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Buyer-Supplier Relationship in the Adoption of e-Purchasing in the Small and Medium Printing Industries in Singapore: An Empirical Test Using Structural Equation Modelling

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Abstract

This research aims to explore how buyer-supplier relationship impacts the intention to adopt electronic purchasing (e-purchasing) by the printing industry in Singapore. The study utilizes the key concepts of organizational buying behaviour in terms of buyer-supplier relationship. A research model combining the theory of buyer-seller relationship and organizational culture with aspects of Innovation Diffusion Theory is developed. The model is tested by collecting data from the samples of executives from the printing industry (SMEs) in Singapore. The responses are analyzed by Partial Least Square (PLS) based Structural Equation Modelling approach. It is observed that buyer-supplier relationship strongly influences individual factor and organizational factor. However, organizational factor in turn does not significantly influence the intention to adopt e-purchasing. The only factor which significantly influences e-purchasing is perceived characteristics of e-purchasing. The implications of the results are highlighted. The results of this study will contribute to the existing theory and to the prospective adopters of e-purchasing in the printing industry in Singapore.

Keywords: Buyer-Supplier relationship, electronic purchasing, adoption, structural equation modeling, PLS

1. Introduction

Current marketing and sales practices are undergoing unprecedented transformations due to the adoption of new technology like Internet (Avlonitis and Karayanni 2000). Internet and its associated applications not only streamline organizational operations, they also exert significant influence on organization's relationship with its suppliers and customers, which is popularly known as buyer-supplier relationship (Cannon and Homburg 2001) in the literature. Developing and keeping existing relationships is given top priority in today's competitive business environment (Gummesson 1999).

This study takes a deep look in one type of internet based application called e-purchasing. Specifically the study attempts to explore the impact of buyer-supplier relationship on the adoption of e-purchasing in the printing industry in Singapore. Motivation of this research was dominated by practical reasons. First, we were interested to understand the

lack of adoption of e-purchasing in the printing industry in Singapore. Second, the study was also motivated by the general lack of specialized research in the context of e-purchasing and printing industry. Thus, the major objectives of this research are as follows:

- i. to study the key features of electronic purchasing adoption intention of the small and medium size printing companies in Singapore.
- ii. to investigate the influence of the buyer-supplier relationship in these companies on adoption intention.
- iii. to explore the impact of organisational culture of these companies (SMEs) on adoption intention.
- iv. to study the IT and e-Business readiness of the small and medium size printing companies in Singapore.

2. Background

Today's enterprises are rethinking and reexamining their relationships with their suppliers, distributors and customers. These companies (primarily SMEs) realize that buyer-supplier partnerships and alliances are becoming increasingly important (Smeltzer 1997). The key components of these relationships are: information flow (Kalakota and Robinson 2001), trust (Smeltzer 1997), and cooperative relationships (Cannon and Homburg 2001; Landeros, Reck and Plank 1995). The literature on the management of buyer-supplier relationships in industrial markets (Cannon and Homburg 2001) indicate that communication plays an important role in lowering acquisition costs. It is thus expected that buyer-suppliers relationship will be an important antecedent of e-purchasing.

Another important antecedent of e-purchasing is organizational culture. Organizational culture is the pattern of shared values and beliefs that influences employee attitudes and behaviour (Smither, Houston and McIntire 1996). The dimensions of organizational culture of a buying organization comprise of individual, group and the organization itself. These dimensions are applicable to this research study that focuses on the adoption of e-purchasing by the SMEs. Hult (2002) states that: "innovativeness encourages the introduction of new processes, products, and ideas to the organization". Innovativeness is one of the variables of organizational culture used in this research. The adoption of an innovation requires an individual or a group of consumers to make a decision regarding a new product, in this case – the adoption of "e-purchasing." Adoption antecedents like communication and cultural norms of the buying organizations in the acceptance of the electronic procurement are examined as a link to "e-purchasing".

Above brief background and other past literature has been used to develop a research model as shown in the next section.

3. Research Model

Figure 1 show the research model which is based on two underlying theories, i.e. buyer-supplier relationship (Sheth and Parvatiyar 2000) and 'diffusion theory' (Rogers 1983). The model consists of eight factors which are interacting in a complex way. It is observed that the ultimate dependent factor is 'intention to adopt e-purchasing', while the ultimate independent factor is 'buyer-supplier relationship' along with a number of other factors, while the mediating factor is the organizational factor.

