# The Role of Trust and Dependency on E-procurement Adoptions: An Empirical Analysis

## Nik Ab Halim Nik Abdullah and Latif Al-Hakim

*Firms often have to integrate with supply chain partners to remain competitive in today's business environments. Information technology (IT) such as E-procurement help supports the integration of supply chain activities between partners in their daily business operations. Literatures identified that trust is important in IT adoption decisions and firms also have to adopt IT initiative when they become dependent to their suppliers or customers. This paper discussed the influence of inter-organizational trust and dependency factors on the e-procurement adoption decisions by manufacturers in Malaysia. Data were collected through survey questionnaire and the samples are manufacturing companies from various industries. Influence of trust and dependency factors were empirically tested using the Partial Least Square Regression (PLS) analysis, to determine whether they significantly influence adoption or not. Findings indicate that dependency did have a significant impact on adoption decision but not trust. The interaction of both factors however did influence adoption. Discussions of the findings together with direction for further studies are then discussed.*

**Field of research:** Supply chain management, Electronic commerce.

## 1. Introduction

Today, manufacturers increasingly engage in strategic alliances and partnerships with their supply chain partners to gain benefit from each other skills and resources. Development in information and communication technology, especially the Internet helps made this alliances becoming more effective through the integration of firm's information technology (IT) infrastructure. One of the information systems that helps revolutionize the supply chain activities is e-procurement. Procurement consists of all the activities necessary to acquire goods and services consistent with user requirement (Coyle, Bardi & Langley, 2003), and previously considered as a slow manual business procedures that create problems such as error in ordering, costing, invoicing, which were time consuming and costly to trace (Hawking et al., 2004). Businesses then realized that time and cost savings can be achieved by having a link with major suppliers through private networks such as electronic data interchange (EDI). Internet then enabled firms to even centralize their procurement and logistics systems that previously conducted in every country they operated. E-procurement means applying the procurement process electronically via the connected infrastructure such as the Internet.

Nik Ab Halim Nik Abdullah, Faculty of Business, University of Southern Queensland email: abhalim@uum.edu.my
Latif Al-Hakim, Faculty of Business, University of Southern Queensland email: hakim@usq.edu.au

It helps improve process efficiency, reduce lead time, cost (Hall, 2008; Hawking et al., 2004), permit electronic checking of inventory, negotiate price, issue and check status of order, issue an invoice and even receive electronic payment (Coyle, Bardi & Langley, 2003). E-procurement consists of many different tools. Firm may implement all of them or just some applications that relevant to their business needs. Six type of e-procurement system are e- sourcing, e-tendering, e-informing, e-reverse auction, e-MRO/Web-based MRP and e-collaboration (De Boer, Harink & Heijboer, 2002).

Literature on e-procurement or e-commerce/e-business adoption in general reveals that factors that influence IT adoption can be categorized into two groups, which is company's internal and external factor. Internal factor includes organizational culture and attitude of people working in it (Hogarth-Scott, 1999), management structure and their support (Ungan, 2005; Gunasekaran & Ngai, 2008), leadership, organizational learning, IT resources(Wu et al., 2008) and company's financial situation (Gunasekaran & Ngai, 2008). External factors include competitive environment of their business (Vilaseca-Requena et al., 2007) or the social network where the firm or the management belongs. Firm try to behave the way their social network which consists of trade association, accreditation agencies or channel members view as appropriate (Atkinson, 2007). Two external factors that did not gain much interest from previous research, and therefore is explored by this study is the influence of inter-organizational trust and dependency between manufacturers and their partners. Therefore, the purpose of this study is to determine the influence of these two factors on an e-procurement adoption decision. Other objectives are to identify which factor is more important than another and how the interaction between both factors influence e-procurement adoption decision.

