the extent to which perceived *EI barriers* influences suppliers' involvement in EI with automakers, GLM MANOVA was used to identify whether there are statistically significant differences among the groups of EI barriers in relation to suppliers' involvement level in ongoing and non-going procurement processes. Table 4 shows that the effects of EI barriers on the degree of EI involvement. Among all barriers, only *buyers' barriers* recorded a significant value in relation to involvement level in *ongoing procurement* activities ($p = 0.005$, < 0.025 ; observed power = 83 %, $> 80\%$).

Table 4: Tests on subject effects

Barriers	Involvement in EI	F	Sig.	Observed Power(a)
Financial	NOPA	0.134	0.716	0.065
	OPA	0.654	0.422	0.125
Buyers	NOPA	0.002	0.962	0.050
	OPA	8.659	0.005	0.826
IT	NOPA	0.806	0.372	0.143
	OPA	3.776	0.056	0.482
Security	NOPA	0.131	0.718	0.065
	OPA	1.219	0.274	0.193
Cultural	NOPA	0.584	0.448	0.117
	OPA	1.852	0.178	0.268

Note: NOPA – Non ongoing procurement activities; OPA – Ongoing procurement activities

Davila et al., [5] described adopting e-procurement are only maximized if these technologies move to the main business processes where the big saving are expected to accrue like in routine (ongoing) procurement activities (e.g.: placing orders and checking delivery schedule). This explains why buyers' barriers established significant relationship with ongoing procurement activities but not with non-ongoing procurement activities. This result is consistent with the mean factor score that shows e-procurement is not highly used to

facilitate non ongoing procurement activities. Table 4 also depicts that other EI barriers do not significantly influence the suppliers' involvement level in both ongoing and non ongoing procurement processes. The result confirms that, there is statistically significant effect of *buyers' barriers* towards suppliers involvement in EI for *ongoing procurement* activities which warrant only H_2 is accepted out of the five hypotheses assigned for five EI barriers in the study.

4.3 Multiple hierarchical regression analysis

Hierarchical regression was used to examine whether *supplier's strategy and firm size* moderate the relationship between perceived EI barriers and suppliers' involvement in EI with automakers. The regression model in Table 5 shows the R^2 change = 0.267 means that EI barriers explain an additional 26.7% of the variance in suppliers' involvement in EI, when the effects of the passive integrator are controlled for.

Table 5: Coefficient results for EI strategy and firm size

EI strategy				
Variable	Barriers	β	t-value	p
Passive			-0.409	0.684
	Financial	-0.174	-1.168	0.248
	Buyers	-0.409	-3.013	0.004
	IT	0.252	1.979	0.053
	Security	0.124	0.959	0.342
	Cultural	-0.108	-0.816	0.418
	R^2 change	0.267		
Aggressive			0.702	0.514
	Financial	0.315	0.176	0.867
	Buyers	-0.533	-0.557	0.601
	IT	0.096	0.089	0.933
	Security	0.277	0.276	0.793
	Cultural	-0.315	-0.686	0.523
	R^2 change	0.198		
Company size				
Variable	Barriers	β	t-value	p
Large			-0.271	0.788
	Financial	0.267	0.995	0.327
	Buyers'	-0.665	-3.198	0.003
	IT	0.021	0.108	0.914
	Security	-0.061	-0.312	0.757
	Cultural	-0.097	-0.517	0.609
	R^2 change	0.321		
SME	(Constant)		0.112	0.912
	Financial	-0.302	-1.632	0.114
	Buyers'	-0.096	-0.542	0.592
	IT	0.291	1.767	0.088
	Security	0.238	1.390	0.175
	Cultural	-0.258	-1.547	0.133
	R^2 change	0.293		

Specifically, among all EI barriers, buyers' barriers profound to show the most significant result with $\beta = -0.409$; $p = 0.004$, < 0.05 . In other words, passive integrators view buyers' barriers as more significant compared to aggressive integrators. The tolerance value for buyers' barriers is 0.737 which indicates another 26.3% variance in buyers' barriers when controlled for passive integrators is explained by other factors. Therefore, this study has confirmed that the suppliers' EI strategy (passive integrators) significantly influences the way suppliers view buyers' barriers as a factor for them to be involved in EI. Thus, H_6 can be safely accepted.