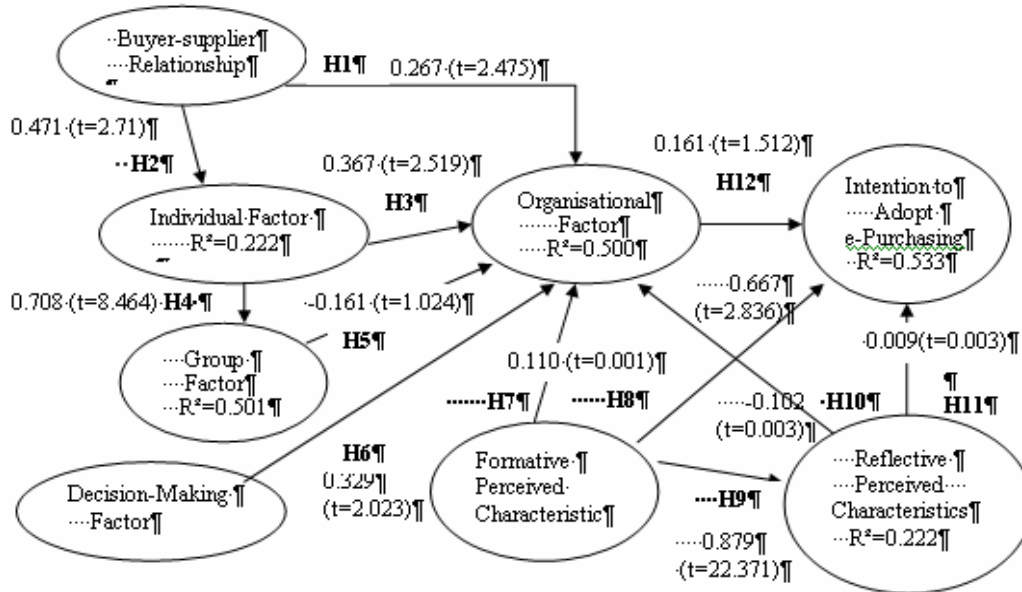


Figure 1: The research model

3.1 Hypotheses

The links among the factors in Figure 1 represent various hypotheses. The model thus has twelve hypotheses. Due to page limitation discussions on the hypotheses are not presented in the paper. However they are quite intuitive. The primary hypotheses of our research study are as follows.

Hypothesis 1 (H1): Buyer-supplier relationship has a positive impact on the organizational cultural factor of the printing company in the intention to adopt e-purchasing.

Hypothesis 2 (H2): Buyer-supplier relationship has a positive impact on the individual factor of the printing company in the intention to adopt e-purchasing.

Hypothesis 3 (H3): Individual factor of the owner/manager positively impacts the organizational cultural factor of his/her company in the intention to adopt e-purchasing.

Hypothesis 4 (H4): Individual factor of the owner/manager positively impacts the group factor of other departments in the intention to adopt e-purchasing.

Hypothesis 5 (H5): Inter-departmental group factor positively impacts the organizational culture factor of the company in the intention to adopt e-purchasing.

Hypothesis 6 (H6): Decision-making factor positively impacts the organizational cultural factor of the company in the intention to adopt e-purchasing.

Hypothesis 7 (H7): Formative perceived characteristics positively impact the organizational cultural factor in the intention to adopt e-purchasing.

Hypothesis 8 (H8): Formative perceived characteristics positively impact the intention to adopt e-purchasing.

Hypothesis 9 (H9): Formative perceived characteristics positively impact the reflective perceived characteristics in the intention to adopt e-purchasing.

Hypothesis 10 (H10): Reflective perceived characteristics positively impact the organizational cultural factor in the intention to adopt e-purchasing.

Hypothesis 11 (H11): Reflective perceived characteristics positively impact the intention to adopt e-purchasing.

Hypothesis 12 (H12): Organizational cultural factor has a positive impact in the intention to adopt e-purchasing.

4. Research Method

4.1 Field Study and Fine-tuning Research Model

This study used a four phased mixed qualitative/quantitative research approach (Tashakkori and Teddlie 2003): developing an initial research model based on the literature, fine tuning the research model via field studies, pilot study, and final study. In the field study stage, six executives of some printing companies in Singapore were interviewed to fine-tune the research model. After these interviews had completed, several items in the construct were either altered or deleted from the model. The most apparent was the construct of 'quan-xi'. Most of the respondents had said that this construct or factor was not appropriate in the e-purchasing domain. One reason could be that for e-purchasing there would be less personal interaction between supplier (printing company) and its customers (buyers). The main concerns were time saving, cost and price, ie characteristics of e-purchasing.