## 2. Theoretical background and hypothesis

### 2.1 Trust
Trust is a key factor towards a successful and long lasting supply chain relationship. It is becoming more crucial as today's supply chain involved high level of interdependency and information sharing between firms (Mayer, Roger & Davis, 1995). Trust is the willingness to rely on partner in whom one has confidence (Dwyer, Schurr & Oh, 1987) and it exists when one party has confidence in partner's reliability and integrity (Morgan & Hunt, 1994). The economic importance of trust in business relationship is that it reduces the detail and monitor of a contract, reduce transaction costs (Gulati, 1995) and reduce the transaction-specific risks (Ba & Pavlou, 2002). The outcome of trust is the firm's belief that partners will perform actions that will benefit both parties, as well as not undertaken any unexpected actions that result in negative outcomes (Anderson & Weitz, 1989). There are many level of analysis on trust conducted as evidence in previous literature such as at micro/individual level, organization/inter-organization level, society/economy level or in some cases within the cross-level (Gulati & Sytch, 2008). The interest of this study is on inter-organizational trust as the focus is on the relationship between manufacturers, their suppliers and their customers. Studies on trust in business and management mostly concentrate on the role of trust on organizational behavior and inter-organizational relationships (Ba & Pavlou, 2002; Mayer, Roger & Davis, 1999; McAllister, 1995). It is only

recently that the role of trust in organizational information technology adoption is getting more attention (Tung, Chang & Chou, 2008; Mukherjee & Nath, 2003; Bahmanziari, Pearson & Crosby, 2003). It is also identified as an important factor in supply chain relationship (Svensson, 2001). Most studies identifies that trust have a positive relationship with information technology adoption (Belanger & Carter, 2008; Tung, Chang & Chou, 2008; Bahmanziari, Pearson & Crosby 2003). Therefore, the first hypothesis for this study is:

   $H_1$:  The level of trust will positively influence the e-procurement adoption decisions.

Trust that is developed based on contractual agreement between supply chain partners can directly influence adoption decision in a positive manner (Ryan, Giblin & Walshie, 2004; Sako & Helper, 1998). Therefore, legal environment is expected to influence adoption decision and the next hypothesis is:

   $H_{1a}$:  Contractual trust will positively influence the e-procurement adoption decisions.

Level of dependency will increase when firm places a higher amount of trust towards it partners and could lead to control over partner's decision making process (Ireland & Webb, 2007). Based on this argument, the next hypothesis is:

   $H_{1b}$:  Trust will positively increase the level of dependency between one company to another.

## 2.2 Dependency

Dependency is a situation when firms that control valuable, scarce resources hold power over firms seeking those resources to the extent that the dependency is not mutual (Pfeffer & Salancik, 1978). Dependency itself roots from the theory of power. Power refers to control, influence or direction of one party's behaviour by another (Emerson, 1962). In a channel dyad, channel member A's power over B is derived from B's dependency on A. Studies identified seven type of dependency which is technical, time, knowledge, social, economic/judicial, market and judicial dependency (Hammarkvist, Hakansson & Mattson, 1982; Mattsson, 2000). In manufacturing supply chains, there is a possibility that one party will become more powerful than another, especially among large corporation that plays a central role in coordinating production networks. Dominance of a particular partner will result in increased dependency and ability to impose sets of practices on smaller partners (Wood & Brewster, 2005). Partners are made to believe that goods or services they obtain from the suppliers are essential in achieving its goals or by getting the partner to perceive that switching to alternative sources of supply would be difficult (Brown, Lusch & Muehling, 1983). Studies indicate that dependency between one party to other can influence technology adoption decisions (Atkinson, 2007); (Harrison, Mykytyn & Riemenschneider, 1997; Treadgold, 1990). Partners will become more dependent to one another especially when partner that contributes much to company's sales conducts all their purchasing activities through the system. Literatures indicate that the level of dependency between supply chain partners will positively influence IT adoption decision (Teo, Wei & Benbasat, 2003; Patterson, Grimm & Corsi, 2003). Therefore, this hypothesis is developed:

   $H_2$:  The level of dependency will positively influence the e-procurement adoption decisions.

Firms which rely on their partners for the latest information technology or technical ability to improve their efficiency will eventually lead to adoption ('Using Organizational Control Mechanisms to Enhance Procurement Efficiency: How GlaxoSmithKline Improved the Effectiveness of E-Procurement', 2006). Therefore, IT/technical dependency is expected to influence adoption and the hypothesis is:

H$_{2a}$: The level of IT/Technical dependency will positively influence the e-procurement adoption decisions.

Most relationships are based on a mixture of trust and power (Bachmann, 1999). It is expected that the interaction of trust and dependency will positively influence adoption. It is hypothesised that:

H$_3$: Interaction between the level of trust and level of dependency will positively influence adoption.