When assessing the firm size, apparently large firms show a statistically significant contribution for interactions between buyers' barriers and suppliers' involvement in EI with $\beta = 0.665$, $p = 0.003$, < 0.05 ; R^2 change = 0.321. Nevertheless, the interaction for SME firms fails to reach the significance value. Alike the first moderating variable (EI strategy), only buyers' barriers are significant; the other barriers failed to do so. Large firms' tolerance value for buyers' barriers shows 0.507, indicating that another 50% of the variance in buyers' barriers is explained by other factors. This result confirms that, suppliers' firm size (large firms) significantly influences the way suppliers view buyers' barriers as a factor for them to be involved in EI, hence, enables hypothesis H_7 to be accepted.

5 Discussion

This study revealed that only *buyers' barriers* are significant in affecting the suppliers' involvement in EI for *ongoing procurement* activities with the buyers in this study. A possible explanation for this is the suppliers need to place EI with the buyers as a high priority as a mean to secure businesses with the buyers. No integration means the suppliers will be "disconnected" to know order information and delivery schedule placed by the buyers. Firms that are not anchored in the networking logic are at serious competitive disadvantage and at risk of being by-passed or eliminated from the mainstream of economic development [12].

When assessing the effect of moderating variables (suppliers' strategy and firm size) towards suppliers' EI decisions, the results show that suppliers who take on passive approach to EI and large firm suppliers view buyer's barrier as significant. The possible explanations for these findings are discussed in the next paragraphs.

5.1 Implications for passive integrators and aggressive integrators

It can be inferred that, most suppliers in this study are skeptical towards new changes or new events introduced

by their buyers. According to Davila et al.[5], passive integrators would rather adopt a 'wait and see' approach in order to learn from the aggressive adopters' past experiences with the buyers' systems. If they view the costs are lower than expected eventually they also would consider moving fast in utilising the system.

Moodley [12] and Dai and Kauffman [21] remarked that, in order to encourage the adoption of inter-organisational application integration, buyers as the initiator, often subsidize suppliers in the form of free software, system implementation assistance, employee training or financing to partially offset suppliers' adoption costs. However, in return, these subsidy initiatives are often offset with the buyers demanding their suppliers to comply with certain requirements as a trade-off to the costs borne by the buyers to develop the system. In this lieu, the passive integrators in this study may view these trades-off costs surpass the expected EI benefits as the buyers could deplete the suppliers' bargaining power in the business dealings, a situation where the suppliers incur costs due to sharing business information with the buyers. In contrary, the aggressive integrators may value EI for a competitive lead in the market, hence, explains why they view buyers' barriers as insignificant.

5.2 Implications for SME and large suppliers

The *SME suppliers* in this study view buyer' barriers as insignificant to influence their involvement in EI with the buyers compared to large suppliers, indirectly rejecting many past findings which noted that small firms are unlikely to commit resources in EI without recognizing the returns or benefits for their investment, time and money (see [1] [2] [5] [6] [20] [34] [35]).

Malaysian automobile industry is quite fragmented in both demand and supply sides due to insufficient population size with only 26 million of people, while the number of players struggling for market shares is immense (more than 12 automakers); disproportion with what the demand side could offer. Many suppliers rely on one or two automakers to buy a majority of their products. If an automaker decides to switch suppliers, it would be devastating to the supplier's business. As a result, suppliers are extremely susceptible to the demands and requirements of the automakers [46]. This situation asserts considerable pressure to the suppliers especially the SME suppliers that are operating in the country with less business but more pressure from the buyers to reduce cost lowest possible and to comply with other requirements. Operating in this type of market environment has forced the SME suppliers to be dependent on their buyers to ensure their survival in the industry. On the contrary, this situation enables the

buyers to exercise more coercive power towards the suppliers.

On the other hand, the *large suppliers* view buyers' barriers as significant influence towards their involvement in EI due to several possible reasons. As explained earlier, the automobile industry in this country is operating in a small and saturated market. Suppliers are expected to merge as ways to sustain in this industry. In the 2000s, the Malaysian government gradually urged the suppliers to consolidate as a means to reduce the number of existing suppliers with an aim to strengthen the competitiveness of the Malaysian auto parts and components industry in order to better face global and domestic challenges. Although the consolidation exercise among the automobile parts and components suppliers is not yet mandated by the government, local automakers have started to reduce the number of suppliers to save time and resources as well as to better manage their suppliers. For example, Proton, a national automaker, which most local parts and components suppliers depend on for their business has reduced the number of suppliers to not more than 50 from 275, indicating that consolidation would "happen progressively"). The suppliers that fail to qualify for the Tier-1 category will have to work with the core suppliers (mostly large firm's suppliers) to continue supplying parts to Proton [47].