4.2 Measures

After the fine tuning of the model, eight constructs (factors) described earlier (see Figure 1) have been measured with great care. Most of the items have been adapted from existing literature. Six point Likert scale ranging from 'strongly disagree' to 'strongly agree' has been used in all the items. The reliability and validity have been assessed based on the standard procedure of Partial Least Square (PLS) technique (Chin 2000; <http://www.plsgraph.com>).

4.3 Sample and Procedure

The sample of this study was obtained from managers and owners of printing companies (SMEs) in Singapore. Primary data was collected via questionnaire based survey. Prior to that, the complete questionnaire was pilot tested by a group of ten (10) small to medium size printing companies in Singapore with workers ranging from 5 to 99. The questionnaire was revised twice to improve its face validity and readability.

In the main data collection phase the questionnaire was sent to 500 printing companies in Singapore. 125 companies returned their responses. 12 of them were not valid responses

due to missing data. We thus got 113 usable responses (22.6% response rate). It is noted that Singapore has been known for its low response rate (Tung and Kyung 1998, Goh, Lau and Neo 1999, Zaded et al. 2000). The profiles of the respondents are as follows. 41.6% of them have less than 5 workers. 39.8% employ 5 to 20, 4.4% in 21 to 49 bracket and 14.2% in the 50 to 99 bracket. 23% are managers, 32.7% are partners, 35.4% are either proprietors or owners and 8% as other. Their annual turnovers are: 15% have under S\$100,000 (100K), 46.9% have \$100K to 499K, 10.6% have 500K to 999K and 27.4% have an annual turnover of S\$1million and above. Only 31.9% ever requested e-purchasing and the majority (68.1%) of their clients have not requested e-purchasing. None of these respondents are members of The Association of Small and Medium Enterprises (ASMEs) of Singapore, which was quite surprising. As for the using of e-purchasing: 1.8% are using it less than 6 months, 1.8% are from 7 to 12 months, 2.6% are from 13 to 18 months and 8% are using more than 19 months. The average number of transactions a day is as follows: 7.1% for 0 to 10 transactions, 4.4% for 11 to 20, and only 2.7% had 31 or more transactions per day.

5. Results

5.1 Assessment of Measurement Properties

As per Barclay et al. (1995) item reliability, internal consistency and discriminant validity were used as criteria to assess model acceptability of measurement properties. The initial model with 40 observed variables was tested using PLS.

The individual item reliability was assessed by examining the loadings of the items. A minimum value 0.4 was used as criterion to accept the reliability of individual items (Igbaria et al. 1997). Results of the model showed that only one item under 'buyer-supplier relationship' construct had loading less than 0.4. The item was thus dropped from further analysis. The revised model was run again using PLS which showed all items have loadings above the cut-off point of 0.4. The item reliability was thus satisfied by the revised model. Due to page limitation item reliability table is not presented in the paper.

Internal consistency of the latent variables was measured following the procedure of Fornell and Larcker (1981). The cut-off point for internal consistency is normally taken as 0.7. Table 1 shows that all latent variables have internal consistencies above 0.7, indicating that all the constructs are internally consistent and reliable.

Table 1: Internal Consistencies

Latent Variables	Internal Consistencies
Buyer-supplier Relationship (B-S R)	0.932
Individual Factor (IND)	0.806
Group Factor (GRP)	0.981
Decision-making Factor (D-M)	0.884
Organisation factor (ORG)	0.909
Reflective Perceived Characteristics (RPC)	0.952
Formative Perceived Characteristics (RPC)	0.947
Intention to Adopt e-Purchasing (INT)	0.762

Discriminant validity refers to the extent to which a given construct differs from other constructs. It can be evaluated using either square-root of AVE (Table 2) or by cross-loading (Barclay, Higgins and Thompson 1995). In this paper the former has been used to assess the discriminant validity. Table 2 below shows the correlation matrix for the constructs. The diagonal of this matrix is the square root of the AVE. For adequate discriminant validity, the diagonal elements should be significantly greater than the off-diagonal elements in the corresponding rows and columns. The assessment of discriminant validity has shown sufficient support for the model, except for the reflective construct (REF) which has a very minute value of only 0.002 over.