## 2.3 Company size

Company size is a control variable which allows any variance in the dependent variable that may not be explained by the research model. It indicates the scope of firm's operation and the power to influence industry's overall structure (Porter, 1987). The smaller the size of the firm, there is greater possibilities of using external advice in adopting internet technologies (Atkinson, 2007; 'Using Organizational Control Mechanisms to Enhance Procurement Efficiency: How GlaxoSmithKline Improved the Effectiveness of E-Procurement', 2006). The hypothesis is:

H$_4$: Size of company will negatively influence the e-procurement technology adoption decisions.

## 2.4 Theoretical framework

Theoretical framework of this study was developed based on the assumption that the level of trust directly influences adoption decision and at the same time contributes to the increase level of dependency (Figure 1). Meanwhile, contractual trust not only determines the level of trust but also directly influence adoption decision. Dependency is also expected to have a positive influence while the need for IT or technical knowledge transfer from partners is expected to increase the level of dependency, besides of having a direct relationship with e-procurement adoption. Company size is expected to negatively influence adoption decision. Finally, this study try to identify the interaction effect of both the level of trust and the level of dependency on adoption and therefore, it is calculated based on the product indicator approach (Chin, Marcolin & Newsted, 2003). Under this method, the interaction terms are calculated by multiplying every indicator in the moderator (trust) by every indicator in the independent variable (dependency).
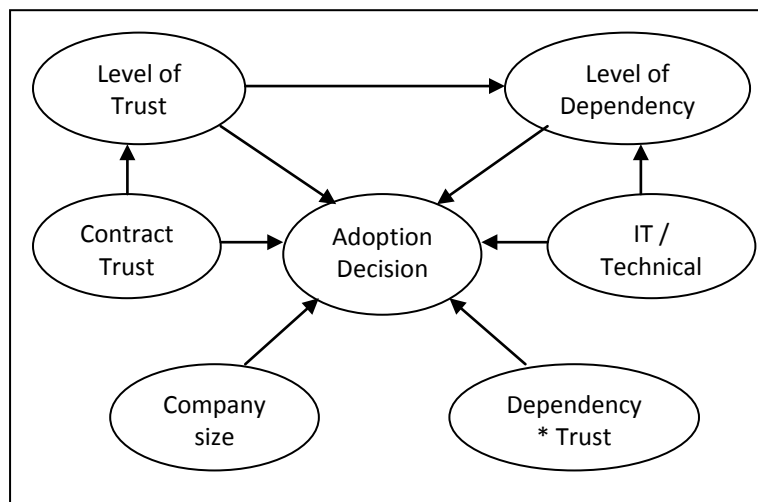


Figure 1: Theoritical Framework

## 3. Methodology

This study used survey questionnaire for data collection and sampling frame is the Directory of Malaysian Industries for the year 2007. Instruments developed in previous study related to technology adoption (Premkumar & Potter, 1995; Harrison, Mykytyn & Riemenschneider, 1997), trust (Kwon & Suh, 2005; Myhr & Spekman, 2005; Svensson, 2001) and dependency (Brown, Lusch & Muehling, 1983; Gassenheimer & Ramsey, 1994) were adopted with some modification for this study. Draft questionnaire were pilot tested and then modified base on the findings, before it is given to managers from five companies for professional verification. Some items were removed or modified after going through these processes. Survey questionnaire were then mailed to key informant of the company. 18 companies fill in the survey online while 94 mail surveys returned, which makes the return rate of 13.43 percent. This response rate is acceptable for a mail survey as evidence in other doctoral dissertation or research conducted in developing countries ('Cognitive and behavioural determinants of trust in small and medium-sized enterprises', 2005; (Sulaiman, 2000). Only 86 are valid for further analysis. Therefore, the total number of available questionnaires for empirical analysis is 104.

## 4. Data analysis

Data were tested for non-response bias using the time trend extrapolation method (Armstrong & Overton, 1977) and analysis shows that there is no evidence of non-response bias in data. Company's profiles are shown in appendix 1. Structural equation modelling technique using the Partial Least Square (PLS) regression software known as SmartPLS (2.0) was used to validate the measurement instrument and research model. PLS has the ability to model latent constructs under conditions of non-normality and small sample sizes as it places minimal restrictions on measurement scales and residual distribution (Chin, Marcolin & Newsted, 2003). It involved two stages; the assessment of reliability and validity of the measurement model and the assessment of structural model. Decision to accept or reject hypothesis is based on PLS findings, where the relationship must be significant and the direction is as proposed for it to be accepted.