As a result, the chain of suppliers is becoming smaller, as now the automakers prefer a smaller number consisting of first-tier producers to whom automakers are passing on part of the responsibility of manufacturing and development of parts and components [48]. Indeed, the large suppliers received pressure more directly from the buyers. It is due to 'responsibility shift' received from the buyers who have started to concentrate their demand on one large supplier rather than on several small ones. This exercise has gradually given the large suppliers the hardest effect [44]. This has placed considerable pressure on the large supplier community's margins and operational responsibilities due to increased inventory burden. Consequently, the large suppliers have to modify their existing business processes (internal operation) to meet the EI requirements by exerting pressure on their SME suppliers to participate in the e-procurement as well [11].

6 Managerial Implications

This study presents some managerial implications which warrant further attention by the automakers and the Malaysian government to spur the EI practice in the country.

This study emphasizes that the suppliers who are striving to establish or to sustain an integrated e-

procurement system with their buyers need to understand that the buyers play a dominant role in EI. Although “forcing” element was found to be successful in getting the Malaysian automobile industry suppliers to involve in EI, buyers are advised to rectify present deficiencies (both technical and non technical) to uphold the value of e-procurement. This study also proved that in the automobile industry, even large sized suppliers who are able to reap the economies of scale of e-procurement investment and have greater financial resources and information processing as compared to small or medium sized firms, would not necessarily guarantee that they are free from experiencing buyers’ barriers. Therefore, the government needs to critically gauge the impact of merger exercises among suppliers towards supply chain structure, which undeniably could affect EI effort for both the SME, and large suppliers.

It is for certain that EI is a necessary agenda for Malaysian automobile industry to better face future challenges namely business challenges arising from Asean Free Trade Agreement (AFTA), the government regulations, industry players’ strategies, continuous hike of the operation costs and many more. Thus, the industry players to reach the utmost benefits e-procurement could offer should tackle problems arising as the result of this integration proactively. Future research needs to conduct a longitudinal study to harness suppliers’ opinion before and after using MANeX— particularly; does MANeX really help to improve information exchanges between the automakers and suppliers?. In addition, it would be worthwhile to study more “buyers-suppliers” power and its effect on procurement behavior in relation to information exchange via e-procurement in the automobile industry.

References:

- [1] Ab Hamid, NR, Majid, Z. and Md Rejab, MR, The Efficacy of Electronic Procurement to Businesses: Lessons Learnt from Malaysian Industries, *WSEAS Transactions on Systems* Vol.2(2), 2003, pp. 281-286.
- [2] Kim J.I. & Shunk, L., Matching indirect procurement process with different B2B e-procurement systems. *Computers in Industry*, Volume 53(2), 2003, pp. 153-164
- [3] Neef, D. E -procurement: From strategy to implementation”, Prentice Hall, 2001, p 3 & 38.M. Young, *The Technical Writers Handbook*. Mill Valley, CA: University Science, 1989.
- [4] Thomson, D & Singh, M., A Macro Level Business Model for E-Enabled Procurement “, *ColLEC TeR*, 2001, p 227 – 237.
- [5] Davila, A., Gupta, M. & Palmer, R., Moving procurement Systems to the Internet: The adoption and use of e-procurement technology models. Research paper series No. 1742, 2003, Standford University.
- [Online]. Available: <https://gsbapps.stanford.edu/researchpapers/library/RP1742.pdf> (Accessed: 8 June 2007).J. U. Duncombe, “Infrared navigation—Part I: An assessment of feasibility (Periodical style),” *IEEE Trans. Electron Devices*, vol. ED-11, pp. 34–39, Jan. 1959.
- [6] Hoppen, N., Konig, W., Fricke, M., and Pfitzer, D. The role of bilateral B2B e-procurement in the European automotive industry: Results from an empirical survey. *Eight Americas Conference on Information System*, 2002.
- [7] Themistocleous, M. Justifying the decisions for EAI implementations: a validated proposition of influential factors. *Journal of Enterprise Information Management*, Vol.17(2), 2004, pp. 85 – 104.
- [8] Jhakaria, S. & Shankar, R., IT enablement of supply chains: Understanding the barriers. *Journal of Enterprise Information Management*, Vol.18(1), 2005, pp. 11 – 27
- [9] Economic Planning Unit, *The Third Industrial Master plan* – Chapter 13, Transport and Equipment Industry, 2006.
- [10] Malaysian Industrial Development Authority (MIDA). The Transport Equipment Industry. [Online]. MIDA online. Available: <http://www.mida.gov.my/beta/print.php?cat=5&scat=9&pg=1708> (Accessed: 14 Jan 2007).
- [11] Mühge, G., Hertwig, M., & Tackenberg, H., More competition, more cooperation. E-business and transition of the automobile supply industry. *International Journal of Automotive Technology and Management*, Vol.4(4), 2004, pp. 308-323
- [12] Moodley, S., Internet-enabled supply chain integration: prospects and challenges for the South African automotive industry. *Development Southern Africa*, Volume 19, Number 5, December 2002
- [13] Muffatto, M. & Payaro, A. Implementation of e-procurement and e-fulfilment processes: A comparison of cases in the motorcycle industry. *Twelfth International Working Seminar on Production Economics Igls*, February 18-22. [Online]. Available: <http://www2.ipe.liu.se/rwg/igls/igls2002/Paper087.pdf> (Accessed: 20 February 2005).
- [14] Muffatto, M., & Payaro, A., The role of the Internet in Procurement and Fulfilment Processes: A comparison of case studies. *International Journal of Information Management*, Vol.24(4), 2004, pp. 295-311.
- [15] Hallikas, J., Karvonen, I., Pulkkinen, V., & Tuominen, M., Risk management process in supplier networks. *International Journal Production Economics*, Vol.90, 2004, pp. 47-58.
- [16] Fujimoto, T., & Oh, J., Electronic technology and parts procurement: a case of the automobile industry. *International Journal Automotive Technology and Management*, Volume 4, Number 4, pp. 324-335.W. D.

Doyle, "Magnetization reversal in films with biaxial anisotropy," in *1987 Proc. INTERMAG Conf.*, 2004, pp. 2.2-1-2.2-6.

[17] Marston, L. & Baisch, L., The overdue promise of e-procurement. *Health Management Technology*, Volume 22 (11), 2001, pp. 32-35.

[18] Stockdale, R., & Standing, C., Benefits and barriers of electronic marketplace participation: an SME perspective. *Journal of Enterprise Information Management*, Volume 17(4), 2004, pp. 301-311.

[19] Sulaiman, A. & Jani, R. E-Commerce Implementation in Malaysia Manufacturing Sector, University of Malaya., *Refereed ETEC2000 Proceedings*, 23-24 November, 2000.

[20] Min, H. and Galle, W. P., Electronic commerce usage in business to business purchasing. *International Journal of Operation and Production Management*, Volume 19, Number 9, 1999, pp. 909 – 921.

[21] Dai, Q., & Kauffman, R.J., To be or not to B2B? An evaluative model for e-procurement channel adoption. *Proceedings of the Fifth INFORMS Conference on Information Systems and Technology*, San Antonio, TX, November 2000.

[22] Subramaniam, C., & Shaw, M., *A Study on the Value of B2B E-Commerce: The Case of Web-based Procurement*. Hingham. Kluwer Academic Publishers 2002.

[23] Thomas, K., Many firms are using supplier relationship management system to cut costs and automate processes. But how do you convince suppliers that it will help them too? *Financial Times*, Nov 26, 2003, p. 6.

[24] Ageshin, E.A., E-procurement at work: A case study. *Production and Inventory Management Journal*, First Quarter 2001, Volume 42(1).

[25] Luchi, R. & Paladino, M., Improving Competitiveness in Manufacturing Value Chain: Issues Dealing with the Automobile Sector in Argentina and Mercusor. *Industrial Management and Data Systems*, Volume 100(8), 2000, pp. 349-358.

[26] Kaefer, F. & Bendoley, E., Measuring the impact of organisational constraints on the success of business-to-business e-commerce efforts: a transactional focus. *Journal of Information and Management*, Vol. 41, 2004, pp. 529 – 541.

[27] Themistocleous, M., & Irani, I., Benchmarking the benefits and barriers of application integration. *An International Journal*, Vol. 8(4), 2001, pp. 317-331.

[28] Zhang, C. & Li, S., Secure information sharing in internet-based supply chain management systems. *Journal of Computer Information System*, Vol. 46(4), 2006, pp. 18-24.