Table 2: Correlation and Discriminant Validity

	B-SR	IND	GP	D-M	ORG	REF	FORM	INT
B-SR	0.735							
IND	0.471	0.764						
GP	0.599	0.708	0.888					
DM	0.642	0.658	0.743	0.810				
ORG	0.559	0.595	0.498	0.627	0.745			
REF	0.202	0.253	0.278	0.273	0.187	0.877		
FORM	0.231	0.237	0.212	0.301	0.234	0.879**	0.885	
INT	0.263	0.367	0.252	0.327	0.318	0.626	0.713	0.729

*Note: The diagonal values are the square roots of AVE

** Correlation is significant at the 0.01 level

5.2 The Structural Model and tests of Hypotheses

Table 4 shows the results of the structural model. It is observed that among the hypotheses H1, H2, H3, H4, H6, H8 and H9 are supported (significant t-values) while H5, H7, H10, H11 and H12 are not supported (insignificant t-values). The model also explains 22.2% of the variance of Individual Factor, 50.1% of the variance of Group Factor, 50% for Organisational Factor, 22.2% for Reflective Perceived Characteristics and 53.3% of the variance of Intention to Adopt e-purchasing (see Figure 1 and Table 3).

Table 3: Tests of Hypotheses

Hypotheses	Standard path coefficients	t-value
H1: B-S R -> ORG	0.268	2.475
H2: B-S R -> IND	0.471	2.718
H3: IND -> ORG	0.367	2.519
H4: IND -> GRP	0.708	8.464
H5: GRP -> ORG	0.161	1.024
H6: D-M -> ORG	0.329	2.023
H7: FPC -> ORG	0.110	0.001
H8: FPC -> INT	0.667	2.836
H9: FPC -> RFC	0.879	22.371
H10: RPC -> ORG	0.102	0.003
H11: RPC -> INT	0.009	0.003
H12: ORG ->INT	0.161	1.512

6. Discussions

The structural model analysis has revealed some interesting findings. This study explores the possible synergies between buyer-supplier relationship and adoption of electronic purchasing (e-purchasing). The results provide full and some partial support for the hypotheses. The importance of buyer-supplier relationship in e-purchasing is consistent with other previous research in this specific research arena (Croom 2000; Deeter-Schmelz and Kennedy 2002; Leek, Turnbull and Naude 2003).

Among the hypotheses, H1, H2, H3, H4, H6 are supported. It is apparent that buyer-supplier relationship has great impact on the printing organisation in the intention to adopt e-purchasing. In H7 to H11 (see Table 3), the findings indicate partial support for the buyer-supplier relationship within organization but not the reflective characteristics like enhancing the company's image and assisting in their business operations. As for the formative characteristics, the printing companies showed full support for various characteristics of e-purchasing influencing the intention to adopt e-purchasing. However, hypothesis **H12**, the organizational factor does not support the intention to adopt e-purchasing. The qualitative aspect of the executive interview reveals that most of the companies interviewed did not support the intention to adopt e-purchasing because their clients (customers) were not keen in electronic procurement. Further evidence also shows in the demographic data that only 31.9% wanted electronic purchasing, and 68.1% did not. This could be attributed to the slow economic situation in Singapore during the time of data collection.

Another possible reason is that the Singapore government has not imposed any legislation on electronic transaction. Even for tendering of government printing, printers are still filling up forms and forwarding written tenders to government bodies and departments. However, for certain industries like shipping, the Singapore Port authority has already implemented electronic transactions. Therefore, adoption of e-Purchasing also depends on government influence.

7. Conclusions

This study comprehensively investigated the intention to adopt e-purchasing by the small and medium printing enterprises in Singapore. A research model was first developed from the literature which was then fine tuned via field studies. The results are mixed. While buyer-supplier relationship significantly impacts individual and organizational factor, the organizational factor in turn does not impact the intention to adopt e-purchasing. This was also evident from the field study where the respondents clearly mentioned that 'quan-xi' does not play an important role in the decision to adopt e-purchasing which is mostly influenced by operational characteristics like cost saving, speed of transaction etc. The quantitative analysis also found that perceived formative characteristics of e-purchasing significantly impact the intention to adopt e-purchasing.

Our research unearthed some interesting findings which will provide some valuable insights for the printing industry in Singapore.