**Measurement Model**: Assessment is done by examining the indicator reliability, convergent validity and discriminant validity. All scales used in this study were derived from previous study related to trust, dependency and technology adoption. They were pilot tested and therefore, content validity is assumed to be fulfilled. Items loading of individual items measurement for each latent variable determined the convergent validity. Item loadings for both supplier and customer data were over the cut-off level of 0.7 (Chin, 1998), except for one item. This item was removed from the construct in the supplier and customer sample to ensure consistency of the measures and also to allow direct comparisons of findings later on. Construct reliability shows whether or not a common factor can be shown to exist underlying several measurements using different observable indicators. It is analysed using the composite reliability value of each latent constructs. Composite reliability for each latent variable for suppliers and customers is more than the minimum recommended value of 0.7. Discriminant validity shows that a test of a concept is not highly correlated with other tests designed to measure theoretically different concepts. Square root of the average variance extracted statistics (AVE) was calculated and compared with the correlations among the latent variables using the latent variable correlation matrix output of PLS (Chin, Marcolin & Newsted, 2003). Correlations between constructs are displayed at in the lower left off-diagonal elements in the matrix (Table 1). AVE shared between the construct and its measure should be greater than the variance shared between the construct and other constructs

in the model (Fornell & Larcker, 1981). The diagonal elements highlighted in bold (square root of AVE), are greater than the off-diagonal elements at both corresponding rows and columns, for both supplier and customer data which shows evidence of discriminant validity.

**Structural Model:** Bootstrap procedure with 500 re-samples was used to calculate the significance of path coefficient (Chin, 1998). One-tailed t-tests were used to determine whether path is significant or not because the entire hypotheses in this study are one-directional. Figure 2

Table 1: Latent variable correlation matrix

**SUPPLIER**

| Variable | Comp Reliability | AVE | Correlation | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | COMPSZ | CONTRU | DEP*TRU | DEP | IT/TECH | TRU |
| COMPSZ | 0.961 | 0.923 | **0.962** | | | | | |
| CONTRU | 0.939 | 0.887 | 0.039 | **0.941** | | | | |
| DEP*TRU | 0.989 | 0.791 | -0.015 | 0.675 | **0.890** | | | |
| DEP | 0.898 | 0.689 | -0.018 | 0.526 | 0.813 | **0.830** | | |
| IT/TECH | 0.913 | 0.839 | 0.133 | 0.165 | 0.438 | 0.476 | **0.916** | |
| TRU | 0.949 | 0.758 | 0.009 | 0.794 | 0.786 | 0.689 | 0.301 | **0.870** |

**CUSTOMER**

| Variable | Comp Reliability | AVE | Correlation | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | COMPSZ | CONTRU | DEP*TRU | DEP | IT/TECH | TRU |
| COMPSZ | 0.961 | 0.923 | **0.962** | | | | | |
| CONTRU | 0.973 | 0.948 | -0.021 | **0.973** | | | | |
| DEP*TRU | 0.987 | 0.767 | 0.054 | 0.717 | **0.876** | | | |
| DEP | 0.895 | 0.682 | 0.028 | 0.634 | 0.744 | **0.826** | | |
| IT/TECH | 0.879 | 0.785 | 0.024 | 0.406 | 0.463 | 0.435 | **0.886** | |
| TRU | 0.949 | 0.760 | 0.078 | 0.769 | 0.869 | 0.716 | 0.334 | **0.872** |

Note: COMPSZ, Company size; CONTRU, Contractual trust; DEP*TRU, Dependency*Trust; DEP, Dependency; IT/TECH, IT?Technical dependency; TRU, Trust.

details the path coefficient and variance explain ($R^2$) for the research model. Previous study using PLS has typically considered path coefficient of above 0.20 as having a strong relationship, 0.10 to 0.20 as moderate and below 0.10 as weak (Johnson, 1997). The degree to which the model accomplish its objectives of minimizing errors or to maximize the variance explained can be determined by examining the $R^2$ values (Lertwongsatien, 2000). It is a measure of the proportion of the total of dependent variables, which is explained by independent variables. Findings found out that five paths are significant while the whole model explains 17% of the variance in the adoption decision for supplier while 25% for customer.