[29] Archer, N. and Yuan, Y., Managing business-to-business relationships throughout the e-commerce procurement life cycle. *Internet Research: Electronic*

Networking Applications and Policy, Vol.10(5), 2000, pp.385-395.

[30] Fawcett, S.E., & Magnan G.M., The rhetoric and reality of supply chain integration. *International Journal of Physical Distribution & Logistics Management*, Vol.32(5), 2002, pp. 339-361.

[31] Mendoza, L. E., Perez, M., & Griman, A., Critical success factors for managing systems integration. *Information System Management*, Volume 23(2), 2006, pp. 56-75.

[32] Petroni, A. Critical factors of MRP implementation in small and medium sized firms. *International Journal of Operation & Production Management*, Vol. 22(3), 2002, pp. 329-348.

[33] Gilbert, A. E-procurement: Problems behind the promise. *Information Week*, Manhasset, Issue 813, 2000, p. 48.

[34] Karakaya, F. & Khalil, O., Determinants of Internet adoption in small and medium sized enterprises. *International Journal of Internet and Enterprise Management*, Vol.2(4), 2004, pp. 341-365.

[35] Payaro A., *The Role of Internet in procurement and fulfilment processes*, The proceedings e-Challenges 2003: Building the knowledge economy, organized by European Commission, Bologna October 2003.

[36] Larson, P.D., Carr, P., & Dhariwal, K.S. SCM involving small versus large suppliers: relational exchanges and electronic communication media. *Journal of supply chain management*, Vol.41(1), 2005, pp. 18-28.

[37] Talluri, S., Chung, W., & Narasimhan, R., An optimisation model for phased supplier integration into e-procurement systems, *IIE Transactions*, Vol.38, 2006, pp 389-399.

[38] Doubler, D.W. & Burt, D. N. *Purchasing and supply management*. McGraw Hill, 1996.

[39] Monczka, R., Trent, R., & Handfield, R. *Purchasing and Supply Chain Management*, 2nd Edition, South Western, 2002.

[40] Bartezzaghi, E., & Ronchi, S., Internet Supporting the procurement Process: Lesson from Four Case Studies, *Integrated Manufacturing System*, Vol.14(8), 2003, pp. 632-641.

[41] Mann, C. & Stewart, F. *Internet communication and qualitative research: A Handbook for research online*. London: Sage, 2000.

[42] Proton Press Release (2004, Oct. 21). *Proton Gets Precise With New Solution*. [Online]. Available from: http://www.proton.com/about_proton/press/full_details.php?intArticleID=32 (Accessed: Jan 13, 2005).

[43] Perodua (2002). *Supplier Information & Management System* [Online]. Available: http://esims.perodua.com.my/scm/about_scm.html. (Accessed: 13 Jan 2005).

- [44] Leong, Y. (2005, March 7). Auto industry urged to consolidate and go regional. The edgeOnline. [Online] http://www.theedgedaily.com/cms/contentPrint.jsp?id=com.tms.cms.article.Article_7ccf0813-cb73c03a-1bc4ec80-192f886a&paging=0 (Accessed: 17 March 2005)
- [45] Tabachnick, B.G. & Fidell, L.S., *Using Multivariate Statistics*, Fourth Edition. Needham Heights, MA: Allyn & Bacon, 2001.
- [46] Koranda, C., Saing, Y., Saechao, M., Matheson, A., & Faris, J. (2002). Competitive assessment Volkswagen. *Group paper*. [Online]. Available: <http://www.sba.pdx.edu/faculty/mikez/VWGroupPaper.doc> (Accessed: 5 Jan 2007).
- [47] Tan, Y. (2006, July 28). Proton to maintain Tanjung Malim plant output. *The Star Online*. [Online]. Available: <http://biz.thestar.com.my/news/story.asp?file=/2006/7/28/business/14978143&sec=business> (Accessed: 29 July 2006).
- [48] Singh (2002). Gearing up - Automakers and parts suppliers face up to the impending changes and challenges of Afta. *Ingress Online*. [Online] Available: http://www.ingresscorp.com.my/news/gearing_up.html (Accessed : 12 Jan 2007)
- [49] Joshi, A., How and why do relatively dependent manufacturers resist supplier power? *Journal of Marketing Theory and Practice*, Vol. 6(4), 1998, pp. 61 - 77.