References

- Avlonitis, G.J., and Karayanni, D.A. "The Impact of Internet use on Business-to-Business Marketing: Examples from American and European Companies," *Industrial Marketing Management* (29), 2000, pp. 441-459.
- Barclay, D., Thompson, R., and Higgins, C. "The Partial Least Square (PLS) Approach to Causal Modeling, personal Computer Adoption and Use as an Illustration," *Technology Studies* (2:2), 1995, pp. 285-324.
- Cannon, J. P., and Homburg, C. "Buyer-Supplier Relationships and customer Firm Costs," *Journal of Marketing* (65), 2001, pp. 29-43.
- Carter, P.L., Carter, J.R., Monczka, R.M., Slaughter, T.H., and Swan, A.J. "The Future of Purchasing and Supply: A Ten-Year Forecast," *The Journal of Supply Chain Management* (4), 2000, pp. 14-26.
- Chin, W.W. *Frequently Asked Questions – Partial Least Squares & PLS-Graph*, 2002, <http://disc-nt.cba.uh.edu/chin/plsfaq.htm>.
- Croom, S.R. "The Impact of Web-Based Procurement on the Management of Operating Resources Supply," *The Journal of Supply Chain Management* (4), 2000, pp. 4-13.
- Deeter-Schmelz, D.R., Bizzari, A., Graham, R., and Howdyshell, C. "Business-to-Business Online Purchasing: Suppliers' Impact on Buyers' Adoption and Usage Intent," *The Journal of Supply Chain Management* (4), 2001, pp. 4-10.
- Deeter-Schmelz, D.R., and Kennedy, K. N. "An exploratory study of the Internet as an industrial communication tool: Examining buyers' perceptions," *Industrial marketing management* (31), 2002, pp. 145-154.
- Gable, G.G. "Integrating case study and survey research methods: an example in information systems," *European Journal of Information Systems* (3:2), 1994, pp. 112-126.
- Gefen, D., Straub, D. W., and Boudreau, M.C. "Structural Equation Modeling and regression: Guidelines for Research Practice," *Communications of the Association for Information Systems* (4:7), 2000, pp. 1-77.
- Goh, M., Lau, G. T., and Neo, L. "Strategic Role and Contribution of Purchasing in Singapore: A survey of CEOs," *The Journal of Supply Chain Management* (35:4), 1999, pp. 12-22.
- Greenberg, J., and Baron, R.A. *Behavior Organizations: Understanding and Managing the Human Side of Work*, New Jersey: Prentice-Hall, Inc, 2000.
- Gummesson, E. *Total Relationships Marketing*, Ma: Butterworth-Heinemann, 1999.
- Hult, G.T.M. "Cultural Competitiveness in Global Sourcing," *Industrial marketing Management* (31), 2002, pp. 25-34.
- Igarria, M., Zinatelli, N, Cragg, P., and Cavaye, A.L.M. "Personal computing acceptance factors in small firms: a Structural Equation Model," *MIS Quarterly* (September), 1997, pp. 279-302.
- Landeros, R., Reck, R., and Plank, R.E. "Maintaining Buyer-Supplier Partnerships," *International Journal of Purchasing and Materials Management* (4), 1995, pp. 3-11.
- Leek, S., Turnbull, P.W., and Naude, P. "How is information technology affecting business relationship? Results from a UK survey," *Industrial Marketing Management* (32:2), 2003, pp. 119-126.
- Poulos, M. *Buyer Behaviour: Implication for Marketing*, NSW-Australia: Prentice Hall-Pearson Education Australia Pty. Ltd, 2001.

- Rogers, E.M. *The Diffusion of Innovations*, 3rd ed., New York: Free Press, 1983.
- Rogers, E.M. *The Diffusion of Innovations*, 4th ed., New York: Free Press, 1995.
- Samra-Fredericks *Conversation Analysis*, London: Sage Publication Ltd, 1998.
- Sheth, J.N., and Parvatiyar, A. *Handbook of Relationship Marketing*, London: Sage Publications, Inc, 2000.
- Smeltzer, L. "The Meaning and Origin of Trust in Buyer-Supplier Relationships," *International Journal of Purchasing and Materials Management* (4), 1997, pp. 40-48.
- Smither, R.D., Houston, J.M., and McIntire, S.D. *Organisation Development: Strategies for Changing Environments*, New York: Harper Collins College Publishers, 1996.
- Tashakkori, A. and Teddlie, C. *Handbook of Mixed Methods in Social & Behavioral Research*, Thousand Oaks: Sage Publications, Inc, 2003.
- Tung, L.L., and Kyung, K.K. *Data Mining Applications in Singapore*, 1998, <http://www.sbaer.uca.edu/research/1998/ICSB/q005.htm>
- Zadeh, H.S; Adam, S., and Deans, K.R. *The Sixth Australian World Wide Web Conference, Rihga Colonial Club Resort, Cairns, 12-17 June 2000*.