## 5. Discussion and conclusion

Table 2 details the hypothesis testing results. Among two antecedents of trust studied, only contractual trust factors have a significance influence on adoption decision but moderately. It consistent with other literatures that also identify a positive relationship between contractual trust and adoption (Ryan, Giblin & Walshie, 2004; Sako & Helper, 1998; Gattiker, 1989). Most of the time, supplying or buying entity had to engage in formal written contract with manufacturers and may include specific clause regarding the use of e-procurement in it. This study also empirically

validates the supposition that contractual trust directly influence adoption decisions, instead just being a determinant of trust. In contrast, hypothesis that the level of trust will positively influence adoption decision surprisingly is not supported as previous study demonstrated that it will positively lead to adoption (Tung, Chang & Chou, 2008; Mukherjee & Nath, 2003); Ba & Pavlou, 2002). However, there are evidence that trust is not necessary at all in supply chain relationships, especially when other important factors were taken into consideration (Gefen et al., 2005). Trust however did increase the level of dependency as findings strongly supported this relationship. Findings on the influence of dependency indicate a strong positive relationship with
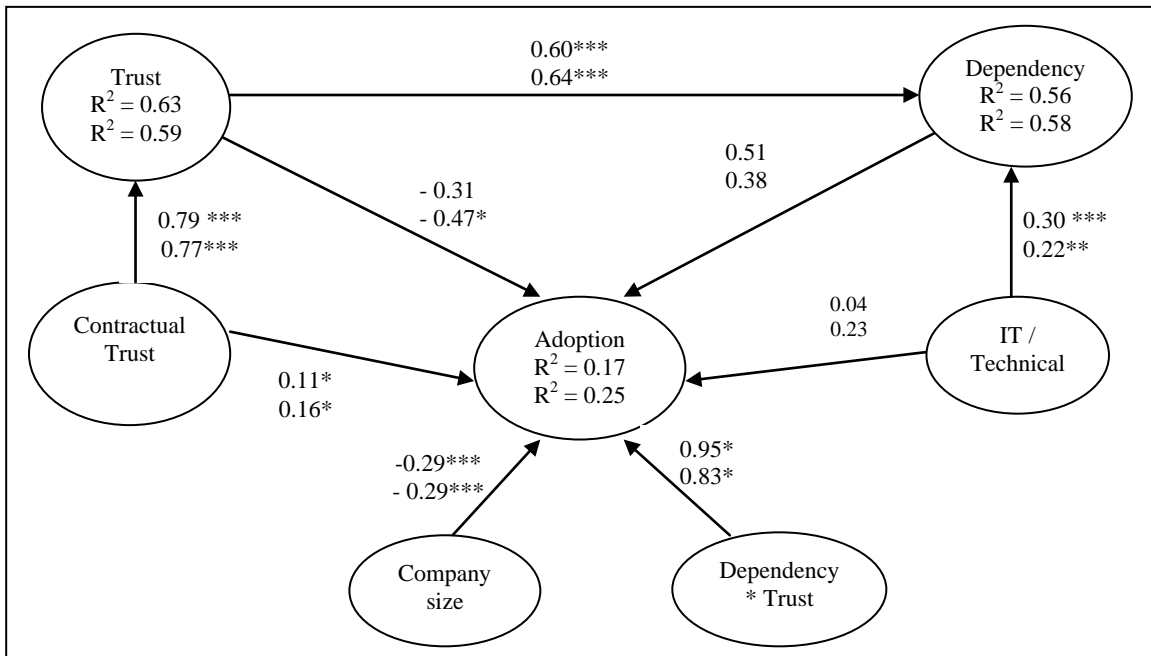


**Notes**: Path coefficient and R2 value for supplier are shown first and followed by value for customer.
Significant at * $p < 0.1$ ** ** $p < 0.05$ *** $P < 0.01$

Figure 2: Results of PLS analysis

adoption. High level of dependency could overshadow the importance of trusting each other in this study, resulting in non-significant relationship of trust. Significant and positive influence of dependency finding are aligning with past research on e-business adoption (Frambach, 1993); Patterson, Grimm & Corsi, 2003; Teo, Wei & Benbasat, 2003) as all these studies report a positive relationship between dependency and adoption. Interaction between trust and dependency shows a strong positive relationship with adoption decisions when both factors are considered simultaneously. Company size also has a significant and strong negative impact on e-procurement adoption decision as expected. It means that smaller firm are more likely to adopt e-procurement and it is in agreement with previous study (Atkinson, 2007; 'Using Organizational Control Mechanisms to Enhance Procurement Efficiency: How GlaxoSmithKline Improved the Effectiveness of E-Procurement', 2006).

## 7. Limitations and direction for future research
First limitations are data collected for this study is small due to cost constraint and also collected within the business relationships in Malaysia only. This definitely limits the generalizability of the findings. Future research could extend this study by making a replication in other developing

or less develop countries to test whether the same findings is observed. Study that compare how trust and dependency influence e-procurement adoption between two or more different countries setting could also be conducted (cross nationally). Second, research model shows that trust and dependency explains only 17% and 25% of the variance in adoption decision for supplier and customer respectively. This is relatively low percentage of variance and it shows that there are many other antecedents relevant to e-procurement adoption that is not addressed by this study and should be explored by researchers. Third, trust and dependency are two external factors that

**Table 2: Hypothesis testing results**

| | Hypothesis | Supplier | | Customer | |
|---|---|---|---|---|---|
| | | **Support** | **Strength** | **Support** | **Strength** |
| $H_1$ | Trust positively influences e-procurement adoption decisions. | Not supported | | Not supported | |
| $H_{1a}$ | Contractual trust positively influences e-procurement adoption decisions. | Supported | Moderate | Supported | Moderate |
| $H_{1b}$ | Trust positively increase the level of dependency | Supported | Strong | Supported | Strong |
| $H_2$ | Dependency positively influence e-procurement adoption decisions | Supported | Strong | Supported | Strong |
| $H_{2a}$ | IT/technical dependency positively influence e-procurement adoption decisions. | Not supported | | Not Supported | |
| $H_3$ | Interaction between trust and dependency positively influence adoption decisions | Supported | Strong | Supported | Strong |
| $H_4$ | Size of company negatively influences e-procurement adoption decisions. | Supported | Strong | Supported | Strong |

influence adoption while only size of company is incorporate in this study as control variable is and internal factors. Studies acknowledge that company's internal factor such as the management, financial situation, IT resources and culture could also influence adoption (Ungan, 2005; (Gunasekaran & Ngai, 2008; Wu et al., 2008). Future research could take into consideration the importance of both internal and external factors and draw a comparison on which factor has more influence on an e-procurement adoption decision.

**Appendix 1: Company profile**

| | Frequency | Percentage | | Frequency | Percentage |
|---|---|---|---|---|---|
| **Industry** | | | **Paid-up capital** | | |
| Electrical and electronics | 25 | 24.0 | Less than 1 Mil | 20 | 19.2 |
| Automotive | 22 | 21.2 | 1 to 20 Mil | 46 | 44.2 |
| Food and beverages | 12 | 11.5 | 21 to 40 Mil | 16 | 15.4 |
| Household product | 6 | 5.8 | 41 to 60 Mil | 4 | 3.8 |
| Telecommunication | 6 | 5.8 | 61 to 80 Mil | 3 | 2.9 |
| Chemical product | 6 | 5.8 | 81 to 100 Mil | 6 | 5.8 |
| Medical and health | 4 | 3.8 | More than 100 Mil | 5 | 4.8 |
| Plastic product | 2 | 1.9 | Unknown | 4 | 3.8 |
| Computer related product | 2 | 1.9 | | | |
| Oil and gas | 1 | 1.0 | **E-procurement** | | |
| Textile and garment | 1 | 1.0 | Yes | 78 | 75.0 |
| Others | 17 | 16.3 | No | 26 | 25.0 |
| **Number of employees** | | | | | |
| Less than 100 | 38 | 36.5 | | | |
| 101 - 500 | 43 | 41.3 | | | |
| 500 - 1000 | 15 | 14.4 | | | |
| More than 1000 | 8 | 7.7 | | | |
| Less than 100 | 38 | 36.5 | | | |